

SUMMIT

RESEARCH

Book of Abstracts

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July 13-15 2022
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Research Summit 2022

Universidade de Aveiro

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under the theme "Open Science"

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Preface

The Research Summit 2022 took place on the 13th, 14th and 15th of July, under the theme "Open Science".

It is a forum to foster an important debate among the research community of the University of Aveiro and to increase collaboration, advancing the state of the art and enhancing research efforts on campus.

Assuming a greater return to academia, Research Summit 2022 also adopts a face-to-face model on the first day (plenary) and essentially face-to-face on the following days (presentations by PhD students and 1st and 2nd cycle students).

This book of abstracts and proceedings, of the Research Summit 2022, are the result of remarkable contributions of young scientists and PhD students working in the topics of the doctoral programs of the University of Aveiro.

Although the Research Summit 2022 is aimed at young scientists, senior scientists have contributed to the success of the conference by their contributions and promoted discussions as well as collaboration in the research works, incorporated in the book of abstracts and proceedings. The presence of senior scientists and thesis supervisors is very fruitful for all participants, and it is hoped that young researchers and PhD students can take profit from this experience.

The organizers hope that this Research Summit 2022 can represent a remarkable opportunity for a fruitful exchange of ideas between the participants, and a landmark in the history of the Forums in the University of Aveiro.

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A. Andrade-Campos

Aveiro, Portugal, July 2022.

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List of Abstracts

Biology

Espécies botânicas raras ou ameaçadas do cerrado brasileiro e promoção da cultura científica – Importância das ilustrações botânicas enquanto embaixadores das ações de divulgação/disseminação científica e sensibilização/conservação ambiental regional

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Biology

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Abstract. *Investigação sobre formas representativas-interpretativas de espécies vegetais do Cerrado brasileiro (Goiás e Distrito Federal) com status de raras ou ameaçadas de extinção, enquadradas como promotoras iconográficas primordiais e de leitura universal.*

O trabalho baseia-se na realização de metodologias híbridas como desenho de observação, a partir de fotografias, descrição taxonômica das plantas, e sua figuração também a partir de exsicatas, com base em medidas biométricas precisas, de proporcionalidade e semelhança entre grupos taxonômicos, na busca pelo modelo desenhado com valor taxonômico. Com esses modelos, ilustrações científicas serão criadas, como reflexo do pensamento científico e parte integrante de sua linguagem visual. Em suma, explorar as formas da dialética entre Arte e Ciência, na busca de um bem maior, sem, no entanto, entrar no campo da criatividade subjetiva.

Application of microorganisms to enhance maize sustainability and tolerance to drought

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Abstract. *Climate change and water availability can lead to drought situations, negatively influencing agriculture production worldwide. New techniques are needed to mitigate crop losses. The utilization of beneficial microorganisms such as plant growth-promoting bacteria (PGPB) is a way to improving soil conditions in areas under drought since the soil microbial communities play a relevant role in the growth and productivity of crops. The utilization of PGPB helps plants survive in stressed environments by promoting faster germination and development, increasing soil productivity in a sustainable and environmentally friendly manner. This Ph.D. intends to investigate the influence of PGPB in maize field development when subjected to drought. To increase the productivity of maize fields in drought situations and reduce the use of chemical fertilizers.*

Development of antibacterial bio-based materials for active food packaging through phage incorporation

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Biology

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Abstract. *Despite the recent advances achieved in food industries to fulfil the growing consumer demand for high quality and safe food, microbial contamination remains a huge problem. The recurrent use of antibiotics, namely in animal production, significantly increases the emergence of multiresistant bacterial strains, resistant to the most used antibiotics. These bacteria can cause food deterioration and more important infectious diseases. Furthermore, the ingestion of antibiotics together with food can lead to the decreased effectiveness of many antibiotics applied in human medicine. Consequently, it is imperative to develop new approaches to overcome this problem. Phages, virus that only infect bacteria, can be a suitable approach. Phages exhibit important features that make them promising antibacterial candidates, such as their ubiquitousness, high specificity against a target host, self-replication capacity while their hosts are present, low inherent toxicity, easy and economical isolation and production, and a long shelf life. The incorporation of phages in food packaging materials can be an effective alternative to protect phages from environmental challenges and improve its efficacy, allowing slower and continuous release. Thus, this study aims to develop new antibacterial biopolymeric films incorporating phages for active food packaging to avoid food contamination. For now, free phages of Escherichia coli (phT4A) and Salmonella Typhimurium (phSE-5) were tested in milk with about 4 log colony-forming units (CFU)/mL of inactivation after 8-10 h of incubation [multiplicity of infection (MOI) of 10 and 100]. In addition, the efficiency of pullulan films incorporating phage phT4A was evaluated. Phages were successfully incorporated in the pullulan films increasing their concentration in solution until it remains stable until the end of the assays with promising results of inactivation during first 12 h of incubation (~ 4 log CFU/mL of inactivation). Overall, pullulan-based films incorporating phages constitute a simple approach to preserve the activity of phages in order to improve food safety.*

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Developing epigenetic biomarkers of metal exposure in *Daphnia*

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Abstract. *Freshwater ecosystems are largely endangered as a consequence of human activities. An efficient monitoring of metal contamination is an emerging concern and major challenge towards preventing freshwater biodiversity loss. Epigenetic mechanisms reflect the impact of environmental factors, including contaminants, on genes. Epigenetic modifications are highly responsive to stressors, which sets them as early-warning signals of environmental exposure and potential new molecular targets for biological remediation. The aim of this project is to develop and validate epigenetic biomarkers of metal exposure, using copper as a model contaminant and test stressor. *Daphnia*, a key organism in freshwater ecosystems widely considered in regulatory frameworks, was tested under different scenarios of copper exposure (assessing the sensitivity and selectivity of epigenetic modifications). Individual, population, genetic and epigenetic endpoints were assayed, and the holistic analysis of such results will represent a key validation step towards incorporating epigenetic biomarkers in the risk assessment of metals.*

NoPlastic - Effects of nanoplastics on marine polychaetes: alone and in combination with trace elements

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Abstract. *Plastic pollution is a serious problem in aquatic systems throughout the world. Despite the increasing number of studies addressing the impact of macro- and microplastics on biota, there is still a significant knowledge gap regarding the effects of nanoplastics alone and in combination with other contaminants. Among the aquatic contaminants that may interact with nanoplastics is arsenic (As), a metalloid found in estuarine and coastal ecosystems, pernicious to benthic organisms. This study aimed to understand how a parental pre-exposure to 100 nm polystyrene nanoplastics (PS NPs) would influence the response of *Hediste diversicolor* to exposure to arsenic in terms of behaviour, neurotransmission, antioxidant defences and oxidative damage, and energy metabolism. The obtained data revealed an increase in burrowing time and a significant inhibition in cholinesterase activity in all polychaetes exposed to As, regardless of the pre-exposure to PS NPs. Oxidative status was altered particularly in parentally exposed organisms, with damage detected in terms of lipid peroxidation at 50 µg/L and protein carbonylation at 50 and 250 µg As/L exposed organisms when compared to control. Overall, data shows that parental pre-exposure to plastics influences the response of aquatic organisms, increasing their susceptibility to other contaminants. Thus, more studies should be performed with other environmental contaminants, to better understand the potential increased risk associated with the presence of nanoplastics may pose to aquatic ecosystems.*

Cephalosporiosis: Can bacteria induce resistance in plants?

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Abstract. *Maize is the most produced sown crop in Portugal (grain and silage), involving 75.000 farmers and occupying 150.000 ha. In the last years late wilt (cephalosporiosis), a disease caused by the pathogenic fungus *Magnaportheopsis maydis* (former *Cephalosporium maydis*), represents a major threat to maize. The disease reduces production up to 59% in Portugal and causes serious economic losses. Currently the pathogen is controlled by using maize resistant varieties, but the success of this methodology is dependent on the fungus virulence. Volatile organic compounds produced by bacterial isolates (BVOCs) have the ability to inhibit growth of some fungi. This proposal aims to study the ability of BVOCs to inhibit *M. maydis* growth and to induce systemic resistance in maize to control cephalosporiosis. Molecular techniques and metabolomics methodologies, in combination with greenhouse experiments and field trials will allow the development of a biologically-based methodology for the control of the disease in maize.*

Phage therapy as an innovative technology to decontaminate bivalves

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Abstract. *The recurrent emergence of infection outbreaks associated with the consumption of bivalves is of extreme importance for public health. Although the elimination of bacteria present in these marine organisms mostly relies on their depuration, this process is not fully effective and some microorganisms can persist in bivalve tissues. Bacteriophage (or phage) therapy represents a promising tailor-made approach to control human pathogens that occur in bivalves. Its success depends on a deep understanding of the kinetics resulting from the interaction between bacteria, phages and bivalves. This study aims to develop an effective approach to decontaminate bivalves by combining depuration and phage therapy, thus preventing the transmission of pathogenic bacteria from bivalves to humans. By combining these techniques, it will be possible to speed-up decontamination and improve its efficiency, as well as enhance bivalves' safety and quality. This approach will ultimately contribute to enhance public health, decreasing morbidity and mortality.*

Effects of drought and contamination on freshwater macroinvertebrates

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Abstract. *Climate change has been increasing the frequency and magnitude of droughts. These have serious repercussions on freshwater ecosystems, causing negative effects on the biodiversity they sustain. The occurrence of drought can also enhance the adverse effects of other impacts to these ecosystems, such as chemical contamination from agriculture. Thus, it is imperative to accurately assess the influence of drought in the response of freshwater communities. Given the high sensitivity and bioindicator value of benthic macroinvertebrates, their response along drought and contamination gradients is being studied in this work to assess whether their resilience to anthropic impacts is compromised or not by drought.*

Use of geochemical tools to trace the geographic origin of two commercially important clams (*Ruditapes decussatus* and *Ruditapes philippinarum*) and socioeconomic impacts of its origin certification

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Abstract. *The traceability of clams is increasingly becoming a requirement to safeguard public health and demonstrate that the shellfish were caught legally and cultivated in suitable locations. The mentality of consumers is shaping itself to these problems, wanting to know what they are buying, as well as how, where and when seafood has been harvested/produced. This PhD research project aims to standardize the use of a geochemical tool (Inductively Coupled Plasma-Mass Spectrometry) to determine and compare elemental fingerprints (EF) displayed by the valves of clams and use them to trace their place of origin. The EF of valves from clams with high commercial value (*Ruditapes decussatus* and *Ruditapes philippinarum*) will be compared in specimens originating from 4 locations along the Galician coast and 6 locations along the Portuguese coast. Potential seasonal and interannual shifts in EF will also be evaluated, as well as the existence of species-specific effects. Finally, the socio-economic impact of certification of clams? geographic origin will also be assessed. The PhD research project may reveal that the EF of clam valves can differentiate locations of origin and shifts over time, as well as, EF of clam valves can still display species-specific features, even if originating from the same location. To complement the research, the socio-economic study can assist us to understand the perception of producers and consumers about clams with a certificate of origin and their added value. The research can contribute to origin certification, to add value to clams, and enhance the food safety of consumers.*

Upconversion nanoparticles for multimodal therapy of melanoma

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Abstract. *The main goal of this work is to develop multimodal nanoplatforms for melanoma skin cancer treatment. The originality is centred on the development of nanoplatforms formed by UCNPs with a shell of mesoporous silica to allow the load of photosensitisers (PS) and anticancer drugs that, under NIR excitation will produce photodynamic therapy, release of anticancer drug (chemotherapy) and plasmonic hyperthermia (photothermal therapy). Progress in every therapy has been accomplished, but mainly in the chemotherapy. Nanoplatforms have been loaded with doxorubicin, an anticancer drug, and their effects on four different cell lines have been evaluated. Cytotoxicity, cell cycle and apoptosis analysis were performed, and the results demonstrated the potential therapeutic application of these nanoplatforms in fighting melanoma cancer.*

Assessment of multiple-stressor scenarios in freshwater systems to determine organic (pendimethalin) and inorganic (copper) pollutants' impacts

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Abstract. *This research aims to assess single and combined toxic and biochemical effects of the herbicide pendimethalin (Prowl®) and the metal copper, under 3 distinct temperatures, at freshwater systems and compromise the nutritional value along trophic levels. Moreover, multiple-stressor scenarios will be conducted by exposing species to non- and contaminated diets at single and mixture treatments. Biochemical tools may allow to determine the presence of stressors in aquatic systems and used as early warning bioindicators to be applied in ecological monitoring studies, with application in a bioenergetic model as proposed. There are few studies in literature about this herbicide, being this work the unique assessing single and mixture toxic and biochemical impacts of Prowl® and copper in freshwater trophic levels. This study intends to contribute with further information to predict the real impacts in risk assessment and establish baseline levels to the healthy status of environmental systems, contributing to the conservation and sustainability of aquatic systems.*

Indoor-generated particulate matter: chemical signatures and associated mutagenic and cytotoxic effects

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Abstract. *Epidemiological studies have shown that ambient particulate pollution has adverse effects on human health. Less attention has been paid to indoor particles, despite the fact that people spend most of their time indoors. Exposure to indoor air pollutants from a short distance may be substantial and even more harmful than exposure to outdoor pollution. The aims of this work are the detailed characterization of particulate organic and inorganic compounds emitted from indoor activities by multiple techniques (e.g., GC-MS, ICP-MS, etc.) and the evaluation of the potential carcinogenic, mutagenic and toxicological effects of the different constituents extracted from indoor-generated particles towards Ames tester strains and human cell line models.*

*In the current year, the cytotoxic and mutagenic potential effects of particulate matter below 10 μm (PM10) obtained from the emissions in a beauty salon and outdoor air were evaluated. The cytotoxicity of the PM10 total organic extracts was assessed in the A549 cell line, representative of the human alveolar epithelial, using the MTT assay. The mutagenicity of the PM10-bound polycyclic aromatic hydrocarbons (PAH) was screened through the Ames test, using *S. typhimurium* TA98 strain with and without metabolic activation by the rat liver microsomal fractions (S9 fraction).*

PM10 organic extracts showed a significant effect ($p < 0.05$) on the metabolic activity of A549 cells. The highest significant decreases were observed for the indoor PM10 organic extracts and lower decreases were observed for the outdoor and indoor background PM10 organic extracts. The results from the Ames test revealed that all the PAH samples presented ratios below 2 (twofold principle of mutagenicity confirmation) for the TA98 strain with and without metabolic activation. In addition, no statistically significant differences were observed.

PM10 organic extracts interfere the metabolic activity of A549 cells. However, any effect was observed for mutagenicity. One important point to note is that all the tested samples were diluted, presenting masses between 7.5 and 66.9 ng/plate. This could be the reason for the apparent absence of mutagenicity.

Application of the biorefinery concept to value the invasive species *Procambarus clarkii*

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Abstract. *The red swamp crayfish *Procambarus clarkii*, native from EUA, is the most well-established invasive species in Europe, becoming the major biodiversity threat of freshwater systems. The success of their environmental compatibility is related to high plasticity, borrowing activity, ability to integrate into the food web at many levels and low predation rates. In spite of the several and diversified methods that have been proposed or used, all have high costs and noneconomical return.*

*The exoskeleton of *P. clarkii* is composed by chitin (15-20%), proteins, including pigments (25-40%) and calcium carbonate (40-55%), which represents a considerable source of these biocompounds with biotechnological relevance. In this way, we propose the development of sustainable efficient techniques to extract astaxanthin, chitin and collagen from the invader *P. clarkii* in order to enrich environmental management strategies with an economic resource that can support the removal of the crayfish from invaded ecosystems.*

The influence of *Eichhornia crassipes* on the environmental integrity of Pateira de Fermentelos and impacts on the aquatic continuum towards the sea

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Abstract. *Aquatic ecosystems are rich in biodiversity and home to a diverse array of habitats and species, providing ecosystem services and human well-being. However, excess of nutrients, contaminants and invasive species are relevant examples of threats to their environmental integrity and to the societal benefits. A central question is to understand how to operationalize ecological indicators in support of governance of aquatic ecosystems continuum. To answer this question, this proposal will use the DPS-ES-IR conceptual model (Drivers, Pressures, State, Ecosystem Services, Impacts, Responses) to identify and assess drivers and pressures of aquatic ecosystems; understand causalities between biodiversity, ecosystem functions and services, having Pateira de Fermentelos as Case study. Overall, this thesis will provide an innovative approach for the integrated management of the invasive species *Eichhornia crassipes*, increasing understanding of its ecological dynamics and providing a more realistic accountability of the negative and positive impacts of this exotic species in biodiversity and ecosystem services provided by the species and its invaded habitats.*

Photodynamic inactivation for blood disinfection by immobilized photosensitizers

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Abstract. *Presently, there is no approved disinfection protocol for red blood cells (RBC) due to the collateral damages of the available procedures. Antimicrobial photodynamic therapy (aPDT) can be an alternative method with promising outcomes. This approach refers to the combination of light, dioxygen and a photosensitizer (PS) to induce microbial inactivation through the production of reactive oxygen species (ROS). Previous results of our group, using a tricationic porphyrin [5-(pentafluorophenyl)-10,15,20-tris(1-methylpyridinium-4-yl) porphyrin tri-iodide - of Tri-Py⁺-Me-PF], have demonstrated a remarkable antimicrobial activity of planktonic cells in blood through the photodynamic procedure. Staphylococcus aureus is one of the most important microorganisms isolated from the blood and biofilm production by S. aureus is one of the most significant virulence factors of the bacterium. In this study, it was evaluated the effectiveness of Tri-Py⁺-Me-PF, in S. aureus biofilms. Results: The results show that the Tri-Py⁺-Me-PF, in PBS, causes significant inactivation of the S. aureus in biofilms form (4.3 log), although the susceptibility was attenuated in relation to planktonic cells. Conclusion: Effective reduction of S. aureus biofilms provided promised indication for its use in blood disinfection.*

Endolith: Niche construction and photobiology of autoendolithic coral symbiotic microalgae

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Abstract. *Symbioses between corals and dinoflagellates of the family Symbiodiniaceae are key for the functioning of reef ecosystems. The recent discovery that free-living symbiodiniaceans can enter a temporary autoendolithic phase by enhancing Aragonite deposition, thus producing structures called symbiolites, significantly widened the research perspectives on these microalgae, especially since expected ocean acidification may jeopardise these calcification processes. This Doctoral project intends to answer central questions about the functioning, ecological significance and fate of this endolithic niche in reefs affected by ocean acidification. More specifically, the aim of the project is three-fold: first, to unravel the role of bacteria and Extracellular Polymeric Substances (EPS) in symbiolite formation; secondly, to describe the photobiology the endolithic niche in Symbiolites and reef sand grains; and lastly, to evaluate the effects of seasonal changes on the calcification process, under current current environmental conditions as well as under ocean acidification conditions expected for the year 2100. To answer all these questions, several complementary conceptual approaches will be adopted. The workplan is expected to provide accurate in vitro models for microbially induced calcification and for the photobiology of endolithic niches, and a detailed characterization of in situ autoendolithic niche construction of coral symbiotic algae.*

Biology and ecology of global changes

Trophic rewilding: unrevealing the effects on carnivores? assemblage

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Abstract. *Rewilding emerged as an initiative to restore abandoned landscapes. Such process has induced a worldwide expansion of large herbivores range. The recovery of herbivores is essential to sustain healthy carnivore populations, but as ?ecosystem engineers?, they can alter vegetation structure and modify the animal community through direct and/or indirect pathways. The effects of herbivores on small mammals are widely studied, however, their impacts on mesocarnivores, who depend on small mammals to survive, are less explored. When accessed, the studied effects are often linked to livestock impacts, frequently ignoring wild herbivores. Livestock presence negatively influences mesocarnivores? activity and abundance, which highlights the importance to understand the effects of herbivores expansion from a carnivore conservation and herbivore management perspective. This project intends to fill this gap by clarifying how domestic and wild herbivores influence the abundance, the individual and population fitness, and the spatio-temporal patterns of mesocarnivores occurrence in Mediterranean landscapes.*

EDIBLE INSECTS: FROM A SUSTAINABLE FOOD PRODUCTION TO A FOOD SAFETY CONCERN

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Abstract. *European legislative proposals on waste have been revised to encourage the industry to place more sustainable products on the market, promote recycling schemes, and recover waste. Insect production has been presented as a sustainable solution, based on a process that challenges the reuse of waste such as vegetable by-products, reintroducing them into the agri-food chain. This PhD Workplan integrates waste management with food safety and environmental sustainability. The safety aspects of rearing insects in agricultural and market leftovers for food and feed by evaluating different contaminants' pathways into the insects will be studied. At the same time, the organic waste that is generated due to the metabolic activity of the insects in the rearing facilities will be evaluated as organic fertilisers on agricultural crops, a topic that needs more in-depth assessment before a significant upscaling of its agronomic applications occurs.*

Different biotic and abiotic environments change the responses of *Lumbriculus variegatus* to long-term exposures to chemicals.

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Abstract. *Environmental risk assessment (ERA) is nowadays based on high acute exposures to a small number of model species in the laboratory using lethal endpoints as observed effects. However, these experiments can hardly simulate the complex conditions of natural environments, where low-level and long-term exposure to chemicals is the day-to-day life. These exposures cause several subcellular changes within the organisms, leading to adverse effects in the long run, which short-term experiments can not detect.*

*For the implementation of chronic exposures in the ERA, new non-standard endpoints need to be investigated. This is the aim of the Marie Curie International Training Network CHRONIC. As part of the CHRONIC network, the aim of the present PhD Plan is to evaluate the consistency of chemically induced initiating events (lower level of biological organisation) and individual-level responses (physiology and behaviour) in *Lumbriculus variegatus* under long-term, low-level exposures, along with combined stressors' exposures (chemical, abiotic and biotic stressors). For this purpose, a chemical model will be chosen based on a first screening approach using standardised short-term technical guidelines.*

Physiological markers represent a useful tool in ERA, as they represent initiating key effects measured at the subcellular level to sublethal exposure. Biomarkers can show effects before irreversible changes occur within the organisms and are considered fast and sensitive responses. The chosen biomarkers for the present study represent the xenobiotic metabolism (e. g. glutathione-S-transferases, sulfotransferase) and the defence response (e. g. catalase, lipid peroxidation rate). Additionally, biomarkers representing the general condition of the organisms, including the energy budget (e. g. glycogen, carbohydrate, lipid contents), will be used for the approach to link subcellular effects to higher biological levels. All biomarkers will be combined in an Integrated biomarker response (IBR). The organism's behavioural response of the organisms and genotoxicity, as well as the dynamic energy budget model and adverse outcome pathways, will be used to link the subcellular response to higher biological levels.

ARISE - Effects of free and encapsulated anticancer biomolecules in zebrafish

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Abstract. *In the last decades, pharmaceuticals and engineered nanomaterials (ENMs) have been considered emerging contaminants in aquatic environments. Antineoplastics agents (AAs) are a group of pharmaceuticals commonly found in aquatic environments but their environmental impact is scarcely studied. Encapsulation of AAs in non-toxic ENMs has been proposed for targeted drug delivery and decrease of side effects in humans. However, their effects in the ecosystem are poorly studied. Therefore, the need of an in-depth assessment of such effects induced by antineoplastics, in both free or nanostructured forms, is crucial to derive an accurate environmental risk assessment (ERA), by developing and/or adapting standardized testing procedures and improve risk-based regulations. The present proposal aims at evaluating the effects of a state-of-the-art clinic antineoplastic, a novel compound with anticancer properties, and nano-drug delivery systems based on both anticancer compounds using the zebrafish model. Finally, the effects at different organizational levels will provide robust information for ERA.*

Impact assessment on large carnivores: can we do it better?

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Abstract. *Impact assessment (IA) procedures are well consolidated in Portugal and wolf monitoring programs under Environmental IA projects have been ongoing for almost 20 years, with dozens of reports produced from intensive field surveys. However, most of these reports fail to give correct insights on impacts at the population level, since they focus on individual and local changes rather than a regional and populational approach, often using naïve statistical analysis and unsuitable spatial resolution, which can lead to biased final assessments.*

In recent years, the improvement and affordability of non-invasive methods such as digital camera traps and genetic analysis from hair or scats have opened new and exciting opportunities to study large carnivores' populations. Advances in species distribution modelling, occupancy models, spatial capture-recapture (SCR) models are now available and are under constant development, making tools to correctly evaluate large carnivores' populations dynamics accessible to biologists and wildlife managers.

Acknowledging that IA calendars and budgets are often shorter than the ones from conservation projects, the current availability of methodologies and analytic tools should result in standardized, systematic, replicable, cost-effective, and robust approach to assess human infrastructure impacts on large carnivores.

We want to demonstrate the usefulness of using SCR models to monitor wolf population under IA procedures and develop strong solutions for it.

The ecotoxicological impacts induced by mixtures of emerging pollutants in marine species exposed to different climate change scenarios

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Abstract. *Environmental change caused by several stressors, such as pollutants and climate associated factors, may significantly influence marine near-shore systems. However, there is limited information regarding the toxicity resulting from emerging pollutants, such as rare earth elements (REEs) and surfactants, especially when acting as mixtures (also with potentially toxic elements (PTEs)) and particularly under predicted climate change scenarios. Since organisms in coastal ecosystems are vulnerable to a combination of several pollutants and climate associated factors, the aim of this work is to evaluate the impacts of multiple stressors (REEs, surfactants, warming, salinity shifts) acting isolated and as mixtures (including PTEs) in *Mytilus galloprovincialis*, identifying early warning signals of environmental change. The impacts in *M. galloprovincialis* mussels will be assessed analyzing biochemical, histopathological and physiological alterations. The quality of *M. galloprovincialis* sperm will be also evaluated by measuring biochemical and physiological markers. The findings will generate essential knowledge for the establishment of regulatory guidelines and practices to ensure the protection of coastal systems, the maintenance of goods and services.*

Biomedicine

Promising cell-based therapies: from heart regeneration to cancer ?vaccines?

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Abstract. *Cell-based therapies are emerging as alternatives to treat age-related diseases, as heart diseases, and cancer. The neonatal mammalian heart is capable of substantial regeneration, however this capacity is lost in the adult heart. Interestingly, this is accompanied by cardiomyocyte's cell cycle exit and the fetal metabolic switch. The use of direct cardiac conversion of resident cardiac fibroblasts by cardiogenic transcription factors, *Mef2c*, *Gata4*, and *Tbx5* (MGT), can create induced cardiac-like myocytes. Besides holding great promise, direct cardiac conversion still lacks effectiveness specially in adult cells and the age-associated epigenetic and metabolic barriers remain highly unknown. We intend to address how long non-coding RNAs (lncRNAs) and metabolic-driven histone landscape remodeling can increase the efficiency of direct cardiac conversion and become novel strategies in cardiac regeneration.*

*We observed that retroviral-induced MGT transduction produced increase expression of cardiac troponin T in mouse embryonic (MEFs; 2,5%) compared to adult ear skin fibroblasts (AEFs; 1,2%). Mass spectrometry-based histone proteomics revealed epigenetic differences in transdifferentiated MEFs and AEFs, compatible with shutting down of the fibroblast program and an open chromatin state (with decreased histone methylation), resembling the epigenetic landscape of HL-1 cardiomyocyte cells. In addition, we are studying the impact of the mouse lncRNA *Gm28592* and its human homolog *AC011611.3*. *Gm28592/AC011611.3*, which are antisense to the cell homeostasis gene *Phlda1*, when silenced improved direct cardiac conversion. In addition, silencing *Gm28592/AC011611.3* increased *Phlda1* expression leading to the assumption that *Gm28592/AC011611.3* knockdown might regulate *Phlda1* transcription.*

*Another promising cell-based therapy are the ?cancer vaccines? where the immune system is prompt to destroy cancer cells. Recently studies demonstrated that stem cells and cancer cells share tumor-specific and -associated antigens. Therefore, we are exploring in vivo how TNG-A (mouse embryonic stem cells) may be harnessed to elicit anti-tumor immunologic responses against breast cancer. TNG-A are cultured in different media conditions (using *Lif* and *Lif/2i* inhibitors) to maintain its pluripotency. Our preliminary data shown that immunization with *Lif/2i*-treated TNG-A cell extracts primed the immune system and avoid tumor growth in an orthotopic breast cancer mouse model.*

Keywords: *heart regeneration, cancer immunotherapy, lncRNAs, metabolic-driven-histone marks, stem cells*

Urine Proteogenomic Analysis for the Identification of Novel Prostate Cancer Biomarkers

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Abstract. Prostate cancer (PCa) is the most common cancer in men and is a major public health problem. The limited accuracy and/or invasive nature of diagnostic tools has increased the demand for new and non-invasive biomarkers. In this sense, urine as a non-invasive sample containing prostatic secretions is a promising source of PCa markers. Therefore, the aim of this study was to identify non-invasive protein targets for PCa detection using an innovative approach that focused on the proteome and proteogenome profile of urine from PCa patients. First, characterization of the proteomic profile of PCa patients revealed several protein targets that were clinically tested in an independent cohort, and the soluble E-cadherin fragment was detected for the first time in the urine of PCa patients. Second, the proteogenome of these patients was profiled, and 1665 mutant protein isoforms were discovered, some of which are differentially abundant in PCa patients. Bioinformatic analysis of the likely effects of mutations on protein function and PPIs involving the dysregulated mutant protein isoforms suggests a protective or detrimental role of some mutations in PCa patients. This work originally characterized the urinary proteome, focusing on the proteogenome profile of PCa patients, which is usually overlooked in the analysis of PCa and body fluids. For the first time in the context of PCa, a combined analysis of mass spectrometry data was performed using two different software packages, which increased the robustness of the data analysis. The application of proteogenomics to the proteomic analysis of urine can be very enriching in mutation-related diseases such as cancer and is promising given the non-invasive and dynamic nature of this biofluid. It can reinforce or renew interest in targets that have not yet been explored. Most of the mutations identified have never been associated with PCa, and some of them are considered deleterious, providing a favourable opportunity for PCa target discovery and development.

Role of VPS34 on plasmacytoid dendritic cell activation

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Abstract. *Plasmacytoid dendritic cells (pDCs), a particular population of dendritic cells (DCs), express pattern recognition receptors (PRRs) such as Toll-like receptors (TLRs) and cGAS that enable them to recognize pathogens and trigger an immune response. When activated, pDCs secrete pro-inflammatory cytokines and rapidly produce massive amounts of type-I interferon (IFN), which makes them an essential component of antiviral immunity, while also being important contributors to the pathogenesis of some autoimmune diseases and cancers. However, the exact mechanisms regulating pDCs function are not yet fully understood.*

Autophagy has been identified as a regulatory component of the immune system, while endosomal trafficking allows some PRRs to detect their ligands and the transport of signaling molecules for degradation after activation. VPS34 plays a role on both autophagy and vesicle trafficking, acting as a member of class III phosphatidylinositol-3 kinase (PI3K) complexes I and II, generators of phosphatidylinositol 3-phosphate (PI3P) at the phagophore and on early endosomes, respectively. However, little is known about the role of VPS34 on pDCs. Thus, our goal was to evaluate the importance of VPS34 on activation of pDCs.

For this purpose, a pDC cell line (CAL-1) was stimulated with a TLR7 agonist or a STING agonist in the presence or absence of the VPS34 inhibitor VPS34-IN1, and the effects of this treatment alone were examined as well. Interestingly, inhibition of VPS34 impaired production of type-I IFN mRNA and subsequent IFNAR signaling induced by TLR7 activation, while potentiating TNF- α expression. On the other hand, it strongly potentiated STING signaling and IFN- α expression after STING activation. Alone, VPS34 inhibitor slightly induced both TNF- α and IFN- α mRNA expression. Furthermore, it altered the cellular distribution of EEA1 and LAMP1 vesicles and reduced the LC3-II/I ratio, suggesting that VPS34 inhibition interfered with endosomal trafficking and also inhibited the cells autophagy flux. Presently, we are dissecting whether the observed effects of VPS34 inhibition are mechanistically dependent on altered trafficking or on autophagy.

Overall, these data show that VPS34 has an important role in pDC function and that it may be targeted to develop treatments for autoimmune diseases and cancers.

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The response of plasmacytoid dendritic cells to ER stress: does intracellular stress affect STING signaling?

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Abstract. *Innate immune responses are fundamental in the fight against bacterial and viral infections but can also trigger autoimmune diseases when dysregulated. Plasmacytoid Dendritic Cells (pDCs) are a subset of Dendritic Cells (DC) specialized in anti-viral responses due to their capacity to quickly secrete massive amounts of the anti-viral type I interferon (IFN-I). A pathway that allows recognition of viral or self-cytosolic DNA is the cGAS-Stimulator of Interferon Genes (STING) pathway. cGAS recognizes dsDNA and converts it into cGAMP that induce STING activation and leads to type-I interferon. STING is located in the Endoplasmic Reticulum (ER), an organelle that is prominent in highly secretory cells such as pDCs. The ER is responsible for the synthesis, folding and maturation of one third of all cellular proteins of the cell. Alterations in proteostasis of this organelle, such as during viral infection, trigger ER stress, accumulation of misfolded or unfolded proteins and the Unfolded Protein Response (UPR). However, the behavior of pDCs under acute and chronic ER stress and the impact of this on STING signaling remain unclear.*

In this work we aim to characterize acute and chronic ER stress responses in pDCs to study the possible effect of ER stress in the STING pathway. We firstly generated by CRISPR-Cas9 a novel tool to study the role of STING in pDC: a pDC cell line, CAL-1 cells, which lack expression of STING. Then, conditions that lead to an acute and chronic response were optimized in CAL-1 cells. Thapsigargin treatment rapidly decreased protein synthesis and induced activation of the UPR, inducing phosphorylation of PERK and eIF2 γ , which indicates acute ER stress. Two hours after stimulation, the levels of protein synthesis were reestablished and there was increased expression of GADD34, despite sustained phosphorylation of PERK, indicative of chronic ER stress. In parallel, we have been optimizing STING activation in the same cell line. Delivering cGAMP to CAL-1 cells by electroporation led to successful activation of the STING pathway, but the electroporation protocol in its own induced UPR. Crucially, it was possible to also trigger STING dependent expression of type-I interferon in CAL-1 cells upon treatment with MnCl₂ for 20 hours. With these established protocols and tools, we will now study STING activation under acute and chronic ER stress, which will contribute to understand the influence of ER stress in immune responses.

Acknowledgments: this work was supported by FEDER through POCI (COMPETE2020) and by Fundação para a Ciência e a Tecnologia ? references PTDC/BIA-CEL/28791/2017 and POCI-01-0145-FEDER-028791, POCI-01-0145-FEDER-030882 and PTDC/BIA-MOL/30882/2017, UIDB/04501/2020; FLP is supported by FCT through an individual grant (2020.08489.BD).

The association of SETD7 expression with Breast cancer oncogenic pathways and its predictive value is influenced by the molecular subtype

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Abstract. *SETD7 is a lysine N-methyltransferase which methylates several proteins important in breast cancer (BC). However, the role and clinical significance of SETD7 in BC is still unclear. The main goal of this work was to use online tools to explore SETD7 expression and its predictive potential in BC considering the impact of clinical factors such as subtype, grade, stage and therapy. Additionally, we also analysed TCGA-BRCA data to identify the significantly overrepresented biological processes and pathways associated with SETD7 differential expression.*

SETD7 is differentially expressed across BC subtypes, being its expression higher in HER2+ and Luminal A subtypes and lower in Basal subtype. Interestingly, patients expressing higher levels of SETD7 in HER2 subtype do not respond well to anti-HER2 therapy. When pooling all samples together the association of SETD7 differential expression (high or low quartile) with survival was variable validating the lack of consistency present in literature, however, when grouped by subtypes, higher SETD7 expression correlated with worse recurrence free survival for Basal subtype. High SETD7 correlates with higher stromal score and lower immune response when samples are pooled altogether. This translates to higher infiltration of cancer associated fibroblasts and endothelial cells in High SETD7 group and B and T cells in Low SETD7 group, which is maintained in the Luminal A subtype. Out of all the genes significantly correlated with SETD7 differential expression, the ones unique for each subtype still translated to some biological processes common between subtypes, including immune response. The genes correlated with immune response processes were mainly associated with Low SETD7 in Luminal A and HER2 subtypes and all genes associated with High SETD7 were unique to Basal and Luminal B subtypes. SETD7 may have a bad prognostic value in BC since even though Basal subtype express less SETD7, the patients that express higher SETD7 have shorter recurrence free survival. Also, high SETD7 correlates with higher stromal score thus higher hypoxia score, and lower immune score, especially in Luminal A subtype. SETD7 seems to also have a predictive value for HER2 therapy since non-responders express higher SETD7.

Pulmonary Rehabilitation modulates salivary microbiota and inflammatory profiles of people with COPD

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Abstract. *Pulmonary Rehabilitation modulates salivary microbiota and inflammatory profiles of people with COPD*

Chronic obstructive pulmonary disease (COPD) is a very heterogenous and complex disease, highly challenge to treat and manage. Pulmonary rehabilitation (PR) is a non-pharmacological therapy and the most cost-effective approach for management of COPD. Benefits of PR on symptoms, exercise tolerance, functional status, muscle strength and health-related quality of life of this population have been widely demonstrated. Although airway microbiota has been largely implicated in COPD trajectory, its role within the PR context is still unknown. Here, we investigated the effects of PR in the oral microbiota and immune mediators of people with COPD.

In total, 456 saliva samples, and data on exercise capacity with the 6-minute walking test, dyspnea during exercise with modified Borg Scale and impact of the disease with the COPD assessment test were collected from 76 patients (79% male, 71±8-year-old, BMI: 26±4kgm⁻², FEV1pp 51±18, GOLD A- 33%, B- 42%, C- 1%, D-24%). Half of the sample participated in a 12-weeks PR programme. Participants were followed monthly for 6 months and characterised based on sociodemographic, anthropometric, clinical data, oral microbiota (16s rRNA sequencing), and oral inflammatory profile (LEGENDplexTM Human Inflammation Panel 1 (13-plex)).

*PR modulated patients' microbiota composition. An enrichment of Proteobacteria (*Haemophilus*) and a depletion in Bacteroidetes (*Prevotella*) that were both previously associated with increased disease severity (Melo-Dias et al, *Respir Res* 2022), were observed upon PR. Regarding the inflammatory profile, we observed a peak of IL-1 β within one moth of PR, and a significant increase in TNF- α by the end of the intervention. Additionally, IL-10, an inflammatory cytokine, also increased in response to PR.*

Remarkably, our data suggests that PR modulates oral microbiota towards more severe states of the disease and increases both pro and anti-inflammatory markers. Future studies should address the implications and stability of these alterations and clarify their role in PR effectiveness.

This study is integrated in ?GENIAL ? Genetic and Clinical markers of COPD trajectory?, ?PRIME ? Pulmonary Rehabilitation and microbiota in exacerbations of COPD? and "MicroAgeing - The role of microbiota in ageing", funded by Programa Operacional de Competitividade e Internacionalização - COMPETE, through Fundo Europeu de Desenvolvimento Regional - FEDER (POCI-010145-FEDER-028806 and POCI-01-0145-FEDER-007628), Fundação para a Ciência e Tecnologia - FCT (PTDC/DTP-PIC/2284/2014, PTDC/SAU-SER/28806/2017 and PTDC/BIA-EVL/30212/2017) and under the project UIDB/04501/2020. S. Melo-Dias was supported by Grant SFRH/BD/140908/2018 from FCT.

Impact of nutritional state and inflammation in Prostate cancer

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Abstract. Prostate cancer (PCa) is one of the most common cancers among men, and its incidence has been steadily increasing over the years. Several risk factors for this disease have been identified, with unhealthy lifestyles (westernization of diet, sexually transmitted diseases, sedentarism, smoking, and alcohol consumption), and inflammation being key contributors to PCa development, progression, and severity. Despite the benefits of currently used diagnostic tools, such as prostate-specific antigen (PSA) serum levels, and digital rectal examination, the development of effective approaches for PCa diagnosis is still necessary. Identifying Finding lifestyle-associated proteins that may predict the development of PCa appears to be a promising strategy to improve PCa diagnosis. In this context, several biomarkers have been identified, including circulating biomarkers (CRP, insulin, C-peptide, TNF α -R2, adiponectin, IL-6, total PSA, freePSA, and p2PSA), urine biomarkers (PCA3, guanidine, phenylacetyl-glycine, and glycine), proteins expressed in exosomes (afamin, vitamin D-binding protein, and filamin A), and microRNAs expressed in prostate tissue (miRNA-21, miRNA-101, and miRNA-182). Taking these into account, patients from health centres in Aveiro will be invited to participate in a retrospective study, where they will answer a questionnaire about their lifestyle habits. Moreover, patients from the Infante D. Pedro hospital will be invited to do the same, as well as to provide some samples to allow the identification and characterization of new biomarkers. Exploring the impact of lifestyle and inflammation on PCa development and progression may open doors to the identification of new biomarkers. The discovery of new PCa diagnostic biomarkers should contribute to a more accurate diagnosis and to better treatment.

The influence of insulin resistance in Alzheimer's disease

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Abstract. *Increasing evidence links insulin resistance to the development of Alzheimer's disease (AD). Evidence from our cohort (pcb-cohort) showed a tendency for patients with type 2 diabetes mellitus (T2D) to perform poorly in cognitive tests. To unravel the potential players involved in the development of AD in T2D patients, a bioinformatic analysis was performed. Key proteins for AD and insulin signalling (IS) were determined using the KEGG pathway database and interactomes for each group were built. Furthermore, a synaptic enrichment was performed and the network with the coincident proteins established. Given the relevance of signalling pathways and phosphorylation processes in both diseases, another network was constructed focusing on protein kinases and protein phosphatases. From this network, we were able to identify kinases (LRRK2, GSK3B, AKT1, EGFR, MAPK1, and FYN) that may play a major role in the development of AD in T2D patients. Moreover, western blot analysis of insulin resistant cells showed a significant decrease in the levels of the insulin receptor alpha and in the deactivation of GSK3B (seen by the phosphorylation of the serine 9) upon acute (ten minutes) insulin exposure. Also, an increase was observed in the levels of total FYN in insulin resistant cells. These alterations may lead to an increase probability to develop AD, since both GSK3B and FYN have a huge impact in Tau hyperphosphorylation, one of AD's hallmarks.*

Deciphering the signaling pathways deregulated in LAP1-associated diseases: what can we learn from the analysis of LAP1-deficient fibroblasts? proteome?

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Abstract. *Lamina-associated polypeptide 1 (LAP1), a ubiquitously expressed protein of the nuclear envelope, has been proposed to play a role in important biological processes, such as somatic cell division and DNA damage response. In the last decade, several mutations in the LAP1-encoding TOR1AIP1 gene have been found to cause highly pathogenic phenotypes ranging from tissue-specific disorders (e.g. muscular dystrophy, myasthenic syndrome) to a progeroid-like multisystemic pathology. Despite this association of TOR1AIP1 genetic alterations with human disease, it remains unclear how LAP1 functionally operates and which are the molecular repercussions of its deficiency. In this work, the liquid chromatography with tandem mass spectrometry (LC-MS/MS) technology was used to perform a quantitative proteome analysis of patient-derived fibroblasts harboring a pathological TOR1AIP1 mutation (p.E482A) linked to strongly reduced LAP1 protein levels, previously reported in a case of severe dystonia, cerebellar atrophy and cardiomyopathy. This proteomic approach permitted the identification of up-/down-regulated proteins in LAP1 E482A fibroblasts relative to age-matched control fibroblasts. A bioinformatic analysis of the LC-MS/MS-identified differentially expressed proteins revealed various signaling pathways deregulated as a consequence of LAP1 dysfunction, including DNA repair, messenger RNA degradation, proteostasis and response to oxidative stress, among others. Ultimately, besides providing novel insights on LAP1's physiological properties, this work unveils some biological pathways that could be targeted for therapeutic intervention in LAP1-associated diseases.*

The genetic contribution for COPD susceptibility, prognosis and treatment response

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Abstract. *People with chronic obstructive pulmonary disease (COPD) have been acknowledged as one of COVID-19 risk groups. Nevertheless, predisposition and clinical response to COVID-19 infection vary considerably, and our understanding of the increased risk for a poor prognosis in people with COPD is still very limited. Our study explored the role of genetic background on the poor prognosis of people with COPD when infected with COVID-19, and the variability observed among worldwide populations. A cohort of 255 people with COPD (66 ±9 years; 72% male; FEV1 53.01 ±20.31 percentage predicted) and 243 controls (67 ±10 years; 80% male; FEV1 100.46 ±19.19 percentage predicted) clinically characterized and genotyped, using saliva samples, was used. SNPs associated with increased susceptibility to covid-19 infection (rs286914 and rs12329760) and increased risk for severe covid-19 with respiratory failure (rs657152 and rs11385942) were selected from the literature. Allelic frequencies of our cohort and of the major world populations (European, Spanish, Italian, African, American, and Asian) were assessed and used to calculate bi-allelic risk for each outcome (susceptibility: rs286914 x rs12329760; severity: rs657152 x rs11385942). Polygenic risk analysis was conducted on our cohort, for both susceptibility and severity outcomes, but also for the increased risk of hospitalization due to covid-19 infection and for survival to covid-19 infection.*

There was no increased genetic risk for susceptibility, hospitalization, severity or survival in people with COPD compared to the control group (all p-values > 0.01), considering either risk alleles individually, bi-allelic or polygenic risk. Alternatively, all populations displayed significant differences from the European population, even those of European ancestry (Portuguese, Spanish and Italian), regarding allelic frequencies or bi-allelic risk for covid-19 associated SNPs (all p-values < 0.0001).

Our study indicates a low impact of genetic background for COVID-19 infection predisposition or worse prognosis in people with COPD. It also shows a high genetic heterogeneity across major world populations, even among European sub-populations. This work was supported by FEDER (Fundo Europeu de Desenvolvimento Regional) funds through the COMPETE 2020, Operational Programme for Competitiveness and Internationalization (POCI) (POCI-01-0145-FEDER-028806; POCI-01-0145-FEDER-016428), CENTRO 2020 CENTRO 2020 (CENTRO-01-0246-FEDER-000018) and by Portuguese national funds via Fundação para a Ciência e a Tecnologia, I.P. (FCT) under the projects PTDC/DTP-PIC/2284/2014; PTDC/SAU-SER/28806/2017; PTDC/BIA-MIC/31849/2017, and the PhD fellowship UI/BD/151337/2021. The iBiMED is supported by FCT funds under UIDP/04501/2020.

NRF-1, NRF-2 and PERK protect castration resistant prostate cancer cells from flutamide-induced toxic aggresome accumulation

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Abstract. *NRF-1 and PERK protect castration resistant prostate cancer cells from flutamide-induced toxic aggresome accumulation*

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Introduction: Pre-clinical studies showed that castration resistant prostate cancer cells (CRPC) activate the unfolded protein response (UPR) and the antioxidative response to protect cells from protein damage and misfolding. These prevents protein aggregation and accumulation in toxic aggresomes. Previously, we showed that in breast cancer, aggresome accumulation can be used as a marker of endocrine therapy response. The aim is to study how CRPC cells protect their proteome in response to flutamide (FLUT) and investigate if there is an association of aggresomes with apoptosis.

Material and Methods: Flutamide (FLUT) sensitive (LNCaP) and resistant (22Rv1) prostate cancer cells were treated for 1h to 24h. Specific markers were assessed by WB, immunocytochemistry and qPCR. Proteostat® was used to study protein aggregation. SUnSET was used to monitor protein translation. CellROXTM was used to measure oxidative stress. Small interfering RNA and GSK2606414 were used for PERK inhibition.

Results: FLUT lead to aggresome accumulation only in apoptotic LNCaP cells. In 22Rv1 cells, FLUT induced a transient antioxidative response through NRF1 (at 3h) to maintain redox homeostasis and selectively activated the PERK/eIF2 α pathway of UPR (at 12h) to temporarily reduce protein translation and prevent toxic aggresome formation. PERK inhibition increased aggresome accumulation, re-sensitizing CRPC cells to therapy.

Conclusions: FLUT treatment induces a first wave of antioxidant response followed by transient inhibition of protein translation, sustaining survival when AR signaling is blocked. PERK inhibition re-sensitized CRPC cells to therapy.

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Microbiota Evolution in the Inflamed Gut

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Abstract. *Low grade inflammation (LGI) is associated with ageing and several pathologic conditions such as inflammatory bowel disease, cardiovascular disease, cancer, diabetes, obesity, autoimmune and neurodegenerative disorders. It is known that inflammation can affect and be affected by microbiota dysbiosis. However, this raises several questions: What are the effects of prolonged inflammation in microbial evolution? Also, is there any potential for commensal microbiota to evolve pathogenic-like traits in response to inflammation? Our hypothesis is that LGI could contribute to the selection of pathogenic-like traits. Thus, this project aims to understand the consequences of inflammation on microbiota evolution by using an animal model of LGI. By promoting systemic and gastrointestinal inflammation in young mice, it will be possible to highlight the effects of LGI with no age-associated alterations. The animals will be injected intraperitoneally with subclinical doses of bacterial lipopolysaccharide (LPS), which triggers the secretion of pro-inflammatory cytokines, thus creating a state of LGI. Additionally, this mimics the effect of disrupting the intestinal barrier, which is often associated with inflammation, leading to the translocation of bacterial products from the luminal compartment into circulation. We will study microbial evolution and the emergence of pathogenic-like traits in commensal bacteria in the gut of this LGI animal model. With the findings of this project, we expect to better understand the selective pressures imposed by LGI on the gut microbiota, and how to modulate the microbiota under this context towards a healthier status.*

This study is integrated in "MicroAgeing - The role of microbiota in ageing", funded by Programa Operacional de Competitividade e Internacionalização (COMPETE), through Fundo Europeu de Desenvolvimento Regional (FEDER) (POCI-01-0145-FEDER-007628), Fundação para a Ciência e Tecnologia (FCT) (PTDC/BIA-EVL/30212/2017) and under the project UIDB/04501/2020. Catarina A. Silva was supported by the individual Grant UI/BD/152845/2022 from FCT.

Plasmacytoid dendritic cells and ER stress involvement in systemic sclerosis-associated fibrosis

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Abstract. Systemic sclerosis (SSc) is a rare autoimmune disease characterized by immune dysregulation, microvascular damage, and fibrosis of different organs. Pulmonary fibrosis, which is a common complication in this pathology, is the leading cause of death among SSc patients. Plasmacytoid dendritic cells (pDC), innate immune cells frequently associated with autoimmunity, mostly due to the production of high amounts of type I interferon (IFN-I), have been suggested as key for fibrosis development. Concurrently, endoplasmic reticulum (ER) stress, which results from the accumulation of unfolded proteins, has been described in fibrosis. Nevertheless, the mechanism of pDC and ER stress involvement in fibrosis remains to be elucidated. We have previously found that the subtilase cytotoxin SubAB, a known inducer of ER stress, triggers activation of CAL-1, a pDC cell line, resulting in the production of IFN- γ . More recently, we found that CAL-1 and IMR-90 lung fibroblasts co-culture leads to inflammation. Interestingly, adding SubAB to the fibroblast ? pDC co-culture led to increased production of fibronectin, a hallmark of fibrosis, and α -smooth muscle actin (α -SMA), a marker of fibroblast activation. Currently, we are exploring the mechanisms behind this pDC-fibroblast interaction and its impact in fibrosis. With this work we expect to elucidate the pDC-mediated fibrosis, aiming to identify molecular targets for treatment of SSc-associated lung fibrosis and other fibrotic diseases.

This work was supported by FEDER through POCI, COMPETE2020, CENTRO 2020 (CENTRO?01-0246-FEDER-000018) and by Fundação para a Ciência e a Tecnologia (FCT) ? references PTDC/BIA-CEL/28791/2017 and POCI-01-0145-FEDER-028791, POCI-01-0145-FEDER-030882 and PTDC/BIA-MOL/30882/2017, UIDB/04501/2020. B.H.F. is supported by FCT through an individual grant (SFRH/BD/144706/2019).

Elucidating the role of tRNA-modifications in Human diseases

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Abstract. *Deregulation of tRNA-modifications have been associated with several diseases including cancer, ALS and some metabolic disorders. However, we do not yet understand how these modifications influence the pathogenesis of diseases. This project will study how tRNA hypomodification influences the accumulation of genome adaptive mutations and how can affects the levels of mistranslation in the proteome. We have experimental evidence indicating that tRNA deregulation alters the genome: mistranslation yeast accumulates compensatory mutations very fast; mistranslating cells acquire drug resistance by deregulating protein expression and accumulating genomic compensatory mutations. Unpublished results from yeast tRNA-modifying-enzyme gene-knockout strains showed an increase in protein aggregation and mistranslation and sharp decrease in cellular levels of specific tRNAs. We suspect that cells can resolve tRNA-hypomodification and protein aggregation induced stress through the accumulation of compensatory genomic mutations. This project will help us to better understand this phenomenon and should provide new insights on how tRNA-hypomodification may cause human diseases.*

The role of ELP3 in pathogenicity and host responses upon influenza A virus infection

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Abstract. *The Influenza A virus (IAV) is responsible for the main seasonal respiratory epidemics in humans. IAV is able to efficiently hijack the host translation machinery and select specific host transfer RNAs (tRNAs) to optimize viral protein translation. To ensure the efficiency and fidelity of translation, tRNAs are extensively modified post-transcriptionally by several tRNA-modifying enzymes. Several lines of evidence demonstrate that tRNA modification levels can change quickly in response to stress leading to the preferential translation of genes related to the stress response. As viral infections are sources of host cellular stress, the reprogramming of the host tRNA epitranscriptome for viral translation efficiency or cellular antiviral responses is expected to occur.*

We demonstrated that the knockdown of the tRNA-modifying enzyme, ELP3, decreased the levels of the mcm5U34 tRNA modification and produced a direct consequence in the translation of specific IAV proteins. We also found that infection of ELP3-depleted cells hindered the IRE1 branch of the unfolded protein response through inhibition of XBP1 splicing and exacerbated host antiviral responses by increasing the mRNA levels of interferon-?. Collectively, our results emphasize the relevance of ELP3 for IAV translation and cellular antiviral responses and unravel a novel cellular target that may be explored for new antiviral treatments.

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Identification of novel therapeutic targets to modulate proteostasis in human health and disease

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Abstract. *Background:* Protein conformational diseases include highly debilitating disorders such as Alzheimer's (AD), Parkinson's, and Huntington's. The incidence of these diseases increases with aging and is often characterized by a decrease in proteostasis maintenance. One possible cause for the disruption of this process relies on the deregulation of translation machinery components that contribute to the production and accumulation of abnormal proteins in cells. Transfer RNAs (tRNAs) are molecular adaptors in the translation process that need to be post-transcriptionally modified by different tRNA-modifying enzymes (tRNAModEnz). Many of these modifications have been found deregulated in neurological disorders, however, there are few reports correlating tRNA hypomodification with the accumulation of protein aggregates found in AD. We hypothesize that tRNAModEnz and tRNA modification dysregulation also occurs in AD and contributes to the proteostasis impairments observed in patients.

Results: We started by assessing tRNAModEnz expression in public transcriptomic datasets from AD patients and found a significant downregulation of the expression of the tRNAModEnz ELP3 in hippocampal tissues of AD patients. We also found a negative correlation between ELP3 expression and amyloid plaque density. These results were further validated in the 5xFAD mouse model of AD, where we found a decrease in ELP3 expression linearly correlated with mcm5s2U34 tRNA modification levels at a time point where neuronal loss and cognitive decline occur. Furthermore, depletion of ELP3 in different human cell lines reduced the levels of the catalyzed tRNA modifications mcm5U34, ncm5U34, and mcm5s2U34. This tRNA hypomodification triggered the formation of insoluble protein aggregates, phosphorylation of eIF2 γ , and upregulation of ATF4 - target stress response genes. The insoluble proteins were enriched in GAA and AAA codons that are known to be decoded by ELP3-modified tRNAs (tRNA-Lys TTT and tRNA-Glu TTC). Indeed, overexpression of tRNA-Lys (TTT) after ELP3 knockdown rescued insoluble protein levels, counteracting the decoding inefficiency.

Conclusion: Our results show that ELP3 expression is affected in AD and that it may represent a novel therapeutic target and disease biomarker, as its expression can provide clues on the levels of protein aggregation and translation alteration at the cellular and organismal levels.

Identifying Novel Metabolic Targets for Myotonic Dystrophy type 1

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Abstract. *Myotonic dystrophy type 1 (DM1) (OMIM 160900), is an autosomal-dominant hereditary disease frequently associated with a short life expectancy, being most common in adults worldwide, yet there are no current treatment options(1). DM1 has a prevalence between 1 in 3, 000 and 8, 000 individuals worldwide(2). Clinical features include myotonia, muscle weakness, and atrophy. Other features observed in DM1 patients are cardiac complications, sleep disorder, dyslipidemia, and insulin resistance(3-4). On a molecular level, DM1 is caused by a trinucleotide expansion of unstable repetitions of CTG in the 3' untranslated region of the DMPK gene(5). Despite, some studies reporting therapeutic strategies in the treatment of DM1, many issues remain unsolved such as the role of metabolism and mitochondria of DM1 pathogenesis. Thus, it is imperative to identify metabolic targets for DM1. Therefore, using bibliometrics analysis and bioinformatic tools, we aimed to address the possible metabolic targets. Through this approach, we obtained 15 common genes for DM1 from VOSviewer and DisGeNET tool. In addition, we identified 62 genes not previously associated with DM1 but are of interest and could be evaluated in future to have a better insight regarding DM1 pathology. Also, biological processes and signaling pathways were assessed by Cytoscape and Reactome DB. The results obtained from this study may suggest new therapeutic strategies for DM1. Through molecular techniques, validation of some targets using dry blot spots could be evaluated further which would be an asset for novel diagnostic methods, besides opening novel opportunities for therapeutic strategies.*

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Characterization of protein aggregation profiles across the mammalian lifespan

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Abstract. *The formation of insoluble protein aggregates during aging has been established as a biological hallmark of several age-related diseases such as Alzheimer's Disease and Type II Diabetes. As cells age, their ability to maintain protein homeostasis (proteostasis) progressively declines, leading to the widespread aggregation of misfolded insoluble proteins. It has been reported that proteins also aggregate during healthy aging, but the mechanisms of such aggregation are poorly understood. We hypothesize that protein aggregation occurs during natural tissue aging due to an age-associated decline of proteostasis responses responsible for misfolded protein degradation. We performed SWATH mass spectrometry analysis to detect age-related shifts in protein abundance that occur in young, middle-aged, old, and late old aged C57BL/6 mice. Detergent-soluble and insoluble proteins were isolated from total protein extracts of hepatic tissues to produce SWATH aging profiles for the identification of aggregation-prone proteins and their respective biological processes. Our results reveal that the proteins present in insoluble liver aggregates in middle- and old aged mouse groups are largely involved in translational processes while soluble proteins whose abundance shifts during ageing are involved in proteostasis-related degradation processes. We also show for the first time that detergent-insoluble protein aggregates containing proteostasis-related components accumulate at different timepoints of natural aging in the mouse liver. Future studies will examine the eligibility of these proteins as targets for anti-aging therapeutic strategies.*

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Analysis of the gold standard biomarker triplet for AD in blood-derived extracellular vesicles

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Abstract. *Alzheimer's disease (AD) is the most prevalent neurodegenerative disease worldwide. Although molecular alterations begin two decades before the symptoms arise, AD early diagnosis is still difficult. Currently, AD diagnosis is based on cognitive tests, brain imaging and the only molecular tool available is based on the monitoring of a biomarker triplet in cerebrospinal fluid (Abeta, Tau and P-Tau 181). A blood test for AD is urgently needed since imaging techniques are very expensive and the collection of CSF requires the performance of a lumbar puncture, a highly invasive procedure that can only be carried out in hospital settings. Exosomes are a small type of extracellular vesicles that can be easily obtained in peripheral biofluids and constitute relevant source of biomarkers as their content is cell- and disease-specific. Interestingly, exosomes can cross the blood-brain barrier which makes them particularly useful to the study of brain disorders. Abeta, Tau and P-Tau species have been found in blood-derived exosomes and thus, in this study, their levels were measured in blood-derived exosomes to address their discriminatory value in dementia or AD. The results obtained in this pilot study highlight the relevance of blood-derived exosomes in the AD diagnosis field*

Targeting pulmonary artery endothelial cells dysfunction in pulmonary arterial hypertension: in situ assessment of the effects of acute exercise

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Abstract. *Despite the available drug therapies, patients with pulmonary arterial hypertension (PAH) still have an ominous prognosis. Recently, exercise training was recommended as an adjuvant treatment, but its underlying pathophysiology is mainly unknown. To phenotype pulmonary artery endothelial cells (PAECs), their communication (exosomes), and transpulmonary metabolomic gradient and assess their changes after acute exercise. Sixty PAH patients will be recruited from a reference centre for PAH. Patients will undergo a clinically indicated resting supine right heart catheterization (RCH) followed by a symptom-limited upright invasive cardiopulmonary exercise testing. During the RHC, PAECs will be harvested using the balloon tip of intracardiac hemodynamic study catheter. Then, PAECs will be characterized by flow cytometry, and their proliferation, apoptosis, and angiogenesis assessed in culture. Transpulmonary gradient and peripheral plasma metabolome and proteome will be assessed at rest and peak exercise and described using nuclear magnetic resonance methodology and/or ELISA assays.*

The role of TrxG proteins in oocyte determination

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Abstract. *The role of Trithorax Group proteins in oocyte determination*

We and others have shown that the epigenetic regulation of gene expression is crucial for female gametogenesis and fertilization. One example is the histone demethylase Kdm5 which is required for correct meiotic chromatin architecture, maintenance of the synaptonemal complex (SC) and meiotic completion. Also, Polycomb group (PcG) proteins have been described to mediate differentiation of the oocyte and the nurse-cells. More recently, we show that Sfmbt, a conserved PcG subunit, is required for the repression of the transcription of the SC genes during mid-prophase I. When depleted from the female germline, the SC genes become highly expressed during mid-prophase I, impairing SC disassembly and leading the formation of abnormal SC structures.

Gene expression is often regulated by a tight balance between the antagonistic activities of PcG and TrxG complexes. We hypothesize that TrxG proteins have important roles in female gametogenesis, more specifically in oocyte differentiation and in the regulation of SC assembly in early prophase I. To test this hypothesis, we depleted several TrxG proteins from the female germline and evaluated if oocyte specification or SC assembly were impaired. We observed that the depletion of several TrxG proteins significantly impaired oocyte specification and the assembly of the SC, showing the importance of the TrxG protein in the female germline.

Unravelling Abeta impact on exosome secretion and signal pathways relevant to Alzheimer's disease pathogenesis

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Abstract. *Exosomes are small endosomal-derived vesicles, recently linked to Alzheimer's disease (AD) pathogenesis. AD is the most common cause of dementia, accounting for 60-70% of all cases. This disease is histopathologically characterized by two hallmarks: the extracellular presence of senile plaques (SPs), as a result of A β peptide deposition; and intracellular formation of neurofibrillary tangles, due to Tau hyperphosphorylation (p-Tau). Exosomes can package pathogenic material, as A β , contributing to its clearance or, alternatively, to its spreading and accumulation in SPs and thus to disease development. In addition, exosomes can be isolated from distinct biofluids and elevated levels of A β 1-42, Tau and p-Tau were reported in neuronal-derived blood exosomes.*

Noticeably, the mechanisms underlying exosomes secretion in AD need to be unravelled. Its secretion can be divided in three steps: exosomes biogenesis, multivesicular bodies (MVBs) transport to the plasma membrane (PM) and fusion of MVBs with the PM, leading to exosomes release. In this process, several proteins are involved and previous studies found that A β can affect some proteins participating in exosome secretion.

Hence, our hypothesis is that A β can modulate exosomes secretion and related signalling events, contributing to AD pathogenesis. By isolating exosomes from neuronal-like cell cultures treated with A β peptide and analysing their size, concentration, content and the levels of proteins involved in exosome biogenesis and secretion, we will understand the molecular basis underlying exosomal secretion, also unveiling novel AD targets with potential clinical application.

Microbial evolutionary signatures of longevity in very old mice

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Abstract. *Aging, one of the biggest health challenges of our time, is associated with several occurrences, including an increase in inflammation and gut microbial dysbiosis. These events contribute to aging by rising intestinal permeability and inflammation, but it remains undisclosed how they influence microbiota evolution and pathobiont selection. Here we approach this question by comparing microbial evolution in the guts of mice of different ages: young (6-9 weeks old), old (19 months old), and very old (25 months old).*

Previous work described the adaptation of an E. coli commensal strain to the intestine of young animals and showed that it acquires metabolic-related mutations whereas, in old mice, the pattern is shifted towards stress-related mutations, and metabolic adaptations arise slower.

Yet, we were interested in understanding the features associated with longevity, and for that, we compared frailty, intestinal inflammation, and microbiota composition of very old animals to younger ones. Very old mice had higher frailty but did not show higher intestinal inflammation than the old. Curiously, when compared with the other age groups, very old mice showed an increase in health-associated bacteria, e.g., Akkermansia muciniphila, and E. coli evolution resembled the pattern found in young animals, as it displayed more metabolic than stress-related mutations.

These data suggest that microbiota alterations during aging may not be exclusively dysbiotic and may eventually even be associated with longevity.

Unfolding the interplay between viruses and cellular proteostasis

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Abstract. *Viruses are opportunist pathogenic agents that represent a significant health threat around the globe. They are responsible for several pandemics that lead to high mortality rates and consequential societal disruptions. To efficiently contain the spread of a specific virus, a deep knowledge of the host-virus interplay mechanisms is pivotal. This knowledge is the basis for the future development of efficient therapies with little to no side effects.*

Viruses, to replicate, require precise interactions with host components and hijack the host cellular machinery throughout their life cycle. They partially or completely take control and manipulate several mechanisms involved in protein synthesis and processing to their benefit, leading to proteostasis imbalances of the host. However, the exact mechanisms and the consequences of these proteome imbalances for the host are still not well understood. Considering that proteostasis is essential for both cellular viability and viral replication, we aim at unraveling the precise mechanisms by which proteostasis related pathways are modulated upon viral infection and explore these pathways as potential antiviral targets. By the end of this project, sufficient data will be generated to identify novel promising targets to modulate respiratory viruses? infections and understand whether protein quality control reprogramming is a common mechanism used by these respiratory viruses to enhance protein synthesis and replication.

Inter-organelle crosstalk in hepatitis C virus infection: in pursuit of novel antiviral targets

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Abstract. *The hepatitis C virus (HCV) is an RNA virus that requires complex lipid metabolic remodeling of the host cells for efficient replication and, hence, relies on the efficiency and plasticity of the intracellular organelles' network. Peroxisomes, lipid droplets (LDs) and the endoplasmic reticulum (ER) have been shown to be involved in the HCV lifecycle but the interplay between these organelles has hardly been explored in the context of viral infections. The main goal of this work is to explore this interplay by performing a detailed analysis of the alterations in the peroxisomes-ER and peroxisomes-LD associations upon HCV infection. To that end, several complex tools for HCV infection in biosafety-level 2 environment have been developed in the last year. Firstly, delivery of HCV RNA replicons into liver cells was optimized to enable analyses during viral replication. Secondly, to study earlier lifecycle stages, a trans-complementing system protocol, which results in the infection of naïve liver cells with HCV particles capable of a single round of infection, has also been optimized. In the near future, the organelle interactions occurring during HCV infection will be evaluated using these methodologies, to assess their relevance for viral propagation and the cellular antiviral response. These findings may contribute for the identification of cellular targets for the development of novel antiviral therapies.*

From protein-based liquified microcapsules to functional bone tissue microunits.

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Abstract. *Tissue bone regeneration engineering has long sought biocompatible and biodegradable platforms that promote bone differentiation and mineralization autonomously. Catechol moieties have been used in a variety of applications due to its adhesive properties in wet environments and its oxidative and coordinative mechanisms. This study aims to study the capacity of catechol analog molecules HOPO and dopamine together with the physiologic advantages of liquified platforms in promoting the differentiation and mineralization in protein-based liquified capsules. Gelatin modified with Hydroxypyridinone (Gel-HOPO) together with gelatin modified with dopamine (Gel-HOPO-Dopamine) allows us to create resistant liquified microcapsules with a variety of focal adhesion points that allow the attachment, proliferation, and differentiation of BM-hMSCs in osteoblasts. The advantageous architectonic characteristics of these liquified microcapsules together with the catechol properties create a unique microscale bone unit to induce autonomously and in a fast way the osteogenesis without the need of external inductors.*

Development of an epididymal organoid: an innovative strategy to study and modulate sperm function

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Abstract. *Infertility is a disease from the reproductive system where ~50% of the cases are attributed to a male cause. The reduced sperm motility and poor interaction between sperm cells and the oocyte are the main causes of male infertility. Spermatozoa are immotile after spermatogenesis, and sperm maturation and motility acquisition occur through the journey in the epididymis. Although the importance of the epididymis on sperm maturation is accepted, the role of the epididymis in sperm physiology is not fully understood. Moreover, it is known that PP1 β becomes inactive from the caput to the cauda and epididymal cells produce small vesicles (epididymosomes) that interact with the sperm membrane, becoming maturation.*

The ability to mimic the epididymal environment in a laboratory setting, deepen the knowledge on sperm maturation is a challenge. Organoids? technology has been essential to model organogenesis, organ function, disease, or drug response in many tissues. On the male reproductive system, organoids and organotypic cultures have been developed for testis, but the epididymis remains almost forgotten.

To overcome the lack of knowledge on the epididymis role, we propose to develop, for the first time, a three-dimensional (3D) epididymis and blood-epididymal barrier (BEB) organoid using hollow tube technology. Hollow tubes were obtained by building-up multilayers of marine-derived polysaccharides (chitosan and alginate) on sacrificial tubular templates using layer-by-layer technology. Cells from bovine epididymis were isolated and cultured in the inner side of the tube. The ability of the organoid to mature sperm will be determined by access sperm motility, morphology, and proteomic profile. A successful in vivo 3D epididymis and BEB organoid will allow us to study the epididymis-sperm interaction, unraveling possible targets to modulate sperm function

Biochemistry

Metabolic response of Triple-Negative Breast Cancer to antineoplastic drug Pd2Spm evaluated by ¹H NMR metabolomics

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Abstract. *Palladium(II)-compounds are increasingly emerging as alternatives to platinum(II)-based anticancer drugs, mainly cisplatin, potentially overcoming the high toxicity and acquired resistance characterizing the latter. Palladium chelates with biogenic polyamine spermine (Pd2Spm) have displayed favorable antineoplastic and antimetastatic properties against distinct human breast cancer cell lines. However, Pd2Spm action needs further validation in vivo, namely using mouse models of triple-negative breast cancer (TNBC), a particularly aggressive type of breast cancer for which existing therapies would still benefit from improvement.*

The present work reports the ¹H NMR metabolomics characterization of TNBC tissue from a cell-derived xenograft mouse model in response to Pd2Spm or cisplatin treatment, in comparison with vehicle-treated animals.

Results show specific-drug responses in polar and lipophilic metabolomes: (i) higher impact on polar compounds, namely few amino acids, nucleotides and derivatives, membrane precursors, dimethylamine, fumarate and guanidine acetate; (ii) neither drug was observed to significantly affect lipidic tumor metabolism.

The lipidomic point of view of autoimmune diseases

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Abstract. *Autoimmune diseases (AID) are characterized by chronic inflammation and dysregulation of the immune system. Tests used for diagnosis of AID are either non-specific or non-sensitive, impairing proper diagnostic and prognosis. Altered lipid metabolism and lipid peroxidation have been reported in AID, thus lipidomics is emerging as a promising approach for AID diagnostics. The aim of this work is to explore mass spectrometry (MS) based lipidomics applied to AID to identify a specific lipid signature of each AID and to identify markers for early diagnostic, prognostic. Modern liquid-chromatography high resolution MS will be used to profile plasma/whole blood phospholipids, oxidized phospholipids and sphingolipids. Dried blood spots will also be evaluated as a potential substitute of the traditional blood sampling methods, as they present several advantages. The results gathered with this project can be explored as a promising tool for personalized medicine, improving health and fostering the reduction of morbidity and mortality of AID patients.*

Metabolic modulations driving direct conversion of fibroblasts into induced cardiomyocytes

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Abstract. Several strategies have been developed to generate cardiomyocytes for regenerative purposes. Direct cardiac conversion (DCC) focuses on the conversion of fibroblasts into induced cardiomyocytes (iCMs), through the overexpression of *Mef2c*, *Gata4* and *Tbx5* (MGT), which are master regulators of cardiac fate. Despite its great potential, DCC is still a very inefficient process.

Fibroblasts and cardiomyocytes exhibit very distinct metabolic profiles. The former mainly use glycolysis to produce ATP, while cardiomyocytes, with a much more complex mitochondrial network, rely on oxidative phosphorylation. As expected, cardiomyocytes produce larger amounts of reactive oxygen species (ROS), whose aberrantly high levels can inhibit cell fate conversion. As such, there is a newly found interest in modulating metabolism to increase the efficiency of DCC. Besides bioenergetics, various studies have demonstrated a crosstalk between metabolism and epigenetics, suggesting that certain intermediate metabolites play important roles in the activity of epigenetic-modifying complexes, thus contributing to the regulation of gene programming events in, for example, cell fate conversion and regeneration.

Using a reprogrammable mouse embryonic fibroblast cell line (icMEFs), harboring both a Tet-On inducible polycistronic construct that encodes MGT, induced by doxycycline (Dox), and an *MHC-eGFP* reporter transgene, rapid detection of newly derived iCMs is possible by GFP expression. As such, to induce DCC, icMEFs were treated with Dox for 3 days. Our results indicate that, when fibroblasts undergo DCC, there is an increase in mitochondrial mass and remodeling of the mitochondrial network, as quantified by HSP-60 staining by confocal microscopy. Supplementation of resveratrol, despite increasing mitochondrial mass, as assessed by flow cytometry MitoTracker staining, had no effect in DCC as measured by the percentage of *MHC-GFP+* cells by flow cytometry. Increased levels of ROS were observed in icMEFs upon Dox addition, as measured by CellROX flow cytometry staining; however, supplementation of the antioxidant N-acetylcysteine produced no impact in the efficiency of DCC.

Modulating bioenergetic pathways can interfere with the levels of intermediate metabolites, such as acetyl-CoA and α -ketoglutarate, with direct impact on chromatin remodeling and gene expression programs. Inhibition of glycolysis with 2-deoxy-D-glucose resulted in an increase in MitoTracker staining and the efficiency of DCC. Moreover, both glucose and lipid deprivation (1mM glucose and 1% FBS, respectively, as opposed to the standard 25 mM glucose and 10% FBS) also enhanced DCC, but such is not always accompanied by an increase in MitoTracker staining. Our results suggest that significant alterations in mitochondrial network take place during DCC and modulation of bioenergetic pathways can potentiate this process by a mechanism that might not rely exclusively on the modulation of mitochondrial mass.

MS-based lipidomics as a promising tool to identify changes in lipidome of FAOD patients

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Abstract. Defects in the fatty acid (FA) mitochondrial β -oxidation caused by FA β -oxidation disorders are inborn error of metabolisms that are diagnosticated in neonatal screening. The most common FAOD are characterized by tissue accumulation of medium-chain FA and long-chain 3-hydroxy FA (and their carnitine derivatives). These dysregulations cause lipotoxicity, affecting several organs leading to malfunction and co-morbidities being life-threatening. To manage these diseases, patients need to follow a life-long low-fat and high-carbohydrate diet. FAOD are clearly associated with disturbed acylcarnitines (CAR) and FA profiles, in patients and animal models, but changes in FA metabolism seems also to affect other lipids, namely polar lipids as phospholipids (main lipids from cell membranes and signalling molecules) and neutral lipids as triglycerides. This topic was scarcely studied, but the few publications available gave evidence of changes in the complex lipid profile, at a molecular level and lipid classes, namely non- and oxidized phosphatidylcholines and sphingomyelins are still poorly understood and deserve further exploitation. Thus, this work aims to identify specific lipid signatures of medium-chain and long-chain FAOD using mass spectrometry-based lipidomics, to elucidate pathophysiology, identify possible biomarkers for prognosis, monitor possible imbalances, and evaluate therapeutic efficacy.

During the first year of the PhD we have done a deep review of the literature and found that, beside CAR, other lipids are changed. Also, a major contribution of the diet in lipid remodelling was found. This review highlights the potential of MS-based lipidomics to understand how (epi)lipidome is affected in FAOD, and the results gathered with this project can be explored as a promising tool for precision medicine.

Incorporation of deep eutectic solvents formulations in biopolymer-based drug delivery systems

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Abstract. *Many active pharmaceutical ingredients (APIs) display low solubility and stability in aqueous media and conventional pharmaceutical vehicles, making difficult their formulation and drug delivery. Deep eutectic solvents (DES) emerge as new alternatives in this area since they allow developing novel formulations where it is possible to improve the drug solubility, permeation, stability, and therapeutic action. Moreover, the DES formulations comprising the API can be integrated into polymer-based drug delivery systems, enabling to control their release profile. However, their combination with biopolymers, such as alginate and pullulan, for different administration routes as well as the approaches used to prepare the respective delivery systems are still scarce. In this vein, the goal of this work is to develop innovative drug delivery systems based on distinct DES and biopolymers with improved therapeutic action and sustained drug release. Furthermore, it aims to provide a solid understanding on the fundamentals behind the development of these systems to enable an easier expansion of this area of research.*

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Sidechain packaging and docking with ProtoSyn

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Abstract. *ProtoSyn.jl is an open-source alternative to molecular manipulation and simulations software, built with a modular architecture and offering a clean canvas where new protocols and models can be tested and benchmarked. By delivering good documentation, ProtoSyn.jl aims to lower the entry barrier to inexperienced scientists and allow a ?plug-and-play? experience when implementing modifications. In this presentation, two quick applications of ProtoSyn are showcased: sidechain packaging and small ligand docking of a protein surface. Learn more on the project?s GitHub page: <https://github.com/sergio-santos-group/ProtoSyn.jl>*

Valorisation of coffee byproducts by the development of active bioplastics and paper coatings

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Abstract. *Paper-based materials are coated with non-biodegradable polymers for allowing their use in food packaging, compromising their biodegradability and recyclability. On the other hand, agrifood industry byproducts are worldwide generated and often discarded, wasting valuable biomolecules. Coffee cascara (CC), coffee silverskin (CS), and spent coffee grounds (SCG) are non-valorised coffee byproducts rich in polysaccharides, lipids, and phenolics, reflecting this reality. To minimize these issues, in this PhD thesis, the feasibility of valorising coffee byproducts through the development of biodegradable plastic formulations suitable for paper coating is being studied. So far, CC-derived extracts rich in pectic polysaccharides allowed to develop brownish, antioxidant, and hydrophilic bioplastics compatible with the paper surface. Therefore, CC revealed to be a renewable source of biomolecules of interest for the development of active biobased materials, opening an opportunity to minimize the ecological footprint of agricultural, plastic, and paper sectors, while promoting a circular economy.*

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Dissolvable carboxymethylcellulose microneedles for rapid and non-invasive drug delivery

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Abstract. *Microneedles (MNs) are three-dimensional arrangements of needle-like projections used to break the protective skin barrier (i.e. stratum corneum), creating pathways in the skin that allow for the enhanced delivery of pharmaceutical agents in a painless, minimally invasive manner. Microneedles produced with biopolymers (e.g., pullulan, cellulose, hyaluronic acid) have risen in popularity since they are abundant, safe, and biocompatible. MNs produced with water-soluble and filmogenic biopolymers, in particular, are of tremendous interest because they can quickly dissolve after skin insertion and deliver the therapeutic cargo throughout the epidermal layer. In this vein, we explored the production of dissolvable carboxymethylcellulose (CMC) microneedles using a simple and environmentally-friendly methodology of micromoulding, envisaging rapid and non-invasive delivery of a non-steroidal anti-inflammatory drug, viz. diclofenac sodium (DCF), frequently used for pain relief. The key properties (e.g., morphology, mechanical properties, skin penetration, dissolution ability, and DCF release profile) of the pyramidal-shaped CMC MNs were appraised and will be briefly discussed in this presentation.*

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Improving alginate hydrogel-based bioinks for 3D-bioprinting applications

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Abstract. *3D bioprinting is a technique with enormous impact in different scientific and technological fields that opened the possibility of fabricating complex living structures with precise shape and morphology, using the layer-by-layer deposition of bioinks composed of cells and biomaterials to obtain a new living tissue. Multiple domains benefit from this approach, including the pharmaceutical and biomedical sectors, with applications in regenerative medicine, organ transplantation, and drug development.*

The importance of the bioinks and their characteristics in this process is clear: bioinks with good rheological and mechanical properties, and enhanced biological performance, result in a more successful 3D bioprinting process. One of the most explored options in this domain is the use of alginate bioinks, a polysaccharide that is easily crosslinked in the presence of divalent cations (e.g., Ca²⁺) originating versatile hydrogels that are commonly applied for extrusion 3D bioprinting. However, alginate hydrogel-based bioinks often fail to possess the rheological properties and the mechanical stability needed for the 3D bioprinting, with unpredictable degradation rates that may hamper their posterior applications. Additionally, alginate lacks cell-binding moieties to promote cell adhesion and proliferation, and its hydrogels frequently reveal underwhelming biological performance.

Given so, new bioinks were developed in this work for 3D bioprinting applications. The bioinks are based on an alginate hydrogel combined with biopolymeric nanostructures that will modify the rheology and improve the mechanical properties of printed constructs and grant them with new functionalities.

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Polysaccharide-based nano-in-microparticles for plasmid DNA pulmonary delivery

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Abstract. *Gene therapies can enter the organism via the pulmonary system although requiring a vehicle. It is hypothesized that polysaccharide-based nano-in-microparticles can be used to transport plasmid DNA through the pulmonary system. Chitosan nanogels will be formed by crosslinking with genipin. The nanocarrier will be combined with plasmid DNA. The nanoparticles will be incorporated into Trojan microparticles that are capable to deliver the nanoparticles into the systemic circulation through the pulmonary system.*

Decoding the lipid signature of avocado and by products using lipidomics-based approaches

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Abstract. Avocados are increasingly consumed worldwide due to its nutritional and functional properties [1]. This fruit has a high content of lipids, including monosaturated fatty acids, with important benefits to prevent coronary diseases [2,3], and can be consumed as raw or as processed food and ingredients. However, the industries produce large amounts of avocado-derived by-products, as peels and seeds, which can be recovered and reused in new ingredients rich in lipids. Therefore, the lipid composition either of fruit or by products should be studied. This will foster its sustainable exploitation and valorization as a source of polar lipids, such as phospholipids and glycolipids with putative bioactive properties, which remain poorly explored. Thus, the detailed characterization of their lipidome is essential to update the knowledge in this field. This can be achieved by modern lipidomics approaches allowing the in-depth characterization of lipid composition of avocado and its by-products using high throughput mass spectrometry (MS) tools. The present work aims to profile the pulp, seed, and peels of two avocado cultivars (Hass and Bacon) farmed in Portugal using MS approaches and bioprospecting their polar lipidome using in chemico and in vitro models to screen antioxidant, anti-inflammatory, anti-diabetic, and anti-obesity effects. This will support the national circular economy by enabling a better assessment of avocado nutritional value and bioactive lipid components. The exploitation of pulp, seed, and peels as more sustainable source of health-promoting lipids will foster their use as ingredients or raw material for the food, nutraceutical, cosmetic and pharmaceutical industries.

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Chlorophyll-based photosensitizers in the treatment of Triple-Negative Breast Cancer

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Abstract. *Breast Cancer (BC) has the highest incidence and mortality rate among women worldwide; in particular, the Triple-Negative BC (TNBC) subtype contributes for the worse survival rate and poor prognosis, mainly due to the lack of hormone receptors and treatment options. Photodynamic Therapy (PDT) has been largely used in the treatment of several types of cancers, including BC. The combination of visible light, molecular oxygen and a photosensitizer (PS) led to the formation of reactive oxygen species (ROS); singlet oxygen, a very reactive species, can react with cellular components and trigger the destruction of cancer cells. The low selectivity for cancer cells, poor solubility in physiologic medium and skin photosensitivity are the major problem of common PSs used in PDT; however, PSs with good absorption in the therapeutic window (eg. chlorin), combined with specific biomolecules selective to cancer cells (eg. carbohydrates, nucleic bases), have received particular interest. Thus, here it was reported the development of new photoactive molecules based on chlorin derivatives conjugated with uracil-alditols moieties for targeted therapy of BC. The structural characterization and the photophysical properties of chlorin derivatives were performed; the photodynamic evaluation of the new photoactive conjugates in a TNBC cell line (MDA-MB-231) is ongoing and the preliminary results will be discussed.*

BioBlisterPack – Application of circular economy in the development of bioblister based on starch/locust bean byproducts

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Abstract. *The ecological footprint of non-biodegradable packaging, particularly the single-use ones, demands the development of more sustainable materials. On the other hand, agrifood industry produces biobased residues that are often discarded while still containing valuable biomolecules, including film-forming ability compounds. Potato and locust bean gum byproducts have been used in the development of flexible/water tolerant bioplastics [10.1016/j.ijbiomac.2020.06.231; 10.1002/jsfa.11883], but poorly used in the development of bioblister. In this PhD, it is hypothesized that dust derived from locust bean milling (LBMD) allows to increase the thermoforming capacity of thermoplastic starch (TPS), making it suitable for the development of biobased blisters. Under a circular economy, starch recovered from potato washing slurries was used in the TPS production.*

When melt-mixed with TPS and hot-pressed, LBMD, a protein-rich byproduct (56% of protein) also containing polysaccharides (28%), lipids (6%), phenolic compounds (12%), and ashes (2%), imparted a yellowish coloration to the TPS-based films while maintaining their transparency. LBMD increased the elongation of TPS-based films from ca. 13% to 56%, giving rise to stretchable materials. When applied for blisters production, TPS/LBMD-based materials were able to be thermoformed, however, the obtained shapes were partially lost after a short period of time (2 h). After immersion in ethanol, the TPS/LBMD-based blisters acquired a stable shape and a hydrophobic surface.

Therefore, blending TPS with LBMD revealed to be a promising approach to overcome the limited thermoforming ability of TPS-based materials, opening an opportunity to develop biobased blisters with a low ecological footprint.

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Bioelectronic tongue for the detection of paralytic shellfish toxins

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Abstract. *Most of coastal countries are affected by out-of-control proliferation of microalgae which can biosynthesize phytochemicals, such as paralytic shellfish toxins (PSTs). PSTs can be accumulated in bivalve mollusks, representing a healthcare concern due to the life-threatening symptoms they can cause. To avoid commercialization of contaminated bivalves, monitoring programs were established in the EU. According to the EU legislation, the official reference method for the detection of PSTs is the Liquid Chromatography with Fluorimetric Detection, but this is a laboratorial technique involving the use of expensive apparatus, which must be operated by highly skilled personnel. Several assays and biosensors have been proposed for PSTs' detection. However, most of them are restricted to a single target, saxitoxin (STX), and/or are antibody-based which requires animal host for their production. Thus, development of alternative sensing methodologies not involving use of antibodies for PSTs' detection is of practical interest.*

*The purpose of the present work is the development of a bioelectronic tongue for the rapid detection of PSTs' most prevalent in bivalves of Portuguese waters. Initially a potentiometric chemical sensor with plasticized polyvinyl chloride membrane for the detection of those toxins have been developed; this first sensor was capable of detect both STX and decarbamoyl saxitoxin (dcSTX) toxins. Then, to overcome the impossibility of the detection of Gonyautoxin-5 (GTX5) and N-sulfocarbamoyl gonyautoxins 2+3 (C1+2) toxins by that sensor, an enzymatic assay employing a PSTs' transforming enzyme ? carbamoylase ? immobilized in alginate beads was proposed. Carbamoylase was extracted and purified from the surf clam *Spisula solida*. This enzyme displayed similar specificity to both carbamate (STX) and N-sulfocarbamate toxins (GTX5 and C1+2) converting them into dcSTX and decarbamoyl gonyautoxins 2+3 (dcGTX2+3), respectively. This assay involved hydrolysis of GTX5 by carbamoylase and quantification of the product of enzymatic reaction (dcSTX) using the same initially developed potentiometric chemical sensor. This assay can also be done with the free enzyme, but immobilized enzyme was used in order to be reused. Enzyme immobilization on electrode surface is a current challenge. Carbamoylase enzyme was also used to develop an impedimetric test for rapid simultaneous detection of several carbamate and N-sulfocarbamoyl PSTs. Combination of electrochemical impedance spectroscopy using metal electrode and carbamoylase-based assay was applied to harness changes in the enzyme adsorption to the electrode surface during enzymatic reaction as an analytical signal.*

Establishment and characterization of cellular models to study breast cancer-associated macrophages

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Abstract. *Cancer development, disease progression and response to therapy are strongly influenced by the tumor microenvironment (TME). Tumor-associated macrophages (TAM) are abundant infiltrating immune cells, which may display either tumoricidal functions (inflammatory M1-like) or pro-tumorigenic functions (anti-inflammatory M2-like). In breast cancer (BC), a higher frequency of M2-like TAM strongly correlates with increased relapse rate, poor outcome, and aggressiveness. Hence, shifting TAM polarization towards an anti-tumoral M1-like phenotype has emerged as an attractive strategy to aid cancer treatment. To develop such immunomodulatory strategies, it is important to establish and characterize in vitro cellular models of TAM. To generate TAM in vitro, we have incubated human monocytes (THP-1)-derived macrophages with medium conditioned by BC cells (metastatic MDA-MB-231, and non-metastatic MCF-7 cell lines), and performed their metabolic and phenotypic characterization. BC-conditioned medium induced macrophage polarization toward a pro-tumorigenic TAM phenotype (secretion of the proangiogenic factor VEGF). Metabolomics analysis revealed distinct macrophage metabolic profiles, with multivariate analysis of the intracellular metabolism showing a clear separation between TAM, M0, and M1-like macrophage subsets. Among other changes, the results suggest that TAM display changes in pyruvate-lactate flux, such as higher consumption of pyruvate and higher intracellular levels of lactate; several shifts in aminoacid metabolism, namely in alanine metabolism, BCAAs and in the uptake of extracellular BCKAs, which might be correlated with lower phagocytic capacity. The results set the basis to establish an in vitro model of TAM, which can be used to investigate their pharmacological metabolic modulation towards anticancer functions.*

Toxicometabolomics of particulate matter (PM): towards mechanistic insights and new biomarkers

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Abstract. *Although air pollutant emissions have decreased substantially over the last decades, problems related to air quality persist. Epidemiological studies have shown that environmental pollution by particulate matter (PM) has adverse effects on human health, requiring a better understanding of PM biological effects. Omics approaches offer the opportunity to discover unanticipated effects on human cells and to define new biomarkers of toxicity. This work aims to investigate the biological effects of airborne PM, collected in different locations, using NMR metabolomics of in vitro cultured macrophages, neuronal and lung cells, integrated with traditional toxicological endpoints. During the current year, the cytotoxic effects of PM below 10 µm (PM10) obtained from emissions in two sites at Coimbra (background and roadside) were evaluated. The cytotoxicity of the PM10 total organic extracts was assessed in the A549 cell line, representative of human alveolar epithelial cells, using the MTT assay. Moreover, cell cycle progression and the production of reactive oxygen species (ROS) were analysed by flow cytometry. The results showed that PM10 organic extracts affected cell viability after 72h of exposure, while some extracts caused changes in the cell cycle and increased ROS levels. We are now conducting studies to evaluating the metabolic activity of the exposed cells, in order to correlate the cellular effects, at the phenotypic and metabolic levels.*

Analytical tools to trace authenticity multielement markers of industrially processed pear and apple

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Abstract. *The authenticity of some of the most relevant Portuguese Protected Designation of Origin fruits, PDO (Protected Designation of Origin) ?Pera Rocha do Oeste? and PGI (Protected Geographical Indication) ?Maçã de Alcobaça?, is easy to recognize when commercialized as whole fresh fruit in retail markets but not when processed in fruit fillings used in pastry. Aiming to contribute to find markers of PDO pear and of PGI apple in fruit fillings that enable establishing the basis for geographical origin, it is hypothesized that Fourier Transform Infrared (FTIR) spectra profile together with multielement analysis of ash-rich fractions can provide discrimination of processed fruits. To fulfil this hypothesis, multielement analysis will be designed using Inductively Coupled Plasma (ICP) and FTIR spectroscopy. This PhD plan intends to explore rich-ash fractions of samples to identify multielements such as geographical origin authenticity markers of PDO pear and PGI apple in fruit fillings, industrially processed, using rapid tools based on FTIR spectroscopy and chemometry.*

Biorefineries

Production of cellulosic sugars and bioethanol

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Abstract. *Eucalyptus globulus* is recognized as one of the most widely used species in the pulp and paper sector, particularly at the national level. However, debarking is a key operation to ensure a high yield of the pulping process and quality of the pulp, which results in large amounts of this industrial residue. Typically, the bark is burned for energy purposes. Alternatively, it can be converted into more profitable applications, stimulating the bioeconomy and contributing to the implementation of the circular economy concept.

The conversion of E. globulus bark into cellulosic ethanol involves four main stages: pretreatment, hydrolysis, fermentation and product recovery. The integration of this pathway into the pulp and paper sector leads to sustainable waste management, valorization of feedstock unsuitable for pulp production, and boosts market opportunities. Also, this sector already has industrial facilities and logistics well established.

In this context, the main objective of the PhD project consists of studying the production of cellulosic sugars and bioethanol from E. globulus bark kraft pulp. Accordingly, the research mainly focused on the optimization of the operational conditions, selecting the most suitable yeast strain, evaluating low-cost supplementation alternatives, and studying the effect of several configurations at the bioreactor scale on the overall yield and productivity.

Biobased thermoplastic composites with high cellulose incorporation

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Abstract. *Biocomposites, or natural fiber-reinforced composites, are a segment of the composite industry with increasingly relevance. Moreover, the non-renewable and non-biodegradable conventional matrices typically used in biocomposites (e.g., polypropylene and polyethylene), can be replaced by biobased polymers, such as poly(lactic acid), poly(hydroxybutyrate) and cellulose derivatives, in order to increase their sustainable character. In this context, the use of cellulose derivatives is of particular interest since it allows the production of composites made entirely from cellulose (All-Cellulose Composites (ACC)). However, the high brittleness and low impact strength of these polymers and of their corresponding composites often requires the use of considerable amounts of plasticizers, which are usually hazardous chemicals.*

Therefore, one objective of this PhD is to find a suitable green plasticizer able to improve the performance of All-Cellulose Composites made of Cellulose Acetate Butyrate (CAB) reinforced with micronized kraft pulp fibers. For that purpose, an epoxidized linseed oil (ELO) was investigated. Different loads of this additive were tested and the ACCs, obtained by a simple melt-mixing procedure, were characterized regarding mechanical, thermal properties and flowability.

The obtained results show that the incorporation of ELO decreased the Young's and Flexural strength and moduli but significantly improve the elongation and flexion at break. The composite's resistance to impact improves up to 5.2 times in comparison with the ACCs without plasticizer and the melt flow rate raises from 0.6 to 50.9 g.10min⁻¹. Therefore, we can conclude that ELO is a promising green plasticizer to improve the processability and properties of these ACCs.

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New paper functionalization strategies by superficial photopolymerization

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Abstract. Paper is one of the oldest commodities used by humankind, especially as a support for printing and writing, as a packaging material and in sanitary products. However, this biodegradable, recyclable, and renewable material has found a wider range of advanced applications, including in sensors, conductive papers for electronic devices, thin-film solar cells, and functional papers for medical diagnosis. Many of these new applications require the use of coatings, which confer new functionalities to paper, such as conductivity, antimicrobial activity, hydrophobicity, or optical properties. An expeditious way for the functionalization of paper is the application of photopolymerizable coatings. This type of coatings can be formulated without solvent (avoiding the formation of VOCs) and their curing is done through the incidence of light. Through the design and optimization of the coating formulation and of the curing conditions, the final properties of the coated papers can be tuned to better suit industrial production while attributing paper with the desired properties. In this pitch, it will be presented an overview of the main results regarding the development of a photopolymerizable coating consisting of a mixture of the monomers, namely 2-ethylhexyl acrylate and isobornyl methacrylate, capable of increasing paper's hydrophobicity, contributing for new and more sustainable packaging. This work was carried out under the scope of the Project *Inpactus* ? innovative products and technologies from eucalyptus, Project N.º 21874 funded by Portugal 2020 through European Regional Development Fund (ERDF) in the frame of COMPETE 2020 nº246/AXIS II/2017 and of the project CICECO- Aveiro Institute of Materials, UIDB/50011/2020, UIDP/50011/2020 & LA/P/0006/2020, financed by national funds through the FCT/MEC (PIDDAC).

Production of new polymeric materials from lignin

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Abstract. Lignin is one of the most abundant by-products of the kraft pulp mill with huge application potential. Being an aromatic oligomers rich in phenolic and hydroxyl groups OH, lignin can be considered a suitable raw material for the synthesis of a diversity of eco-friendly polymers, which can boost the added value of kraft lignin and can contribute to a sustainable environment. This Ph.D. project focuses on the development of synthetic strategies to obtain lignin-based polyols from kraft lignin isolated from black liquor using the Lignoboost[®] process for the production of polyurethane (PU) foams and adhesives and subsequently for the preparation of functional composites. Oxyalkylation with propylene carbonate was the method used to obtain the lignin-based polyols with circa 22.5-25 wt.% of lignin depending on the purpose of the application of the PU as rigid foam or as adhesive. The formulation of rigid foams was optimized using a design of experiments towards the production of a thermal insulating material and yielded a low thermal conductivity ($< 0.030\text{W/m}\cdot\text{K}$) and lightweight (33.2 Kg/m^3) foam. Additionally, conductive composite foams were coated with electro conductive polymer PEDOT: PSS, with or without multi-walled carbon nanotubes (MWCNT), for IoT (Internet of Things) devices and adhesives for wood bonding were developed. The ensuing composite foams presented an electrical conductivity in the order of magnitude 10^{-5} S/cm and adjustable mechanical performance according to the amount of MWCNT used. As regards the bio-based adhesives obtained, their performance was comparable with that of a commercial PU, with good chemical resistance. Interestingly, a lower content of isocyanate in this bio-based formulation was necessary than that used in the commercial adhesive, which is a very important to reduce the costs and environmental impact of this type of material.

Chemical characterization and biological evaluation of extracts from residual biomass of *Eucalyptus globulus* and *Acacia dealbata*

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Abstract. *In Portugal Eucalyptus globulus wood is the main raw material for the pulp and paper production. This industry generates a wide variety of forestry by-products whose integrated valorization may represent a significant contribution to the profitability of the sector and the national economy. Besides E. globulus residues, such as bark, branches and leaves, biomass residues from invasive species such as Acacia dealbata are also generated during forest management, including wood and undifferentiated forestry biomass which, together with the E. globulus residues, are most often only used to produce energy in the factories.*

In the last years pulp and paper industries have been trying to improve residues management, and upgrading them in novel applications, promoting thus a circular economy and industrial symbiosis. Agro-forest residues have been seen in the last years as a promising source of valuable compounds. In fact, the high content of bioactive compounds in different morphological parts of E. globulus have been reported, with a panoply of biological activities addressed, such as antioxidant, anti-inflammatory, antiproliferative, among others (1). These make E. globulus residues very promising to be exploited in high value applications. However, for the valorization of E. globulus leaves, an integrated process for obtaining extracts enriched in specific families of bioactive compounds is missing. This process includes the extraction of essential oils by hidrodistillation, where the resulting residual biomass is enriched in value-added compounds with potential to be exploited, including triterpenic and phenolic compounds. In the same way little is known regarding the detailed composition of the different morphological parts of A. dealbata, which has hindered the exploitation of these residues in high-value applications.

Thus, the extraction of high- value compounds from forest biomass and the exploration of potential applications is a topic of great importance for the national economy, since it will bring added value to forest biomass before its use in energy production. Therefore, the aim of the PhD is to study the chemical composition of E. globulus leaves with the perspective of an integrated extraction process, as well as of the different morphological parts of A. dealbata (bark, wood and leaves) and to evaluate the bioactive potential of the obtained extracts in order to contribute to the declassification of residues and promotion of the status of useful by-products with various industrial applications.

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Biotechnology

Donor-independent metabolic adaptations during MSC osteogenesis

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Abstract. *Innovative strategies involving mesenchymal stem cells (MSCs) have emerged as promising alternatives to conventional bone grafts. However, donor heterogeneity limits the clinical value of MSCs, triggering attempts to use data signatures as predictors of differentiation potential. Because local metabolic alterations seem to be critical for bone regeneration, metabolomics (through cell extracts and culture media) may unveil novel information on MSCs osteogenic differentiation. In this work, NMR untargeted metabolomics was applied to monitor human adipose tissue-derived MSCs (hAMSCs) throughout 21 days of osteogenic differentiation, aiming at i) understanding of the dynamic crosstalk between intra- and extracellular metabolic pathways and ii) searching for osteogenesis-specific predictive markers independent of donor origin and of underlying cell proliferation. Articulation of endo- and exometabolome results from a single donor enabled important correlations to be established regarding membrane remodelling, anti-oxidative mechanisms, phosphate production, protein synthesis, and energy metabolism in hAMSC osteogenic differentiation. Furthermore, detailed polar endometabolome adaptations from two hAMSC donors under osteogenic and basal (control) conditions allowed the identification of donor-independent features of osteodifferentiation (e.g. increased levels of adenosine, choline and ethanolamine after day 7). Overall, this work has shown the great potential of NMR metabolomics to characterize the dynamic metabolism of MSC osteogenic differentiation, ultimately enabling the potential discovery of universal biomarkers of osteogenic differentiation efficacy, with potential translation to in vivo clinical practice.*

Silica-based supported ionic liquids for the downstream processing of the L-asparaginase biopharmaceutical

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Abstract. *L-asparaginase (ASNase) is an aminohydrolase enzyme widely applied as a biopharmaceutical, a biosensor for L-asparagine quantification, and as an acrylamide reduction agent. While widely distributed in nature, most commercial ASNase are from recombinant microorganisms, whose production can be performed through fermentation. Nevertheless, downstream processing of ASNase accounts for up to 80% of total production cost. Aiming at overcoming this drawback, in this PhD, silica-based supported ionic liquid-like phase materials were studied as cost-effective ASNase purification supports through a simple adsorption method. Through this approach, process costs, energy consumption, and waste produced, could be significantly reduced, leading to the decrease of ASNase price, thereby allowing its widespread application.*

Multifunctional Hybrid Laminaran/Platelet lysate-based hydrogels

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Abstract. *Our newly developed self-feeding hydrogels with enzyme-empowered degradation capacity have demonstrated high biological performance in-vitro and in-vivo as a novel self-maintained and biocompatible 3D scaffold1. Photo-cross-linkable platelet lysates (PL)-based hydrogels have exhibited to support distinct human-derived cell cultures owing to their high content of bioactive molecules, such as cytokines and growth factors2. To take advantage of all features of both PL and self-feeding hydrogels, here we combined UV responsive laminaran-methacrylate (MeLam) and PL-methacrylate (PLMA) derivatives plus glucoamylase (GA) to fabricate a multicomponent hybrid hydrogel (GLMPL). This hydrogel emerged as an unique scaffold due to the combination of sustained delivery of glucose produced via enzymatic degradation of laminaran and granting cell adhesion by presence of PL. Besides, this biomaterial was also applied to fabricate high-throughput freestanding microgels with controlled geometrically shapes. Impressively, such multicomponent hybrid hydrogel was successfully implemented as a glucose supplier bioink to fabricate complex and well-defined cell-laden structures using a support matrix.*

Heart-on-a-chip: a fully-human 3D printed device for disease modelling and drug screening

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Abstract. *The high number of deaths caused by cardiovascular diseases and the repeated withdraw of drugs from the market due to cardiac side effects make the heart one of the major concerns of the pharmaceutical industry in current times. However, the lack of effective and predictive models for testing new drugs in pre-clinical assays remains a challenge. Recent developments in 3D cell culture and microfluidic chips have emerged as a promising solution that enables the recapitulation of human tissues in vitro with higher accuracy. In this project, a fully-human cardiovascular model, comprising amniotic membrane-based hydrogel and human-derived cells, will be integrated into a microfluidic system to produce a heart-on-a-chip for drug screening. This platform will be able to mimic both healthy and fibrotic cardiac tissue thus enabling comparative studies between the two conditions. Moreover, the incorporation of sensors will allow real-time monitorization of assays which increases its pharmaceutical and clinical value.*

Hyperbaric inactivation of *Alicyclobacillus acidoterrestris* endospores in commercial apple juice – dependence of pressure and electro-based pre-activation steps

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Abstract. *Alicyclobacillus acidoterrestris* is a gram-positive, thermophilic microorganism that produces highly resistant spores that represent an atypical case of an endospore able to germinate and outgrowth in acidic food products, as it is generally accepted that most endospores are unable to germinate/outgrowth at pH levels below 4.6, with the acidity hurdle blocking the nutrient receptors of the spores¹. Indeed, this particular endospore represents a threat to the industry, as it is rather prevalent in fruit juices and concentrates and, in its vegetative form, it is able to produce guaiacol, which is responsible for the off-flavours and odours in fruit juices and concentrates contaminated with this microorganism.

Lately, high pressure processing (HPP) has been widely used for nonthermal pasteurization of foods, although, as for any pasteurization procedure (either thermal or nonthermal) it is unable to destroy bacterial spores, although, the combination of high temperatures (above 70 °C) with HPP has shown to be efficient for endospore inactivation. Nevertheless, the combination of these temperatures with HPP may also cause considerable changes to the food products (although in a lower extension compared with intense thermal processes aiming the inactivation of spores, such as sterilization)².

In a previous study, hyperbaric storage (HS) at uncontrolled room temperatures (RT) has shown to be quite efficient to inhibit endospore development³, and in some cases resulting in *A. acidoterrestris* inactivation in commercial apple juice, with the results pointing out that these spores could be reduced below detection limits within 48 h, which led to the hypothesis that an increase of the set pressure level could result in higher inactivation rates, in a range of pressures usually higher than those used in hyperbaric storage (up to 100 MPa)⁴, but lower than those used in HPP (above 450 MPa), leading to a new concept aiming endospore inactivation, called hyperbaric inactivation (HI). This principle states the use of hydrostatic pressures between 150-250 MPa to inactivate microorganisms that are usually resistant to HPP, such as bacterial spores.

In the present study, hyperbaric inactivation was performed, using *A. acidoterrestris* endospores inoculated in commercial apple juice (pH 3.70) as case-study. The HI conditions were set to 150, 200 and 250 MPa up to 24 h, at uncontrolled room temperature (20-23 °C). At the same time, HPP (600 MPa, 3 min, 17-18 °C) and pulsed electric fields (30 kV/cm, 80 μs, 1400 Hz) were performed to infer how a previous endospore activation step would impact their behaviour under HI conditions.

The inactivation kinetics results followed a Log-Logistic model for all the evaluated pressures. A pre-activation by HPP allowed to reduce *A. acidoterrestris* endospore counts below quantification limits after 24h, with at least 4.54 log units[?] reduction, while a pre-activation by PEF delayed endospore inactivation while under HI conditions, being the inactivation rates slower for higher HI pressures, which was demonstrated by the lower τ value (tau value, representing the time to reach the maximum inactivation rate, Log (hour)) for pressures above 250 MPa. Non-pre-activated *A. acidoterrestris* endospores (that were not pre-activated by HPP or PEF) showed a slower inactivation rate compared to HPP (especially at 150 MPa) but faster than those observed for PEF. This result may be related to a direct opening of the dipicolinic acid channels of the endospores caused by HPP, leading to a quicker endospore inactivation upon exposure to HI conditions, contrary to PEF, which only is able to cause slight vibrations on the calcium-dipicolinic acid complex in the core, being unable to trigger its release to the external media and thus, unable to trigger the first stage of the germination process.

These results seem to indicate that HI can be used to inactivate bacterial spores in foods, with wider potential, for food safety improvement.

Human plasma derived hydrogels for myocardial tissue engineering

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Abstract. *Heart failure due to myocardial ischemia (MI) is a global cause of death. Heart remodeling mechanisms after MI include replacement of myocardial tissue with fibrotic scar tissue. Despite all the promising results of current therapies, new strategies must be developed to generate new functional tissue within scarred regions. Hydrogels are attractive scaffolds in tissue engineering (TE), capable of mimicking native extracellular matrix. In this project human-derived hydrogels with tunable mechanical properties will be used to develop cardiac microtissues that resemble native myocardium. 3D bioprinting of patches incorporating cardiomyocytes with desired shapes/patterns will be also explored. Such hydrogels should provide support for 3D cells growth and their functional control. These hydrogels could exhibit the right biomechanical environment to support myocardium tissue development in vitro for regenerative therapies and drug screening. This platform is the first complete human-based material for 3D cell culture and an easy-to-use solution for clinical purposes.*

Development of functional food targeting cardiometabolic risk

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Abstract. *Cardiovascular diseases (CVDs), the leading cause of death worldwide, are closely related to several interrelated risk factors, namely hyperglycemia, hypertension, dyslipidemia, insulin resistance and obesity. Diet has been pointed out as one of the most important strategies to fight CVDs and, in this topic, the phenolic compounds resveratrol and hydroxytyrosol assume particular relevance. Nevertheless, their usage as functional food ingredients needs to overcome several challenges, including stabilization and solubility issues modulated by polysaccharides and proteins. This work intends to elucidate the impact of distinct vehicles of polysaccharides or proteins (either co-mixed or as complexes) on the stability and bioaccessibility of the aforementioned phenolics to design functional foods for CVDs prevention.*

Resveratrol was investigated to develop lemon juice, rice drink and bread. In the lemon juice, it was applied the β -cyclodextrin complex to a final concentration of 0.625 mg of resveratrol/mL juice. It showed quite promising by promoting the solubility of RSV in the aqueous matrix that, consequently, contributed to the slight increase of bioaccessibility as compared with free resveratrol (2%, compared to 0.5% of free resveratrol in the intestinal phase) and stable antioxidant potential of resveratrol for at least 28 days. The potential of this β -cyclodextrin complex led us to evaluate the bioaccessibility of resveratrol when complexed with other cyclodextrins (α and γ) to supplement rice-beverage (0.75 mg/mL of resveratrol) in a static and dynamic model of digestion. Among cyclodextrins, the bioaccessibility of resveratrol was higher using β -cyclodextrin, 24 and 28% in static and dynamic digestion models, respectively, compared with the absence of rice beverage with free resveratrol, 11 and 6%. In bread, the vehicles used were zein nanoparticles and β -cyclodextrin complex at a final amount of 0.5% of resveratrol without altering the physicochemical properties of bread dough. Bread matrix acted as a suitable vehicle for resveratrol consumption through diet once no improvements in bioaccessibility and resveratrol bioavailability were visible with the delivery vehicles. Additionally, an interaction study of resveratrol with starch showed that resveratrol could be linked to the starch matrix without interfering significantly with its digestibility and α -amylase and β -amylase activities. In vivo study using the developed bread as food for diabetic rats showed visible improvements in the well-being of animals.

Regarding hydroxytyrosol, a panoply of food-formulated products exists, but its stabilisation and extraction from natural and non-food-competitive sources are still rolling. Thus, evaluation of the steps used for selective extraction of olives phenols compounds was done using olive leaves. Selective extraction of hydroxytyrosol is possible, but other extraction steps were essential to obtain an extract with more antioxidant activity.

Evaluation of hyperbaric storage as a feasible cell preservation methodology – case studies in blood and stem cells

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Abstract. *Blood and stem cells are two biological samples with a huge interest in the health sector and all the efforts are made to improve their preservation. Current procedures have drawbacks such as the high cost and loss of viability throughout time. Hyperbaric storage is a new food preservation methodology that has been studied recently as an alternative to the conventional techniques. In food products the use of pressure promotes bacterial growth inhibition and at higher pressures even bacterial inactivation allowing shelf-life extension [1]. Some studies have also showed that it is possible to modulate the metabolism of bacteria such as lactic acid bacteria [2].*

The main goal of this PhD work is to evaluate the possibility to use this novel methodology to preserve cells, with case studies in blood and stem cells. For this, whole blood was kept under pressure (up to 100 MPa) in combination with temperature (5 to 37 °C) and compared with the current method of preservation. Several analyses were made such as hemolysis quantification, pH, confocal microscopy and NMR.

Pressures above 50 MPa led to cell rupture in the first days of storage independent of the temperature combined (uncontrolled room temperature or refrigeration). With lower pressures (25, 30 and 40 MPa) at uncontrolled room temperature the hemolysis values were below the maximum allowed for transfusion for 21 days of storage. When combined with refrigerated temperatures (5 °C) the hemolysis values were lower than those storage at the same pressures but without temperature control (at room temperature) reaching the 35 days of storage (maximum shelf-life at refrigerated temperatures).

Further studies are necessary and are being carried out to deeply evaluate the use of hyperbaric storage as a preservation technique for biological samples such as blood and stem cells.

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Development of bioactive human-based cryogels to fabricate bio-inspired scaffolds for bone tissue engineering

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Abstract. *Bone degenerative diseases and trauma injuries affect millions worldwide. Specifically, to temporomandibular joint, beyond about 60-70% of the general population have signs of disorders, only about 25% of those are reporting symptoms. Beyond the capacity to bone regenerate itself in some situations, there are many others where this ability fails, and the currently available solutions have a lot of shortcomings. In this sense, in this project will be explored the use of human-derived proteins from two different sources: placental chorionic membrane (abundant of numerous extracellular matrix (ECM) proteins, as collagen and laminin) and platelet lysates derived from blood (rich in growth factors), as well as, calcium phosphate particles (to provide both mechanical strength and calcium and phosphate ions) in order to produce highly bioactive, porous and tough cryogels. It is expected that these three-dimensional resembling bone scaffolds would allow osteogenic differentiation of mesenchymal stem cells and to cryopreserve them fully populated, ready-to-use, until needed. Furthermore, the characteristic mechanical properties of the cryogels, will allow them to be compressed through a needle and fully shape recover after delivery, without requiring a complex surgery, during the administration.*

A closed and self-sustainable system for tissue engineering applications

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Abstract. *Owing to the difficult control over the kinetics of the establishment of stable vascular networks within compact forming tissues, as well as their effective anastomosis to host's circulation, engineering in vitro systems capable of readily providing oxygen at initial stages of the regeneration are crucial to enable homogeneous tissue function. Currently, there are few successfully engineered tissues in vitro mostly due to the inability to achieve proper oxygen and nutrient diffusion over the whole length of tissues with clinically relevant sizes. Despite frequently overlooked, this aspect is especially relevant while the construct takes time to either achieve the establishment of an effective and mature vascular network - capable of connecting the whole construct to the body's circulatory system (in pre-vascularization strategies) -, or to be invaded by the surrounding vasculature (in angiogenic phenomena). While approaches targeting accelerated vascularization have enabled the formation of pre-vascular networks through the use of recombinant pro-angiogenic growth factors, gene vectors encoding for therapeutic molecules and endothelial progenitor cells, achieving the proper oxygen levels through mature vascular supply usually requires several days or weeks. Herein, in an attempt to circumvent low oxygen tension in engineered tissues, photosynthetic microalgae have been proposed to act as oxygen generators able to induce ventilation on demand within macro-tissue engineered symbiotic systems. Microalgae show remarkable photosynthetic abilities and oxygen production. Taking this into account, we propose the development of hierarchical modular 3D structures through the bottom-up assembly of liquid-core macrocapsules. These will act as self-sustainable systems comprising (i) photosynthetic microalgae releasing oxygen on demand, and (ii) endothelial and mesenchymal stem cells, forming vascularized multipotent tissues. A proof-of-concept biosilicification-based coating will be applied to prove the fully autonomous character of the developed system, which is intended to be explored as a disruptive broad platform for tissue engineering. We hypothesized that by combining such microalgae with liquefied cell-laden capsules, a controlled kinetics based on (i) the initial localized release of oxygen throughout the whole volume of engineered tissues, (ii) concomitant with the establishment of a highly vascularized network could be created in a fully autonomous fashion. The proposed 3D platform may find applicability in tissue engineering applications.*

Magnetic-responsive platforms to control cell behavior for tissue engineering applications

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Abstract. *Magnetic responsive systems have been gaining momentum in the controlling of cell detachment in cell culture, namely harvesting of sensitive cells, single-cell analyses and development of sheets of cells (CS). By taking advantage of this knowledge, we are exploring the construction of CS aided through magnetic field to attain functional tissues, using two different strategies. Heretofore, we are being focused in the first approach, by creating magnetic CS through the incorporation of superparamagnetic iron oxide nanoparticles within cell environment. Complex, stratified and hierarchical magnetic tissues were successfully fabricated by such strategy in a simple, one-pot and cost effective manner. Nevertheless, in the second approach, we intend to develop completely biomaterial-free CS using smart magnetic responsive surfaces. Cells cultured on these surfaces will be easily collected by locating a magnet under the magneto-responsive glass surface. Overall, such magneto-responsive systems could enable the creation of 3D tissue in vitro with clinical relevance.*

One-step all-aqueous fabrication of pro-angiogenic cell-laden fibers for tissue regeneration

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Abstract. *Therapeutic angiogenesis has emerged as a promising treatment for ischemic diseases by promoting the growth of new blood vessels through the delivery of angiogenic factors. Controlled delivery strategies are desired to improve therapeutic efficacy by enabling the localized delivery of the angiogenic compounds, as well as to enhance their stability and sustain their long-term bioactivity. Here, fiber-shaped materials with encapsulated cells are proposed as systems to promote angiogenesis. A straightforward technology is expected to be developed to allow the rapid and one-step fabrication of biomaterial fibers with endothelial and/or mesenchymal stem cells using aqueous two-phase systems, promoting the regeneration of ischemic tissues through the rapid deposition and recruitment of stable vasculature. Poly(ethylene glycol)/dextran-based ATPS was used to support the direct and rapid generation of fibers with hollow features in a single step. The addition of oppositely charged polyelectrolytes in each phase and their complexation, enabled the formation of a stabilizing interfacial membrane. The produced membrane-bounded fiber-shaped materials with tubular features, showed robustness and ability to be perfused without compromising their structural integrity. Moreover, fibers with freeform configurations were able to be produced using an extrusion 3D bioprinter, that also enabled controlling the system length. These tubular materials presented adequate permeability and allowed human adipose-derived stem cells to adhere and survive for up to 14 days, in optimized formulations modified with cell adhesive groups.*

Modular enzymatically degradable multilayered membranes based on chemically functionalized dendritic nanomicelles for regulated intracellular therapeutics delivery

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Abstract. *Dendrimers are attractive synthetic macromolecules for various (bio)applications owing to their unique superior structural and physicochemical properties. Those include their well-defined and hyperbranched three-dimensional globular structure, multivalency assigned by the high number of terminal functional groups, good water solubility, and controllable nanometric size. Nevertheless, the most commonly used dendrimers raise cytotoxicity concerns, mainly for cationic and higher generation dendrimers, which leads to the disruption of cell membranes and cell death, thus extensively limiting their applications. To increase the biological functionality and, thus, the practical use of the dendrimers, considerable attention has been devoted to the peripheral functionalization of their functional end groups with poly(ethylene glycol) (PEG), or through conjugation with natural saccharides or other targeting-specific ligands or cargoes. Moreover, the chemical functionalization of dendrimers' surface with desired functional moieties and their incorporation within supramolecular Layer-by-Layer (LbL) assemblies has been reported as an effective strategy to overcome the safety issues and improve their biological outcome. The LbL assembly technology is a simple, cost-effective and highly versatile bottom-up approach to precisely engineer robust architectures under mild conditions, with tunable composition, structure, properties and functions at the nanoscale, by resorting to a myriad of building blocks.*

Herein, we propose the design and development of electrostatically-driven smart free-standing multilayered membranes encompassing chitosan and oppositely charged matrix metalloproteinase (MMP) cleavable peptide-functionalized polymeric nanomicelles loaded with naringin for bone therapeutics delivery. After the LbL process, the exposure of smart membranes, disclosing modular MMP sensitive peptides, to target cells expressing those MMPs, is expected to cleave the MMP sensitive peptide sequence and, thus, direct the released nanomicelles to desired cells and the encapsulated naringin in the lysosomal/endosomal cellular compartments to guide stem cell differentiation and trigger bone regeneration. To date, the build-up of multilayered assemblies encompassing commercially available dendrimers and distinct oppositely charged polymers (e.g., alginate, hyaluronic acid, chondroitin sulfate, polystyrene sulfonate) was successfully accomplished as monitored in situ by the quartz crystal microbalance with dissipation monitoring. However, the adsorption of dendrimers per bilayer was rather low and the multilayered thin films did not reveal to be stable enough to enable the fabrication of thick and robust free-standing multilayered membranes. Experiments are currently ongoing aiming to increase the stability of the multilayered assemblies. Moreover, we are also exploring the possibility to produce (i) free-standing multilayered membranes by resorting to the use of chitosan derivatives soluble under physiological conditions and oppositely charged macromolecules, and (ii) dendrimer-based glue both for bone tissue regeneration.

Bioengineering Living Units for Emulating Pancreatic Tumor-Stroma Interplay

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Abstract. *Bioengineering biomimetic in vitro models that recapitulate human tumors bioarchitecture and native tumor microenvironment signature is in high demand for improving preclinical disease modeling. To tackle, herein physiomimetic tumor-stroma pancreatic cancer living units – so termed cancer-on-a-bead models – were generated by using superhydrophobic surfaces. Compartmentalization of pancreatic cancer and stromal cells in well-defined ECM microenvironments stimulated the secretion of key biomolecular effectors including TGF β , closely emulating the signatures of human pancreatic tumors. Cancer-on-a-bead models also display increased drug resistance to chemotherapeutics when compared to their reductionistic counterparts, reinforcing the importance of differentially modeling ECM components inclusion and their spatial stratification as observed in vivo. Importantly, the developed methodology enabled to modulate the spatial compartmentalization of both tumor and stromal elements proving to be a scalable, solvent-free fabrication of ECM-tunable 3D platforms that can be leveraged for recapitulating differential matrix composition occurring in other human neoplasia's.*

Valorization of *Opuntia ficus-indica* L. through an integrated production of high-value products

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Abstract. *Opuntia ficus indica* L. fruits display high concentration of organic acids, vitamins and minerals. All these compounds can be responsible for enhancing the bioactivity of these fruits in which can be observed high antimicrobial, antioxidant, anti-obesity activities. For that reason, the *Opuntia ficus-indica* L. (OFI) species is an important food resource throughout the Mediterranean basin. However, the commercial flow of the products of this crop will have to face strong challenges from the already rooted markets.

This project aims to develop new value-added products in order to Integrate *Opuntia ficus-indica* L. in European daily life. The products will include juices and others obtained from the main by-products of juice production, ie peels and seeds. Peels, rich in dietary fibbers, iron and minerals, will be used as an ingredient in gluten-free flours, that in turn can be used in the formulation of distinct food products, namely for celiac persons. The seeds remaining in the pomace will be used for oil extraction (linoleic, oleic, palmitic, etc.) to be used as an encapsulating agent in order to produce tofu enriched with Vitamin B12. Moreover, the flowers, rich in bioactive compounds and with the capacity to inhibit the action of the enzyme's aromatase and 5- α -reductase (responsible for the benign prostatic hypertrophy) will be used on the production of a nutraceutical. Notably, innovative non-thermal processing technologies, namely high-pressure processing (HPP), and microwave assisted extraction (MAE) will be herein exploited as a non-thermal pasteurization in juices increasing the shelf-life of the product, as well as a green methodology for seeds oil extraction in order to attain higher yields of extraction, aiming to achieve differentiated products from the currently marked.

Bioengineered bioinstructive soft supramolecular multilayered patches for spinal cord repair

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Abstract. *Bioengineered bioinstructive soft supramolecular multilayered patches for spinal cord repair*

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Spinal cord injury (SCI) represents a serious neurological condition that permanently changes sensorial and motor individual's functions, representing a serious health problem worldwide. The inhibitory and hostile environment at the lesion site combined with the low central nervous system (CNS) ability to self-repair contribute to spinal cord regeneration failure, for which no therapeutic strategy has been effective.

Over the last few decades, the interdisciplinary field of tissue engineering has opened new avenues to address the multifaceted nature of SCI by leveraging innovative neural extracellular matrix (ECM)-mimetic supramolecular biomaterials, enlisted with biochemical, mechanical and structural features and acting as a physical support, to modulate cell behavior and grow bio-functional neural tissues.

Herein, emphasis will be given to the supramolecular design and development of robust biomimetic nanofibrous patches, endowed with synergistic topographical, biomechanical, and biochemical guidance cues to recapitulate the diversity of signals in the native CNS microenvironment to be used as an implantable device that could encourage axonal regrowth and trigger spinal cord repair. Biocompatible polymers, namely hyaluronic acid, poly(L-lysine), widely used to support neural cell functions and bioactive laminin-mimetic nanofibrous self-assembling peptide amphiphiles were used to recreate neural ECM and promote neurite outgrowth. The soft nanobiomaterials were assembled on substrates denoting distinct nanotopography into multicomponent multilayered patches exhibiting tailored nanostructure organization along the Z axis by combining the molecular self-assembly with the simple, cost-effective, and highly versatile Layer-by-Layer assembly technology. The bio-instructive patches physicochemical, morphological and biological properties will be disclosed.

Decellularized in vitro-assembled mini-tissues for regenerative medicine

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Abstract. *An ideal biomaterial for tissue regeneration should have the ability to provide cues that promote the deposition of healthy regenerated tissue comprising its microstructure, cell composition, and extracellular matrix (ECM). Providing highly tissue-specific, and possibly biomimetic, biomaterial matrices is a promising approach to obtain highly active biomaterials for tissue regeneration. Few biomaterials that have reached the market rely on animal or human decellularization-based, all-cellular or (semi)synthetic hydrogels. However, such approaches have not been able to fully recapitulate the native tissues' bioinstructive potential and function in order to promote in situ regeneration of a target tissue defect. Therefore, this project aims to bioengineer and stimulate the in vitro deposition of donor tissue-specific matrices to produce decellularized 3D bioprinted structures. In this project, two strategies will be employed (i) to assemble ECM enriched fibers generated with pre-differentiated cells or (ii) pre-assembled unspecific cell fibers will be matured in vitro with cell-specific differentiation media. Moreover, autologous cells and immortalized cell lines will be chosen for the assembly of these tissue-instructive structures. After a decellularization step, ECM networks are expected to maintain a similar biochemical composition to the originally assembled in vitro tissue, as well as bioinstructive ability, while being disposed of any cell remnant that could elicit a cytotoxic response upon implantation. With the proposed methodology/technology, we hope to obtain a material-free cell-based construct with high tissue specificity depending on the cell type chosen in order to replicate the uniqueness of the target tissue. The final structure can be envisioned as an off-the-shelf regenerative product with controllable shape and microarchitecture as well as specific biochemical and biophysical cues for recruitment of tissue resident cells to enhance the reconstruction of defected tissues.*

Aligned fibres for spinal cord guided regeneration

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Abstract. *The spinal cord is made up of aligned motor and sensory neurons that are responsible for the electrical information transmission between the brain and the body. Therefore, spinal cord injury can result in permanent loss of sensory and motor function.*

Tissue engineering has been attempting to overcome the lack of available treatments to restore spinal cord physiology by associating biomaterials, cells, and advanced microfabrication techniques. Here, magneto-responsive nanofibres are being developed with the purpose of creating a minimally invasive injectable hydrogel upholding fibres that could be aligned in situ by an external magnetic field. Electrospun nanofibres mimicking the human extracellular matrix are being fabricated by mixing natural and synthetic polymers with magnetic nanoparticles.

Our first findings indicate that neural stem cells adhere to and proliferate effectively on nanofibers that are aligned. We anticipate that implanting this fibrous structure will assist neurons in connecting between the two damaged stumps, thereby regenerating the neural network.

Designing foliar delivery systems towards controlled release of nano-enabled micronutrients for safer soil and plant health improvement

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Abstract. *As the unsustainability of conventional agricultural practices causes concern for the security of global food production, nanotechnology has shown the potential to revolutionize the advancement of precision agriculture. Polymer-based carriers for agriculture applications allow for high versatility in terms of functionalization and targeted delivery. Herein, novel biopolymer-based dynamic systems with enhanced adhesive properties for improved effectiveness of agrochemicals foliar application, are proposed. This plan will seek to understand nanomaterial properties responsible for increasing plant uptake and promoting leaf-to-rhizosphere transport, utilizing plants as a rhizosphere/soil delivery vector. Nanomaterial exudation to the rhizosphere will be mediated in planta preventing excess exposure of rhizomicrobiota to these materials. This new strategy is expected to improve both plant and soil health, increasing productivity by bolstering the symbiotic relationship between organisms.*

Natural phenolic compounds - gut microbiota dynamics: a reciprocal modulation approach for personalized nutrition

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Abstract. *From the beginning of humankind, plants have been seen as an essential source of food or natural healthcare products. In order to improve consumers' health and well-being, much effort is being centered on the exploitation of their biological activities and their secondary metabolites, in particular, phenolic compounds. These secondary metabolites have a huge structural diversity and widely distributed in the plant kingdom, and thus, commonly present in human diet, as part of the natural diet, or as supplements. Phenolic compounds have a vast range of biological activities (such as antioxidant, anti-inflammatory and/or antiproliferative) and are therefore very promising in some disorder's prevention. Although, their human health beneficial effects could be influenced by phenolic compounds bioavailability. In fact, bioavailability could be influenced by a huge diversity of factors, namely, compound's structure, human enzymatic activity, gut microbiota, among others.*

In this vein, this work aimed to evaluate the bioavailability and intestinal absorption of different classes of phenolic compounds, particularly, flavonols (rutin), flavanones (naringenin and naringin), dihydrochalcones (phloretin) and a monomeric phlorotannin unit (phloroglucinol), through an in vitro gastrointestinal digestion. Thus, these phenolic compounds bioavailability screening allowed to verify that they remain present through the gastrointestinal tract, in in vitro simulated digestion and that they are absorbed in intestine simulated level, for the most part.

Bioengineering humanized 3D osteosarcoma models for therapy development – moving from static to dynamic modelling

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Abstract. *In vitro* tumor invasion modelling combining 3D biomimetic materials and multicellular spheroids has sought to achieve the complexity of tumor microenvironment, including for osteosarcoma (OS). However, the lack of mechanical stimuli, tumor-stromal cell interaction and tumor angiogenesis are critical limitations. Recent advances in engineered organ-on-a-chip platforms have revealed the potential of these microsystems to recapitulate pathological features. In an attempt to provide a dynamic platform for OS tumor invasion modelling, the aim of my PhD project is the development of a human osteosarcoma-on-a-chip to establish the vasculature-bone tumor barrier, and compare with a 3D OS model in a static setting.

A microfluidic chip was designed to comprise a channel to introduce an ECM-mimicking matrix and perfusable channels to recreate vascular vessels. Exploring a fully human-derived approach, non-metastatic and metastatic tumor spheroids were embedded in human methacryloyl platelet lysates (PLMA)-based hydrogel. The synergistic tumor-stromal cell and cell-extracellular matrix interaction of an invading tumor was studied in co-culture with bone-marrow mesenchymal stem cells. As result, the tumor growth was supported and an increased spheroid invasion in the microfluidic chip was verified. The presented human 3D dynamic model provides the first osteosarcoma-on-a-chip to study tumor progression events, offering an innovative platform for anticancer therapies screening.

Development of cell-based immunomodulatory materials

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Abstract. *Cell-based materials have been used as modulators of the immune system, namely in circumstances where the inhibition of immune system is required, for instance in context of transplantation, acute and chronic inflammation, and regeneration. Therefore, this thesis pitch explores the immunosuppressive potential of cell-based materials in context of transplantation of pancreatic islets from a donor other than the self (allogeneic transplantation). The cell-based constructs produced were shown to be non-toxic when in contact with cells normally used to access metabolic activity. When in contact with macrophages, immune cells involved in inflammation, the cell-based materials did not trigger the pro-inflammatory polarization of macrophages and reduced these pro-inflammatory populations that are normally responsible for propagating inflammation scenarios. Future studies evaluating the ability of our systems to impair the rejection of allogeneic pancreatic islets in vivo will provide further clues to the efficacy of these setups.*

Construction of a cell delivery system for propelling regenerative medicine

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Abstract. *Cell-delivery therapies are currently recognized as a promising approach for propelling regenerative medicine. Cells and their secreted factors are key aspects of the native tissue environment that directly participate in new tissue formation. Still, the protocols used to deliver them fail in providing: i) the appropriate environment for tissue growth, ii) the protection from the shear forces in the needle, and iii) the controlled release of cells at the target tissue. Herein, we propose an injectable enzymatically degradable microgel system loaded with alpha-amylase to act as a vehicle for human adipose stem cells (hASCs). Such combination enables the cells to escape from the particle in situ, thus becoming increasingly available to participate in the new tissue formation. In our first approach, starch was modified with methacrylic groups to develop starch methacryloyl (SMA) microgels. The modification was confirmed by ¹H-NMR and FTIR and produced microgels were characterized in terms of their morphology, pore size, water content capacity and mechanical properties. Results showed that microgels incorporating 500 mU/mL of alpha-amylase experienced 100% of degradation after 1 day, whereas hydrogels with 50 and 250 mU/mL experienced 27% and 36% of degradation after 15 days in culture compared to control with no enzyme. Nevertheless, when SMA microgels were placed in a culture medium, the stability of the hydrogels was compromised. To circumvent this problematic, we now propose the development of methacryloyl platelet lysates (PLMA)-based hydrogels. Being derived from human blood samples, these hydrogels are rich in adhesive proteins, cytokines and growth factors that control cell activities in an autocrine and paracrine manner, which is advantageous to local enhance the regeneration response. Thus, our previous strategy was adapted, and cells were encapsulated in PLMA microgels with different concentrations of Proteinase K (the enzyme elected to controllably degrade PLMA). Preliminary results demonstrate that hASCs remained viable after 14 days in culture. At this time point, the microgels with 4 U/mL of proteinase K were fully degraded and cells adhered to the culture plate, whereas in the 0.4 mU/mL of the enzyme, cells have just started to migrate outgrow the gel and adhered to the plate. In summary, although some adjustment has to be done in the concentrations of enzyme tested, we believe this newly enzymatic-derived cell delivery system based on the conjugation of PLMA and Proteinase K, can overcome the current limitations associated with current cell delivery approaches, maintaining cells in place, and allowing them to slowly exit the gel and build in situ remodeled tissue.*

Exploring Living Materials for Tackling Human Diseases

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Abstract. *Living materials represent a new generation of human-engineered biotherapeutics that are highly attractive for a myriad of medical applications. Such innovative technologies provide multi-adaptable cell-rich platforms, with encodable and controllable bioactivity, that is unattainable with current and conventional biomaterial approaches. Owing to their living characteristics, the cellular units within these materials can also be rendered with additional therapeutically-relevant biofunctionalities. On this focus, this PhD project aims to develop hydrogels with tissue-like density for biomedical applications, through the glycoengineering of multipotent stem cells, followed by their bottom-up processing through additive manufacture and volumetric 3D bioprinting technologies. Such disruptive approach will leverage the development of multi-cellular tissue-like platforms, applicable to a wide range of tissues and biomedical applications, by exploiting the differentiation potential of such cells.*

Designing Bioinspired medical adhesives from marine biopolymers and tannic acid

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Abstract. *Adhesive biomaterials have been studied by the scientific community in attempt to surpass the current disadvantages of sutures and staples in surgery, such as the difficult application and the risk of infection. Bioadhesives have been used as: i) glues, ii) tissue sealants, and iii) hemostatic agents. Despite the potential of this area, existent adhesives still present several limitations. Some are not biocompatible, or produce cytotoxic by-products; others lack bulk strength or bioactive properties. Regarding wet-adhesion, mussel-inspired bioadhesives mimic the mussel's strong underwater adhesion, using catechol groups. Tannic acid (TA), a plant-derived polyphenol, is a safe and low-cost source of catechol/pyrogallol groups. It allows polymeric crosslinking through hydrogen and ionic bonding, or hydrophobic interactions, improving biomaterials adhesiveness and mechanical performance, while endowing it with anti-microbial, anti-inflammatory and antioxidant properties. Hence, by combining methacrylated laminarin (LAM-MA) or pullulan (PUL-MA), with TA, bioinspired adhesive biomaterials for biomedical applications were produced.*

High hydrostatic pressure (hhp) for osteogenic differentiation

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Abstract. Bone is constantly exposed to a range of macro-scale loading which creates a complex mechanical microenvironment for its resident cells. One such mechanical stress generated is hydrostatic pressure (HP) which plays an important role in cell function and fate determination. Although HP is a constant mechanical cue for bone resident cells, little is known about the effect of this external stimuli in a 3D microenvironment. Inspired by native bone mechanical microenvironment, this research studied for the first time the effect of different ranges of cyclic HP on human adipose-derived mesenchymal stem cells (hASCs) encapsulated in a 3D liquefied microcapsule. In the proposed system, while encapsulated hASCs were free in a liquid environment, surface functionalized microparticles were provided as cell attachment sites. In the first step of the study, different ranges of HP (10-250 MPa) were applied to the hASCs for 10 minutes, to find the maximum magnitude that cells could survive. According to the results, 50 MPa was the highest applicable pressure without jeopardizing cellular viability. Then, cyclic HP (6 cycles of 10 minutes) was applied to the hASCs encapsulated in microcapsules in a low (5 MPa) or a high (50 MPa) magnitude. The electrospraying technique was employed to produce alginate microgels encapsulating hASCs and microparticles in a calcium chloride bath. Using alginate microgels as templates, a multilayered membrane made of poly(L-lysine), chitosan, and alginate polyelectrolytes were produced via layer-by-layer assembly technology (n=12-layers). After a mild core liquefaction process, liquefied microcapsules were cultured in basal (BAS) or osteogenic (OST) media up to 21 days. Taking advantage of the liquefied core environment of microcapsules, hASCs were exposed to cyclic HP at 5 or 50 MPa magnitudes 3 times/week. Biological tests including MTS and live-dead assays indicated that hASCs remained viable up to 21 days of culture in all tested conditions. The fluorescence staining of F-actin filaments demonstrated a noticeable increase in cell-cell interactions and network formation of hASCs in the pressurized groups, compared to the non-pressurized group. Being this phenomenon more pronounced in OST condition, the observation confirmed by fluorescent staining of vinculin. Results showed that vinculin distribution increased in response to pressurization, specifically in OST group. More interestingly, a significantly higher alkaline phosphatase activity was detected in 50 MPa group. Furthermore, a greater staining of osteopontin, and hydroxyapatite markers was observed in 50 MPa/OST group. Overall, this study demonstrated that the proposed liquefied encapsulation system holds great potential as an effective platform for studying the impact of various magnitudes of HP for numerous differentiation purposes. Moreover, results revealed that the beneficial effect of HP for osteogenic differentiation is magnitude dependent. Finally, the highest differentiation effect was observed when both biochemical and mechanical cues were combined (50 MPa, OST).

Metabolic study of NLRP3 inflammasome activation in human macrophages

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Abstract. *Macrophages are essential in the regulation of inflammatory processes. Activation of the NLRP3 inflammasome, a large intracellular multiprotein complex, is key in host defense during innate immune responses, as well as in multiple inflammatory diseases. The development of strategies to modulate inflammasome activation is promising towards the mitigation of persistent, unresolved inflammation. Macrophages reprogram their metabolism in response to inflammatory stimuli. Hence, modulating macrophage metabolic pathways is a promising strategy to achieve control over inflammasome activation. In this work, we have employed NMR metabolomics of human macrophages to reveal the metabolic alterations involved in NLRP3 inflammasome activation. Moreover, we have developed nanoparticle carriers of shikonin, a small molecule that inhibits glycolysis, to selectively target macrophages, attenuate inflammasome activation and skew the cells towards a pro-regenerative phenotype.*

Poly (glycerol sebacate) (PGS): a base for new materials

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Abstract. Poly (glycerol sebacate) (PGS) was reported by the 1st time in 2002, and its conjugations/modifications with other elements bring up an attractive class of materials for scientific research and biomedical applications. The synthesis of poly(glycerol-co-diacid) polyester materials, like PGS, can produce a wide range of properties that can be controlled by fine-tuning synthesis procedures to match custom specifications.

In this 4th year, the pitch will show a part of the results involving PGS, poly (glycerol succinate) (PGSuc) and poly (glycerol sebacate/succinate) (PGSSuc). The polymers were synthesized with different molar ratios of each diacid (sebacic and succinic), since 100% sebacic acid (PGS) until 100% succinic acid (PGSuc). The results from tensile test analysis will be presented for each polymer produced (Mechanical properties considered: Ultimate strength, Elongation and Young's modulus).

Microwave-assisted extraction of linear diterpenes from the macroalga *Bifurcaria bifurcata*: Process optimization

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Abstract. *Linear diterpenes (LD) are quite exclusive terpenoids found in a few brown macroalgae families, for instance in Sargassaceae, and notably in Bifurcaria bifurcata. LD have been associated with anti-inflammatory, antiproliferative and antimicrobial properties which make them promising compounds for nutraceutical or pharmaceutical applications. However, most of the studies published so far, dealing with the extraction of these compounds, use conventional extraction methods, with extended extraction time and large amounts of organic (often toxic) solvents, making them unviable for those high-added value applications.*

In recent years microwave-assisted extraction (MAE), has been rapidly developed as an innovative technique to circumvent the problems inherent to conventional extraction methods. Microwave irradiation leads to homogeneous and rapid heating and cell disruption, which promote high diffusion rates, shorter extraction times, as well as reduced energy and solvent consumptions. Despite these advantages, MAE has not yet been exploited in the extraction of LD from macroalgae. In this vein, this study envisaged to optimize the MAE of LD from B. bifurcata. Temperature, extraction time, solid:liquid and ethanol:water ratios were optimized using response surface methodology based on a Box-Behnken design. LD content on a dry weight basis (mg LD/g DW) and per amount of extract (mg LD/g ext) were evaluated and compared with conventional solid-liquid extractions.

Bioengineering of a bone-marrow-mimetic in liquified capsules: a strategic combination of cell and bio-instructive materials for bone regeneration applications.

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Abstract. *Bone tissue engineering (BTE) provides a plethora of temporary scaffolds to be implanted at the defect site until bone is endogenously regenerated and the biomechanical function is restored. The majority of BTE strategies are deprived of an integrated strategy that combines the three co-existing systems of the native bone-marrow (BM) microenvironment, namely skeletal, vascular and hematopoietic. The novelty of the present project is to combine these three systems in liquified compartments as a revolutionary and promising strategy to recreate the regenerative properties of the BM in vitro. For that, multiphenotypic cells (i.e., mesenchymal and hematopoietic stem, and endothelial cells) will be strategically combined with bioinstructive microplatforms comprising mechanical cues (i.e., topography and stiffness) and encapsulated in liquified-core capsules. The main hypothesis is that providing cells the structural, biological and bio-instructive requirements, a self-regulated and vascularized bone-like microtissues could be engineered*

Materials science and engineering

Creating and exploring non-reciprocal colloidal microparticles as swimmers

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Abstract. *Colloidal particles with increasing complexity have been developed in the last decades, aiming new functionalities and applications such as self-assembly and autonomous flow. Thus far, delivery systems, swimmers, and rotors have been developed mainly based on micrometer-size colloidal particles with spheroid, ellipsoidal, cubic or tubular shapes. Since micro-sized swimmers have to break symmetry locally in order to self-propel, using non-reciprocal shapes as building blocks is of great advantage when designing this type of systems.*

In this work, anisotropic colloidal particles based on polyoxometalates with organic moieties are explored as templates for molecular delivery with autonomous movement based on environment conditions.

Photocatalytic Nanocomposites: A Bet to a Cleaner Future

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Abstract. *Water contamination is caused by thousands of different organic pollutants in very low concentrations, as a result of rapid urbanization and industrialization. There is a need to develop new nanomaterials for the efficient treatment of wastewater by means of photocatalysis processes powered by sunlight. Among several nanomaterials, zinc oxide (ZnO) and titanium dioxide (TiO₂) are two of the most used metal oxide semiconductors used in photocatalytic reactions. ZnO and TiO₂ have low toxicity, chemical stability, and wide band gap energy. An enormous effort has been put to improve the properties of these materials by the combination of their physicochemical properties with those of carbon nanotubes. These properties can be tuned according to the desired photocatalytic processes to subsequently improve the efficiency.*

Herein, we present a controlled deposition of two metal oxides, ZnO and TiO₂, via atomic layer deposition (ALD) on high surface area supports, such as wave-like patterned carbon nanotube (w-VA-CNTs) arrays. Both films are conformal, uniform and very thin, with 13 and 11 nm layers of ZnO and TiO₂, which were obtained at 200 °C after 100 and 200 ALD cycles, respectively. The photocatalytic degradation of Rhodamine B using the synthesized nanostructures was assessed by following the absorbance of an aqueous solution of this dye over 240 min of irradiation. We clearly notice of approximately the same thickness, both oxides present similar photocatalytic activity.

Flexible bionanocomposites for muscular rehabilitation

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Abstract. *Currently, wearable devices are getting increasing interest. There is a need for more flexible and comfortable structures to be attached to the body to prevent, monitor, and facilitate rehabilitation processes. Conventional devices for neuromuscular rehabilitation to lose muscular function due to immobilisation, tend to be heavy or require the patient to visit the health centre. Therefore, the design of new functional materials to fabricate on-skin or implanted devices would stimulate muscles for mass and strength maintenance during prolonged immobilisation. On the other hand, there is a concern about producing environmentally friendly and sustainable materials for the next generation of flexible biomedical electronics. Piezoelectric materials can convert mechanical stresses into electrical voltage and vice versa. Although lead zirconate titanate (PZT) is the most used compound due to its high piezoelectric coefficient, the presence of lead limits its application in biomedical devices due to its toxicity. Other lead-free materials exhibit this behaviour, like ceramics (e.g. BaTiO₃, ZnO) which are widely studied but have the drawback of being rigid. Polymers such as poly(vinylidene fluoride-co-trifluoroethylene) and poly-L-lactic acid (PLLA) have been studied but have low piezoelectric coefficients. The development of bionanocomposites is seen as a possibility to combine different phases to tune the response while ensuring flexibility and biocompatibility. Chitosan (CS) is a polysaccharide from chitin, the main structure of shells of different molluscs and insects. Its piezoactive property is not fully understood but is recognised for its intrinsic and exceptional characteristics, such as biocompatibility, non-toxicity and antibacterial activity. In this work, chitosan-based bionanocomposites are being explored to develop materials for a muscular rehabilitation device. The microstructure and physical characterisation were achieved using the X-Ray diffraction and FTIR techniques. The microstructure measurements were correlated with piezoelectric-response force microscopy (PFM) and Kelvin probe force microscopy (KPFM) to identify the contribution of distinct mechanisms at the microscale in chitosan-based films. In addition, the effect of different acidic media and the neutralisation procedure was studied. The vibrational analysis of the samples was obtained through Berlincourt piezometer equipment and a shaker setup. The characterisation result suggested that the main contribution of electrical response in chitosan films is related to electrostriction. The nanoimprinting lithography technique will be explored to generate organised structures and study the relationship of structure-microstructure properties and suitability for an electrical stimulation device.*

Thermoelectric oxides: From microstructural engineering to devices by laser processing

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Abstract. *Thermoelectric oxides: From microstructural engineering to devices by laser processing*

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Today ?green? thermoelectric (TE) conversion is considered as one of the promising methods to produce energy from waste heat and natural heat sources, reducing the overall energy usage and therefore CO₂ emissions. It offers a short route to power generation in almost every industrial sector and is self-sufficient to enable mobile or remote applications. In some energy conversion scenarios, the cost and thermal stability of the materials are decisive, opening a window for oxides. One of the goals of this work is to strengthen the competitiveness of the thermoelectric oxides technology using micro- and nanostructural ceramics engineering by laser processing. This work also aims to identify and optimize prospective laser floating zone (LFZ) conditions for processing of the materials. Structural and thermoelectric properties of the LFZ-grown materials will be assessed. The application of external magnetic and electrical field during the LFZ processing, and various gas atmospheres constitute a particular tool for structural and microstructural tailoring. The prospects for the best obtained laser-processed materials will be demonstrated by assembling module prototypes, considering conventional planar design and tubular configuration, as particularly promising for energy recovery from hot exhaust gases.

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Coating of paper-based materials through the extrusion of biodegradable and flexible bioplastics

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Abstract. *Coated paper industry is a growing sector that requires effective coating strategies and low-cost coating materials that can confer good barrier properties to the wrapping paper. Current coatings based in fossil-oil plastics, such as the thermoplastic polyethylene, need to be replaced by bioplastics based in biodegradable polymers such as polysaccharides. Among them, starch as several additional advantages such as, good sealing ability and the capacity of becoming thermoplastic. However, native starch presents weak barrier properties and usually needs additional modifications that will improve its performance as paper coating. They include, among other strategies, physical blending of starch with other additives that will improve its hydrophobicity. In this work, it is proposed that, through the valorization of agri-food by-products, onion peel and garlic peel wastes can be used as hydrophobic natural additives for starch-based coating films, to improve mechanical and barrier properties at a polyethylene-matching level.*

Agri-food by-products as a source of biomolecules for sustainable bioplastic packaging production through blown extrusion

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Abstract. *Blown film extrusion is among the most used processes for plastic packaging production, making use of synthetic plastic polymers such as polypropylene and polyethylene, which have a high melt tenacity and mechanical resistance/flexibility in the final materials [10.1016/B978-0-323-39395-9.00040-2]. Since these polymers are non-sustainable and detrimental to the environment, alternatives such as the use of bioplastics like thermoplastic starch have been studied. Despite the renewable and biodegradable character of these materials, several difficulties arise when trying to process them through blown extrusion, such as a low melt tenacity and thermal stability, and the resulting materials are too brittle and water sensitive to be competitive in the packaging market [10.1016/j.carbpol.2007.07.001].*

To tackle these issues, options like the chemical modification of starch, addition of plasticizers, and addition of fillers have been reported. The hypothesis of this work is that the combined transesterification of starch along with the addition of natural biomolecules coming from rice and potato industry byproducts, could generate biocomposites with increased processability to allow blown extrusion and generate bioplastic films with a competitive mechanical performance.

Both rice and potato byproducts showed excellent film forming ability using a solvent casting technique, generating flexible and hydrophobic films, in the case of colored rice (RC), which inclusively presented antioxidant and UV-protective properties in the case of RC and rice dust (RD) (up to 88% ABTS⁺ inhibition, and UV absorbance peak at 280 nm). The bioplastic formulations were then transitioned into a more scalable process, melt mixing. Here, the inclusion of formulations with the transesterification of starch using potato frying oil and KOH were also introduced. This chemical modification showed to increase the processability of the resulting materials, which presented an increased melt fluidity (up to 3 times in the case of starch recovered from potato washing slurries). Also associated to the transesterification was an increase in flexibility of films produced through hot-pressing of the melts. Films made with transesterified RD showed an increased elongation % and decreased Young's modulus when compared with the non-modified formulation (from 47 to 67% and from 13.5 to 4.5 MPa, respectively).

The results obtained so far show the potential of the studied byproducts to generate 100% bio-based and bio-degradable biocomposites processable through blown extrusion and with a competitive performance, presenting antioxidant and UV-protective properties.

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Tuning the Thermoelectric properties via Substitution and Defect Chemistry engineering by Taguchi approach

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Abstract. *One of the promising methods to recover the wasted energy, produced in different industries or natural processes is ?green? thermoelectric power generation. Nowadays particular interest is given to the oxide materials, due to have good thermoelectric properties specially at high temperature, as well as absence of toxicity, and natural abundance of prospective constituent compounds. In this work, focus is on one of the promising ceramic n-type materials with the perovskite structure, i.e., BaTiO₃ through solid state technique. In order to reduce the total number of experiments, according to the Taguchi approach three variable parameters with three levels, are selected to evaluate the effect of substitution of Ta in B-site, deficiency of Ba in A-site, in Ba(1-x) Ti(1-y) Ta_yO₃ (where x= 0, 0.025 and 0.05 and y= 0, 0.05 and 0.1), and synthesis temperature. Electrical conductivity and Seebeck coefficient values are measured simultaneously using the four-point probe DC. The best combination we have already achieved related to the E7 (Ba Ti_{0.9} Ta_{0.1} O₃) and E9 (Ba_{0.95} Ti_{0.9} Ta_{0.1} O₃), based on the Taguchi design of experiment (DOE). According to the Taguchi results and considering the correlation matrix and fitting parameters it was found that, the concentration of Ta, has the most effective parameter on the electrical properties. Moreover, temperature plays the chromatic role on the density of the samples. And the selected sintering temperatures range is good for both reduction to Ti³⁺ and sufficient densification.*

On the nature of unexpected white emission with temperature sensor 1949-3086 K and vacuum detection

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Abstract. *White emission broadband based on an upconversion process driven by a cheap, low laser power density in NIR, has been reported in several materials. Though, many questions continue to exist regarding analyzing the process that generates this unconventional emission. Here we discuss the origins of the laser-induced white light emission, along with its characteristic features in terms of the photophysical behavior under-sample compaction, irradiating laser conditions (wavelength, power density, excitation cycles, and excitation time), pressure effects, temperature, and temporal analysis. We demonstrated a straightforward way of estimating the particle temperature under several pump power cycles, using: Planck's law (1949?3086 K with resolution of 6?10 K) for the observed white-light emission. Based on the pressure?emission dependence on white emission it is possible to apply the (Gd_{0.89}Yb_{0.10}Er_{0.01})₂O₃ as a vacuum sensor.*

The effect of substrate on microstructure evolution of potassium sodium niobate films

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Abstract. Potassium sodium niobate (KNN) is the most promising lead-free piezoceramic to substitute lead zirconate titanate (PZT) [1]. Its commercialization for micro-devices requires electric performance optimization and low-cost scalable processes. A variety of preparation conditions of KNN thin films has been reported over the years, covering alkali excess from 0 mol% to 40 mol%, annealing conditions, among others [2?4]. Yet, the role of the substrate on structure, microstructure and electrical performance has not been addressed in KNN films, although its relevance has been well established for other systems such as SrTiO₃ (ST) [5], PZT [6] and PbTiO₃ [7]. In this work, sol-gel KNN precursors were deposited on platinized Si, STO and MgO substrates, and KNN thin films with different degrees of preferential orientation were obtained by manipulating the thermal cycle. All the KNN films present single perovskite phase. The residual stresses of the produced films on different substrates were measured by XRD: i) randomly oriented KNN films deposited on Pt/Si showed tensile residual stress (183 ± 25 MPa), whereas those films deposited on Pt/STO (-358 ± 15 MPa) and Pt/MgO (-430 ± 22 MPa) exhibited compressive stresses; ii) highly oriented KNN films deposited on Pt/Si showed tensile residual stress (844 ± 330 MPa, $f=89$ %), and those oriented films deposited on Pt/STO (-276 ± 51 MPa, $f=55$ %) and Pt/MgO (-734 ± 84 MPa, $f=94$ %) showed compressive stresses. The microstructure of randomly oriented films presents bigger grain sizes than that of the highly oriented films, and the average grain size change with the substrate (Pt/Si > Pt/MgO > Pt STO). Also, STEM micrographs showed the columnar growth in the highly oriented KNN films where 90 nm height columns are clearly visible. We hypothesized that such variation might be attributed to the differences in the thermal conductivity of the substrates (Si = 130 W/mK, MgO = 42 W/mK, and ST = 12 W/mK) which in turn may account for a different thermal history of each film.

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Food science and technology and nutricion

Impact of pH and water activity on food preservation by hyperbaric storage

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Abstract. *Proper storage conditions are necessary to preserve foods, to avoid or delay deterioration or quality issues. Cold storage of foods is used worldwide as the main strategy but it's responsible for great energetic consumptions and emissions of global greenhouse gases, which are environmentally unsustainable.*

Recently, Hyperbaric storage (HS - food storage under mild pressures), has been proposed as an alternative to refrigeration that can be used at room temperature (RT), which is a major advantage, allowing for lower energy costs and green-house gas emissions and has been shown to preserve foods products equally/better than refrigeration.

*The main objectives of this PhD plan are to evaluate, for the first time, the impact of pH and water activity (major influencers of microbial development) of food products on storage/preservation using HS at RT, focusing on microbiological growth (with selected microorganisms) and quality attributes (including endogenous enzymatic activity and lipid oxidation). The research produced so far regarding the inactivation of inoculated *Escherichia coli* and *Listeria monocytogenes* in watermelon juice has shown that lowering the pH and increasing the pressure level lead a quicker inactivation, controlling the microbial growth. Based on these conclusions, additional assays with storage at higher pressure levels (for shorter periods) were performed to assess the efficacy of Hyperbaric Inactivation (HI) of both bacteria inoculated in watermelon juice, revealing that HI has the potential to be successfully used as a nonthermal pasteurization technique. Deeper insights on this possibility are now being evaluated.*

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Shelf-life extension of pasteurized and ready-to-eat foods by hyperbaric storage at room temperature

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Abstract. *In the last years, hyperbaric storage (HS) at room temperature (RT) has been investigated as a new food storage methodology that preserves food under pressure, between 50-100 MPa, from a few days to some months [1]. Recent studies point HS as an alternative/complement to RF, since HS at RT reduces the energy consumption and the carbon footprint, being considered environmentally friendlier without compromising food safety and quality. HS at 50 MPa led to an inhibition of microbial growth while HS at and above 75 MPa caused a microbial inactivation effect to below the detection level (< 1.0 logarithmic unit) during the storage time. These results conducted us to test HS with the specific aim to exacerbate microbial inactivation, as a new nonthermal pasteurisation approach (to achieve at least 5.0 logarithmic reduction in bacterial vegetative pathogens), tentatively called moderate pressure pasteurisation (MPP) by hyperbaric inactivation (HI) [2]. To do so, MPP uses slightly higher pressure, between 125-250 MPa, but still much lower than those employed in high pressure processing (HPP) pasteurisation (usually above 500 MPa), to allow microbial inactivation up to pasteurisation level. After MPP, pressure could be reduced to the levels of HS (below 100 MPa), if subsequent storage is to be carried out by HS or, reduced to atmospheric pressure, if the pasteurised food would be after preserved by storage under conventional RF. This way, MPP and further preservation during storage by HS would occur at naturally variable RT, what is an innovative feature for a pasteurisation and storage process per se. Since the whole process would take place at RT in this case, it would be a quasi-energetically costless process, since energy (in a negligible amount) would be only necessary for the compression phase and not to maintain pressure during the process. So, in this work MPP feasibility as a new nonthermal pasteurisation process was studied to evaluate the microbial inactivation effect of a ready-to-eat fish soup, and subsequently the samples were stored by RF (post-MPP/RF) to evaluate the possible shelf-life extension. For that, the fish soup was pasteurised under MPP at 150-250MPa, up to 24 hours and stored under RF for 21 days.*

MPP (150-250 MPa, 12-24 h) at RT caused a significant reduction of microbial counts, either spoilage or pathogenic microorganisms, of at least 4.0 log CFU/g for total aerobic mesophiles (MPP; 24 h) and Salmonella Senftenberg (MPP; 6 h), while Listeria innocua reduction under MPP (24 h) was 6.9 log CFU/g. Additionally, post-MPP/RF showed microbial development (to above 8.5 log CFU/g), mainly after 21 days. In conclusion, the present work shows for the first time the use of MPP (125-250 MPa) at RT as an interesting methodology for food pasteurisation, followed by preservation storage by RF, resulting in enhanced safety and extended shelf-life. However, further studies will be necessary to understand if MPP could be combined also with HS, being both methodologies quasi-energetically costless.

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HealthyPassion: from Purple Passion Fruit bioprospection to the development of a functional food for asthmatics

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Abstract. *Asthma is a disease with a high socioeconomic impact characterized by the chronic inflammation of the respiratory airways induced by cellular mechanisms that produce increased levels of reactive oxygen species (ROS). The accumulation of these compounds leads to oxidative stress in the airways, which in turn leads to exacerbation of asthma. The intake of exogenous antioxidant compounds through diet has been reported as one of the potential strategies to mitigate the effects of oxidative stress in asthma and existing epidemiological studies have confirmed the correlation between ingestion of polyphenols and lower disease incidence. Oral administration of purple passion fruit (PPF) peel extract, which is rich in antioxidants, has already been demonstrated to reduce several symptoms associated with asthma in a human trial.*

This work aims to take advantage of this potential of PPF and develop a functional food capable of promoting health and well-being in asthmatic patients. The product obtained should meet market trends by using a sustainable production process and capable of being personalized according to consumer needs.

Several green, water-based extraction procedures (solid-liquid extraction, ultrasound-assisted extraction and high hydrostatic pressure extraction) have been screened to based on the phenolic content and antioxidant potential of each fruit fraction. Solid-liquid extraction was selected as the most promising and further optimized through response surface methodology to determine the optimum extraction parameters (temperature, time of extraction and weight-volume ratio). The optimized extracts of peel and seeds were found to be the most promising in terms of antioxidant potential and phenolic content, however all extracts will be further tested for their in vitro anti-inflammatory activity and cyanogenic content.

At the same time, and in order to evaluate the efficacy of the food product that will be developed, a prior metabolic characterization of asthmatic patients is being undertaken using urine and exhaled breath condensate as biofluids. Volatile and non-volatile compounds from several metabolic pathways will be studied in order to establish a metabolic signature of asthma phenotypes.

Innovative Sequentially Combined Processing Technologies to Improve the Quality of Egg Pasteurized Products

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Abstract. Egg is a highly perishable product, being often associated with salmonellosis. Thermal pasteurization (TP) is usually applied to avoid this problem, but this treatment causes changes in eggs' functional properties [1?3]. A possibility to minimize these limitations is the use of pressure pre-treatments to cause sub-lethal damages in microorganisms, thus decreasing their thermal resistance, allowing a subsequent less intense TP [4]. The aim of this study was to evaluate the performance of sub-lethal pressure pre-treatments (50 ? 250 MPa/5 min) followed by a shorter TP (60 °C/1.75 min) on liquid whole egg (LWE), comparing with the commercial TP procedure (60 °C/3.5 min), to assess the effect on inactivation of *Salmonella* Senftenberg 775W and on egg quality properties.

The results showed that, generally, the increment of pressure (50 ? 250 MPa/5 min) alone led to an increase of *S. Senftenberg* 775W inactivation (0.17 ? 2.46 log CFU/mL), but the inactivation pattern (3.35 to at least 6.01 log₁₀ cycles reductions) was even more pronounced when pressure pre-treatments were followed by a shorter TP (60 °C/1.75 min), thus enhancing the thermal inactivation effect. On the other hand, commercial TP caused reductions of at least 4.95 log₁₀ cycles, while the shorter TP led to ? 3.01 log₁₀ cycles decrements. Concerning physicochemical properties, the thermal and pressure treatments caused protein unfolding and aggregation, leading to a decrease in soluble protein content and an increase in LWE's viscosity, being the LWE treated by commercial TP and by the combined treatments the most affected samples, respectively. In addition, foaming capacity of LWE improved with treatments (54 ? 97%), while foaming stability exhibited a decline pattern (decreasing about 17 ? 21%) and overall, commercial TP and combined treatment (at 200 MPa) showed similar foaming properties. Otherwise, the emulsifying activity index diminished (8 ? 24%) with treatments, with the commercial TP causing the greatest reduction. No significant differences were observed between the combined treatment (200 MPa/5 min ? TP) and commercial TP regarding the emulsion stability index.

Therefore, the results open the possibility of using sequentially combined non-lethal pressure pre-treatments, followed by a shorter TP, to enhance inactivation of *S. Senftenberg* 775W and, additionally, maintaining/improving the pasteurized egg functional properties.

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In vitro gastrointestinal digestion-fermentation of coffee for validation of its hypocholesterolemic potential

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Abstract. *Cholesterol is an essential molecule in many biological processes, however, if in excess, it becomes an important risk factor for the development of cardiovascular diseases, one of the major contributors for human mortality. Coffee is a natural source of soluble dietary fibre, including polysaccharides and melanoidins, which have been associated to several health-promoting properties, namely the hypocholesterolemic potential. These soluble fibers are not degraded by human digestive enzymes, thus reaching the colon intact, serving as substrates for the colonic microbiota. The hypocholesterolemic mechanism associated to these compounds is thought to be mainly due to their bile salt sequestration capacity and/or the effect of their fermentation products, the short chain fatty acids (SCFA) and their ratios. Furthermore, these properties are influenced by polysaccharides and melanoidins structural features and total content, which in turn is highly dependent on coffee processing parameters, such as the degree of roasting and the grinding level. This work aims to explore the effect of coffee dietary fiber on cholesterol bioaccessibility, using an in vitro gastrointestinal model to simulate physiological conditions, and to study the impact of these fibers on bacterial population growth, as well as the identification of the SCFA released upon microbial fermentation. The results obtained until now showed that light and medium roasted-fine brews were more effective in decreasing cholesterol (42 and 43%) than dark (30%). No significant differences were observed for the coarser grinding, in any degree of roasting. Polysaccharides and melanoidins rich fractions obtained from dark-coarse coffee had a higher hypocholesterolemic activity, with the last presenting the greatest activity. The different efficiencies observed between distinct roasting degrees can be attributed to the structural changes that these compounds suffer upon roasting, namely on their degree of polymerization and branching, which usually decreases with roasting.*

Increasing of the value of European brown macroalgae through its application as food ingredients in functional foods

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Abstract. *Brown macroalgae have been recognized as a rich and balanced source of nutrients and under-exploited health-promoting compounds, among which phlorotannins (PTs), fucoxanthin (Fx), laminarans, fucoidans and alginates are claimed to exert promising bioactivities, including antioxidant and immunomodulatory effects. Such properties make these compounds attractive for the development of added-value functional foods, although it is imperative to establish the scientific basis for their sustainable extraction. In this context, the present work aimed to obtain economically-affordable extracts rich in those specific target compounds from two European brown macroalgae Laminaria digitata and Fucus vesiculosus to be potentially used as food ingredients in food formulations.*

To achieve this, a holistic extraction methodology was developed and optimized for both macroalgae species. Briefly, it was first performed an extraction either with cold water or hydroethanolic mixtures (96% and 70%) to recover phlorotannins and fucoxanthin. Following that, both macroalgae residues were extracted with hot water to recover water-soluble polysaccharides, followed by precipitation with 2% CaCl₂ to recover alginates. In F. vesiculosus, it was possible with cold water to recover soluble phlorotannins (0.2%), as well as mannitol (5%) and branched laminarans (1.1%). Sequential re-extraction with 70% EtOH showed that F. vesiculosus can be used as a source of fucoxanthin. Also, it was observed that Fucus-hot water extracts contained mainly fucoidans which presence of laminarans depended mainly on the algae solvent pre-extraction. In L. digitata, it was found that the recovery of phlorotannins with ethanol was approximately 75% higher than those from F. vesiculosus in the same conditions, while almost no fucoxanthin was detected. In addition, to increase alginates recovery from both macroalgae, a commonly industrial alginates extraction procedure was applied to the algae extraction residues. The results revealed that L. digitata (17%) is indeed a better source of alginates comparatively to F. vesiculosus (6 ? 9%). Overall, it was possible with this work to develop a simple and environmental-friendly holistic extraction procedure which allowed to obtain affordable algae food-grade extracts rich in target compounds with bioactive potential that can be applied in the next steps as ingredients in food products.

The study of pine nut skin potential as a functional food ingredient

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Abstract. *Pine nut skin (PNS) is a by-product with an annual volume of approximately 550 metric tons worldwide [1]. PNS is easily recovered at the nut processing mill and has low moisture content and low density, reducing the costs associated with drying, transportation, and storage. Although nut skins have been demonstrated as valuable sources of phytochemicals with health beneficial effects [2,3], pine nut skin composition is not yet established. The skins have potential as inexpensive sources of bioactive compounds which, along with the growing interest for functional ingredients and the demand for the utilisation of low-cost wastes and by-products, justify their interest. Within this work, pine nut skin bioactive potential was studied, aiming to propose it as a functional food ingredient.*

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Use of emerging processing technologies to functionally modulate biodegradable films and coatings

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Abstract. *Thermoplastics became essential in our everyday life and, despite synthetic non-biodegradable polymers have several advantages like the low prices and easy industrial processing, they represent a threat to world sustainability as they produce enormous amounts of non-biodegradable wastes. For that reason, several strategies have been used to develop biodegradable packages, mainly those from biodegradable biopolymers, such as starch. Starch is an important biopolymer since it is a renewable source, low price (can be extracted from industrial by-products) and widely available. Moreover, several studies revealed that starch-based films and coatings are suitable to substitute non-biodegradable packages and films, as they are odourless, colourless, provide an aesthetic appearance, can act as antioxidant and antimicrobial carriers and are edible. Notwithstanding, these films can present some challenges like high hydrophilicity and retrogradation. Therefore, this PhD work aims to explore novel structure/function relationships of starch using emergent technologies like high pressure (HPP), ultrasounds, and pulsed electric fields combined with pullulanase incubation. At this point, HPP from 350 to 500 MPa during 5-15 min was used as starch pre-treatment combined with pullulanase incubation during 30-165 min. The developed films were compared with no-treated ones in terms of mechanical characteristics (elongation at break, tensile strength, Young's modulus), hydrophobicity, colour, moisture, water solubility and using FTIR and SEM. Results show that all films treated with pressure combined with enzyme are transparent, have higher tensile strength and lower elongation at break and hydrophobicity than control, regardless of the pressure/time and incubation time. Films treated only with pressure have higher elongation at break and higher hydrophobicity than all films studied. Moreover, SEM analyses clearly shows that films microstructure is modified with enzyme incubation, pressure or the combination of both. It can be concluded that starch pre-treatments are successful to modify starch based films and can be used to achieve films with better characteristics.*

Political science

Lost in translation? Think tanks beyond the West – the case of Western Balkans

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Abstract. *There is growing interest in studying think tanks in contexts beyond the West. However, this begs the question of whether existing models and theorisations of think tanks fully translate to new environments, and to what extent these new experiences require rethinking the existing understanding of think tanks. This article describes the think tank phenomenon in the context of the Western Balkans, a region where they mushroomed after the dissolution of Yugoslavia. It examines the organisational capacity of think tanks in the region, based on an original data collection survey of 68 Western Balkans think tanks, assessing to what extent existing models capture their reality. Our results show that over half of the think tanks in the region are close to the archetypical model from literature, although some operate in a rather hybrid form, performing additional functions aside from research. The think tank market in the region is also principally donor driven and foreign funders prevail. Finally, we find that stronger organisational capacity increases the chances of think tanks being perceived as influential.*

European Radical Left Parties: Programmatic Evolution since the Fall of the Berlin Wall (1990–2019)

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Abstract. *The 2008 economic crisis brought renewed academic attention to European radical left parties (RLPs). However, their programmatic development has remained largely unexplored. Using empirical data from party manifestos, this study examines the evolution of their programmatic positions and salience across four policy dimensions ? socio-economic, socio-cultural, EU integration and foreign policy ? and several specific policy issues. The results suggest that RLPs have undergone two periods of substantial transformation: during the fall of Eastern Communism (1989?91) and, more recently, in the 2010s. Contrary to expectations, no evidence of a de-radicalisation of RLPs over the past 30 years is found. However, there is evidence of an increasing importance of socio-economic issues in their programmes (e.g. welfare, labour, market regulation), greater attention to the emergence of new issues (e.g. environment, anti-growth) and a strategic adaptation, for example, on European integration.*

The Radical Left in Latin America: Early Impressions from the Brazilian Socialism and Liberty Party and the Chilean Communist Party transnational ties

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Abstract. *The wave that led a set of leftist parties to government throughout Latin America during the first decade of the 2000s rekindled the interest in the study of the Latin American Left. One of the trends that emerged in the literature has been to categorise the new left that enjoyed this wave of electoral success into two separate groups: centre/social-democratic left and radical left. We argue that these categorisations are flawed as they fail to provide an overview of the groups of parties that compose this new left for three reasons: (1) they draw on circumstantial criteria such as perceived policy output to judge on a party's ideology; (2) they tend to focus exclusively on governments instead of political parties ignoring hence the ideological diversity within incumbent party coalitions; (3) ignore a set of leftist political parties that despite not having reached government have maintained regular parliamentary representation. We aim to contribute to the study of the Latin American Left by approaching its categorisation from a different angle. We draw on expert and elite surveys and, complementarily, on the study of parties' transnational affiliations and interactions with their counterparts in other countries in order to identify what parties may fit the Radical Left in Latin America. In this presentation, we focus on the latter approach and provide an overview and analysis of the network of transnational interactions of two of the selected cases: the Brazilian party Socialism and Liberty (PSOL) and the Chilean Communist Party.*

Europarties – dynamics and their positions on strengthening European democracy: the case of the Spitzenkandidaten and Transnational Lists

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Abstract. *The lack of real supranational political competition is a cause of the democratic deficit in the European Union (EU). Certain processes aimed at mitigating these effects were promoted by the EU such as the introduction of Spitzenkandidaten (SK) and the possibility of creating Transnational Lists (LT) for European Parliament (EP) elections. These processes would be accompanied by a strengthening of the role of the Europarties as the only transnational federations able to mobilise their national members in decisions taken beyond the EP. Thus, the Europarties would be able to promote transnational candidates for the European institutions. However, the multiplicity of actors from different national parties on these transnational federations may impact the intraparty dynamics of the Europarties such as factions with different objectives and different ideological positions. The aim of this research is to analyse what effects can intra-party dynamics - such as organization and ideology - generate on achieving a common position around EU institutional processes such as the SK and LT. The focus on Europarties is justified for two reasons: because of their increased political legitimacy through these processes, and they facilitate the information sharing of national parties at the supranational level. By employing a primarily qualitative method of content-analysis followed by the use of semi-structured interviews and online surveys, the results of the impact of these dynamics can suggest whether the position of European actors on the EU's democratic deficit coping mechanisms is primarily reflected in their internal party structure.*

Should I Stay or Should I Go: The interaction between corruption and personality traits in migration.

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Abstract. *Corruption is one of the greatest challenges to democracy and stands out as one of the main concerns of citizens. Previous research suggests that, besides social, economic and demographic factors, individual factors and political-institutional conditions (e.g., political stability) are among the push factors of international voluntary migration. Empirical research has applied mostly an aggregate perspective to test the relationship between corruption and migration and has found that corruption is associated with high levels of emigration (Clausen et al., 2011; Popware, 2015; Dimant et al., 2013; Schineider, 2015; Auer et al., 2020). In this study, we argue that different types of corruption can impact the migration decision when the acceptance/tolerance levels vary with diverse forms of corruption (Merkle et al., 2017; De Sousa & Triães, 2008). We also argue that personality traits (i.e., individual factors) play an important role in the corruption-migration link (Kley, 2017; Williams et al., 2017). From this individual-factor perspective and applying a mixed-method (experimental and interviews) we test how and to which extent the personality traits impact the corruption-migration link and how being exposed to different forms of corruption can impact the migration intention.*

The Politicisation of the European Union: preliminary results

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Abstract. *It is often stated by politicians, journalist, and political scientists that the European Union (EU) has become politicised, i.e., that EU decision-making has been transposed from the realm of political elites into the sphere of mass politics and public debates. Extant literature grounds this process in each country's domestic public sphere, as European issues become more salient for both public opinion and interparty competition. However, the study of EU politicisation as it unfolds at the level of the EU's institutions has been neglected by the literature. This communication seeks to present the preliminary results of a Ph.D research project that analysis how the national dynamics of politicisation translate into the European Parliament (EP). By applying automated methods of text analysis ? specifically unsupervised scaling (Wordfish) ? to the EP plenary debates, this project provides a longitudinal map of the politicisation of the EU. This innovative method of text analysis can process large amounts of textual data to estimate party positions on relevant political issues.*

A Co-governança em rede contribui para a regulação da utilização de dados pessoais digitais para fins políticos? – a perceção dos stakeholders na Europa

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Abstract. *Nas últimas décadas, as plataformas multinacionais como a Alphabet-Google, a Amazon, o Facebook, a Apple, e a Microsoft (GAFAM), tornaram-se maiores e mais poderosas do que os Estados-nação, mas, ao contrário dos Estados-nação, muitas vezes não são responsabilizados perante ninguém a não ser perante eles próprios (Morgan, 2006). A sociedade tornou-se Plataformizada (J. Van Dijck, Poell, & Waal, 2018) A Teoria da Governança pode ajudar a compreender como o poder e a política nas (e em torno das) empresas multinacionais exige abordagens conceptuais e empíricas capazes de lidar com o seu carácter transnacional, com a sua ação inserida em múltiplos ambientes institucionais, com hierarquias que ligam sedes e filiais distantes e envolvem numerosos atores com interesses diversos e com diferentes contextos de relações industriais (Leonard, Pulignano, Lamare, & Edwards, 2014 & Edwards, 2014). Partindo de um modelo de cogovernança em rede, o presente trabalho propõe-se a desenvolver uma proposta de modelo de gestão do bem público, que as transações que ocorrem nestas plataformas potencialmente representam, a fim de regular a utilização dos dados pessoais pelas plataformas digitais na Europa para fins políticos.*

Causas e consequências das migrações e desafios à política migratória em Angola

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Abstract. *Nesta tese analisam-se os fluxos migratórios numa dinâmica de interação com a política migratória de Angola a fim de, por um lado, para se aferir até que ponto os fluxos migratórios determinaram a criação de uma política migratória, por outro, compreender as causas e consequências das migrações e os desafios para política migratória Nacional. Para atingir os objetivos a que se propõe com a investigação faremos recurso à metodologia mista (qualitativa e quantitativa). O estudo será realizado em Luanda- capital de Angola.*

Marine science, technology and management

HRM Practices and Performance: Conceptualization and Identification of HRM Practices that Lead to High Performance in Higher Educational Institutes of Portugal.?

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Abstract. *Human resource practices play an important role in any organization for its development and efficiency in operations, for the same reason, Human Resource Management (HRM) has increasingly gained paramount significance in every industry. Every progressive organization prepares its Human resource (HR) policy to provide detailed guidelines regarding every aspect to employees in order to boost their confidence and professional security at workplace. The main problem statement for this research study is to identify what are the main HR practices that will enhance the performance of employees working in higher educational institutions of Portugal. The study is based on primary data analysis and sample of the study will be ten higher educational institutions of Portugal. The results of the study will be mentioned using descriptive analysis and will provide detailed description of attributes of HRM practices that enhances the performance of higher educational institutions of Portugal.*

Biomass and metabolome changes in *Salicornia ramosissima* inoculated with plant growth-promoting bacteria

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Abstract. *Salicornia ramosissima* is often considered the most promising candidate for extensive saline agriculture practices. However, strategies to enhance crop production and improve both nutritional and commercial value represent immediate challenges to the sustainability of the cultivation of this halophyte.

The root microbiome of *S. ramosissima* is a valuable source of plant growth-promoting bacteria (PGPB). Thus, in this work, *S. ramosissima* seeds were inoculated with three bacterial strains (*Brevibacterium casei* EB3, *Pseudomonas oryzae* RL18 and *Bacillus aryabhattai* SP20) isolated from the roots of wild *S. ramosissima* (rhizosphere and endosphere). Non-inoculated seeds were used as negative control. Before reaching the flowering stage, fresh and dry weight of aerial parts was determined, and selected plants were analyzed by GC-TOF-MS for primary metabolite profiling. The secondary metabolite profile was characterized by GC-MS and HPLC-MS analysis. The microbial communities associated with the plants were characterized by Next-Generation sequencing of hypervariable V3V4 region of 16S rDNA gene.

Inoculation treatments with EB3 and RL18 resulted in significantly higher biomass production compared to the control. Bacterial inoculation also impacted the plant primary metabolome, with a significant increase in the levels of several amino acids and glycerol-3-phosphate. The detection of sequences identified as the inoculated bacteria in the rhizosphere and endosphere of the inoculated plants proved the inoculation efficiency. These results sustain promising prospects for the use of PGPB as biostimulants to modulate the phytochemical profile of the plant, while reducing the operational costs of agrochemicals, thus contributing to the sustainability and cost-effectiveness of saline agriculture.

The use of endogenous insects to promote a more sustainable shrimp aquaculture

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Abstract. *Aquaculture is a growing and efficient food production system in line with the Blue Growth strategy. However, worldwide, aquaculture industries rely on wild fisheries as a source of fish meal and fish oil to meet nutritional requirements of several marine species (mainly in protein and long-chain omega-3 polyunsaturated fatty acids), contributing to the collapse of fisheries stocks. Alternative plant origin, and terrestrial insect meal ingredients are not able to meet these nutritional needs and have several environmental and economic costs.*

*Evidence shows that costal and marine insects, due to their feeding habits, present a nutritional composition richer in omega-3, being potentially good candidates to feed marine species. This project is investigating this by testing endemic costal insect species regarding their nutritional composition, such as the fly *Fucellia maritima*, which has PUFA in its composition and developed rearing methodologies which can be readily used to produce adequate aquafeeds and contribute to ensure food security through native insect biodiversity.*

MODELING THE PHYSICAL PROCESSES THAT UNDERLIE HARMFUL ALGAL BLOOMS IN NORTH-WESTERN IBERIAN SHELF AND RIAS BAIXAS

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Abstract. North-Western (NW) Iberian shelf is a coastal upwelling region with a recurrent annual presence of Harmful Algal Blooms (HAB) of *Dinophysis acuminata* and *acuta*. These organisms are responsible for diarrhetic shellfish poisoning (DSP) outbreaks. Different physical mechanisms have been suggested to explain the presence of HAB at the northern Portuguese coast and Galician Rias Baixas. Some authors support that the inner-shelf transport of already established offshore populations is enough to account for the increase of HAB densities after upwelling relaxation and downwelling. Others consider that only the hypothesis of an alongshore transport of allochthonous populations by inshore currents can explain sudden outbreaks of HAB on the coast. There is evidence that both hypotheses can occur and that there are blooms with epicenters in the Portuguese coast that can reach the Galician Rias Baixas and viceversa. A two-way nesting configuration of CROCO, a 3-D hydrodynamic ocean model, was run to obtain a high-resolution configuration forced with realistic forcings. These outputs were implemented as forcings to run a lagrangian model, Connectivity Modeling System (CMS), which was used to study the alongshore transport of particles representative of *Dinophysis acuta* cells at the NW Iberian shelf. Two years, 2015 and 2017, which had different meteorological conditions were selected to analyze the advection mechanisms. In 2015 there were more frequent and longer periods of southerly winds (downwelling events), which promoted the northward transport of these particles, whilst in 2017 less frequent and shorter periods with southerly winds diffculted the transport to the Galician Rias Baixas. The spatial and temporal patterns of 25-year time series of weekly counting cell data of *Dinophysis acuminata* [\log_{10} cells/L] was analyzed through the computation of Empirical Orthogonal Functions (EOF). Three first EOF modes explained 68.35%, 6.18%, and 4.74% of the total variance respectively, summing up to 79.27%. The first spatial had a similar pattern to the spatial average. The second spatial EOF showed a latitudinal pattern with a southerly gradient from Ría de Arousa to Ría de Vigo and the third spatial EOF was alike to the first spatial EOF. Linear correlations between the three first temporal modes and some meteorological and oceanographic variables showed the influence of these meteorological variables and zonal wind component, having higher correlation with the first mode, whilst the second mode correlated with the occurrence of downwelling/upwelling events and the third mode correlated with the variables that influenced the first two modes. As a final application, a basic forecast system will be build using Artificial Neural Network (ANN) to predict the presence of *Dinophysis acuminata*.

Language sciences

A articulação entre a competência metalinguística e o domínio da escrita argumentativa: um estudo de caso a partir de uma abordagem reflexiva de ensino

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Abstract. *Um dos principais desafios do ensino de Português na escolaridade obrigatória refere-se à competência da escrita, área em que os alunos têm revelado níveis pouco satisfatórios (Cardoso et al., 2018). Uma das hipóteses para este insucesso poderá ser a falta de articulação entre os conhecimentos linguísticos e a escrita efetiva de textos (Costa, 2010). A necessidade de articulação torna-se ainda mais premente quando a complexidade dos textos - como os argumentativos, no ensino secundário - assim o exige. Neste contexto, implementaremos um estudo de caso no âmbito do qual conceberemos um dispositivo de organização de ensino/aprendizagem adaptado às fragilidades linguísticas verificadas em produções textuais do género Texto de Opinião (em contexto escolar) em turmas do ensino secundário. Buscaremos desenvolver uma proposta com foco nas características e propriedades linguísticas do género, baseada numa abordagem reflexiva do ensino de gramática como produtora de sentido para a qualificação da comunicação/produção escrita dos alunos.*

Efeitos de um Programa de Intervenção em Sintaxe nas Perturbações da Linguagem: um estudo randomizado controlado

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Abstract. *O principal objetivo deste estudo reside em determinar os efeitos do PROsyntax ? programa de intervenção no domínio sintático, em crianças com perturbações de linguagem com afeção do domínio sintático (crianças com Perturbação do Desenvolvimento da Linguagem e crianças com Perturbação do Espectro do Autismo). O estudo será realizado com crianças com idades compreendidas entre os 3 e os 6 anos, através de um estudo randomizado controlado com follow-up, onde se constituirão 4 grupos (2 grupos de controlo e 2 grupos experimentais). Os resultados obtidos serão uma mais-valia para a comunidade científica, contribuindo para uma prática baseada na evidência, com impacto direto e indireto a nível académico, emocional e social de crianças com perturbações de linguagem.*

Análise contrastiva dos atos de fala em português e espanhol europeus

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Abstract. *Enquanto aprendente de espanhol e mais recentemente professora de português como língua estrangeira, apercebi-me de que apesar de países geograficamente muito próximos, Portugal e Espanha diferem consideravelmente nas suas normas socioculturais, que, por sua vez, exercem uma extraordinária influência sobre o comportamento verbal. Acreditando nas palavras de Chomsky (2006), de que a língua é um produto da cultura, decidi realizar um estudo que se insere nos campos da pragmática intercultural e da pragmática da interlíngua, com o principal objetivo de contrastar padrões de produção de quatro atos de fala ? pedidos, pedidos de desculpa, recusas e expressões de agradecimento ? por falantes nativos de português e espanhol e falantes não nativos de português que têm o espanhol como língua nativa. Esperamos identificar as principais semelhanças e diferenças na realização dos atos de fala e expressão de cortesia verbal dos dois grupos de falantes nativos; observar se a língua nativa influencia a seleção de estratégias e formas linguísticas de aprendentes espanhóis de português na produção dos atos de fala; e analisar se o nível de competência linguística dos aprendentes afeta positivamente o seu nível de competência pragmática.*

A fim de recolhermos os dados para a análise contrastiva, recorremos a uma metodologia desenvolvida por Blum-Kulka, House e Kasper (1989), o Discourse Completion Test. Elaborámos na plataforma Google Forms dois questionários em português e espanhol para complementar o discurso constituídos por vinte diálogos que representam situações socialmente variadas. Após a condução de um estudo piloto, recolhemos questionários de falantes nativos de português, estudantes da Universidade de Aveiro, assim como de falantes nativos de espanhol, das Universidades de Valladolid, Salamanca e Granada. O próximo ano letivo será dedicado ao levantamento de questionários de aprendentes espanhóis de português, de forma a prosseguirmos para o tratamento quantitativo e qualitativo dos dados recolhidos.

Desde uma perspetiva aplicada, pretendemos com os dados obtidos melhorar a comunicação intercultural entre falantes de português e espanhol e facilitar a produção de materiais e manuais didáticos culturalmente mais específicos. Por fim, desde o ponto de vista científico, consideramos esta contribuição necessária e relevante para o campo da pragmática, devido à escassez de estudos pragmáticos interculturais nos quais o português é uma das línguas em contraste, bem como de estudos centrados em aspetos pragmáticos da interlíngua desenvolvida por falantes não nativos de português.

Effects of Pragmatic Intervention Programme in Language Impairment: Preliminary Results

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Abstract. Pragmatic language is often impaired in preschool-age children with Autism Spectrum Disorder (ASD) and Developmental Language Disorder (DLD). The international literature reports several programs that can be used to improve these skills but research findings on the effects of pragmatic interventions attending preschool-age children, especially with DLD, are scarce. In Portugal, the Pragmatic Intervention Programme was recently developed, and content validated but its effects are unknown. In accordance, this study aims to determine the effects of the Pragmatic Intervention Programme (PICP) on preschool-age children ($n=28$) with ASD or DLD with pragmatic impairments. A non-randomized controlled trial with follow-up has been conducted. Each child received 24 intervention sessions in kindergarten. The sessions were freely given biweekly, for one hour, by one Speech and Language Therapist (first author) with deep-in knowledge about the programme content, implementation, and previous clinical practice providing intervention to children with pragmatic impairments in educational settings. The primary outcome measure was a Goal Attainment Scale (GAS). Secondary outcomes include parent/teacher-reported communication skills and an assessment of the child's general language ability. GAS results show that all children in the experimental group made progress. A trend in favor of the experimental group was observed for secondary outcomes but the results were not statistically significant. The main findings suggest that the PICP may improve language use in preschool-age children with ASD and DLD with pragmatic difficulties, but further research is needed.

Colocações na escrita académica e transferências da L1 e da L2 para L3 na aprendizagem do FLE por falantes de português

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Abstract. *Este estudo objetiva investigar o fenómeno de transferências das L1 e L2 para o francês L3 nas produções escritas de um público lusófono universitário de nível B1. A escolha de focalizar nossa investigação nas colocações justifica-se pelo fato de que a compreensão e, particularmente, o emprego dessas expressões polilexicais pressupõem uma dimensão altamente cultural que vai além da questão de nível na língua adicional. Três modelos teóricos tentam explicar o fenómeno de transferências: o papel predominante da L1 defendido por Hermas (2012), o fator L2 apoiado por Falk & Bardel (2011), e a tese sustentada com algumas nuances por Flynn et al. (2004), Rothman (2010), Slabakova (2017) e Westergaard et al. (2017) segundo a qual todas as línguas previamente aprendidas podem resultar de uma transferência positiva ou negativa para a L3. A recolha e a análise de dados nos permitirão observar qual/quais modelo(s) de transferências se verificará(ão) nos resultados obtidos.*

Palavras-chave: Transferências; Francês L3; colocações; modelos teóricos de transferências

Textual Genres in Basic Education Manuals in Mozambique: cultural issues and the development of linguistic and communicative competences

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Abstract. *A presente tese visa refletir sobre o contributo dos géneros textuais, entidades socioculturalmente construídas, no ensino de português. Interessa-nos, particularmente, analisar os géneros que constam nos manuais de Língua Portuguesa (LP) do Ensino Básico (EB) em Moçambique, as questões culturais que veiculam e as propostas de atividades. A pesquisa alinha-se no pressuposto de que os textos usados em LP devem possuir conteúdos associados às questões culturais do público escolar bem como os manuais devem estar ajustados aos documentos reguladores. Idealmente, os manuais não deverão apresentar desalinhamentos: i) entre os géneros textuais e as atividades; ii) entre os géneros mais representados e os propósitos definidos pelo ME/PCEB. O nosso estudo procurará fornecer pistas para compreender a adequação linguístico-cultural dos géneros nos manuais do EB. Além disso, incorporará os agentes educativos e professores para a perceção sobre a qualidade e a adequação dos manuais escolares definidos, com especial foco nos géneros textuais.*

Lexical Renewal in Mozambican Portuguese: A Contrastive Analysis of Mozambican Portuguese and European Portuguese compounds

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Abstract. *A presente tese dedica-se ao estudo do léxico do Português de Moçambique (PM), numa abordagem contrastiva com o léxico do Português Europeu (PE). O que nos leva a trabalhar na renovação lexical é o fato de a língua portuguesa em Moçambique (um país multilíngue e multicultural) sofrer influências das línguas bantu, por estas serem as línguas usadas por grande parte da população moçambicana no seu dia-a-dia. Assim, o objetivo é identificar, a partir da consulta de diferentes bases de dados, os compostos neológicos do PM em contraste com os do PE, descrevendo-os aos níveis morfológicos e sintático-semântico e relacionando a sua caracterização com questões socioculturais dos países em questão. Os corpora do nosso estudo, que serão constituídos por ocorrências de compostos neológicos do PM e do PE, serão selecionados a partir da consulta do caderno de pesquisa número 2 de Neologismos de Moçambique das Cátedras de Português Língua Segunda e Estrangeira, para o PM, e produções neológicas que ocorrem no Português de Portugal, através de consulta da base do Observatório de Neologia do Português (OBNP), projeto do Centro de Linguística da Universidade Nova de Lisboa. Os resultados obtidos neste estudo constituirão uma mais-valia para o enraizamento e autoafirmação do PM em Moçambique e para a consolidação do conhecimento das estruturas lexicais das diversas variantes do português.*

Rehabilitation sciences

Cut-off of the 1-minute sit-to-stand test to detect functional impairment in people with COPD

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Abstract. *Functional status is an important predictor of acute exacerbations, healthcare utilisation and mortality in chronic obstructive pulmonary disease (COPD). Early detection of functional impairment is fundamental to plan the most suitable treatments and prevent health decline in this population. The 6-minute walk test (6MWT) is a commonly used measure to assess functional status of people with COPD. However, it requires a 30-meter hallway and might be time-consuming for routine clinical practice. Other office-based simple measures, such as the 1-minute sit-to-stand test (1-min STS), might be useful as a first screening tool. This study aimed to explore the predictive ability of the 1-min STS in discriminating people with COPD with or without functional impairment based on the 6MWT. Methods: People with COPD were recruited through medical doctors, from routine appointments at hospitals and primary care centres. Socio-demographic, anthropometric and general clinical data were collected to characterise the sample. Functional status was assessed with the 6MWT and 1-min STS. A receiver operating characteristics (ROC) curve analysis was performed. The threshold for the 1-min STS to identify functional impairment was determined based on four different and commonly used cut-offs of the 6MWT (<300, <350, <400 and <450 m). Predictive performance of the 1-min STS for the cut-offs of the 6MWT was assessed by the area under the curve (AUC). Results: 135 stable people with COPD were included (68.1 ± 7.8 years, 80.7% male, FEV1 56.6 ± 19.4 % predicted). Except for the <450 m cut-off of the 6MWT, all other cut-offs detected 19.5 repetitions as the optimal cut-off for the 1-min STS. Excellent discrimination was found for all cut-offs of the 6MWT (AUCs=0.812-0.901). The 1min-STS best predicted functional impairment based on the <300 m cut-off, yielding an outstanding discrimination (AUC=0.901; 95%CI: 0.84-0.96) with 86% specificity and 83% sensitivity. The cut-off of 20 repetitions was superior to 19 repetitions in terms of a balanced specificity (86% vs 77%) and sensitivity (83% vs 86%). People with less than 20 repetitions had higher index of comorbidities (p=0.002), higher levels of activity-related dyspnoea (p=0.005), worse impact of the disease (p=0.004) and health-related quality of life (p=0.02), were less physically active (p=0.03), and had worse functional status (p<0.001) than those with 20 or more repetitions in the 1-min STS. Conclusion: A cut-off of 19.5 repetitions in the 1-min STS discriminates accurately people with COPD with a functional impairment. Future studies could externally validate our treatable trait candidate and investigate its utility in predicting other meaningful outcomes.*

ASSISTANCE FOR PEOPLE WITH STROKE IN ANGOLA

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Abstract. *Background:* According to the World Health Organization, 15 million people have a stroke per year; mainly, which represents a global health problem, with an increasing burden in developing countries. Alongside the increase in the incidence of stroke, these countries propose the intervention point of view. In Angola, the current epidemiological data of the country are scarce, as well as an epidemiological characterization of the reality.

Objectives: This project has two main objectives, specifically designated, to characterize health care for people with stroke in the national health system of Angola and to implement an early prevention program for people with stroke and to assess its impact on functionality and quality of life.

Methods: Two different methods will be chosen. The exploratory, descriptive, and longitudinal study (S1) to characterize health care for people with stroke, housed in 2 hospitals in Luanda; the quasi-experimental and longitudinal study (S2) concerning the implementation and evaluation of an early intervention program aimed at a stroke patient. Ethical and deontological principles for an investigation will be proposed.

Results: Contributor to the knowledge of the reality of providing care to the person after a stroke, in Angola; Propose and implement an early action program; Contribute to influence policy makers on the need for assistance with stroke, aiming at their functional, family and social rehabilitation, particularly in the labor market.

Key words: Stroke; Functional recovery; Quality of life; Health policies, Healthcare

Chronic Low Back Pain and Cognitive Function: Association and Impact on Rehabilitation Outcomes

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Abstract. *Chronic low back pain (cLBP) is one of the most common musculoskeletal diseases worldwide and is also associated with high levels of disability. An association between cognitive function and chronic pain has been suggested, as pain processing and neural systems involved in cognition are related. However, a systematic investigation of this association in individuals with cLBP has not been conducted. Therefore, the aims of this project are to characterize the association between idiopathic cLBP and cognitive function in those individuals, and to assess the effectiveness of exercise and pain neuroscience education combined with cognitive training in adults with idiopathic cLBP.*

The first study of this project consisted of a systematic review with meta-analysis on the association between cLBP and cognitive function. Ten observational studies were included, and four meta-analyses were conducted for different cognitive domains: problem-solving, speed of information processing, working memory and delayed memory. Very low-quality evidence suggests that individuals with cLBP have impaired cognitive function when compared to asymptomatic individuals. The findings of this study were used to inform the design of an observational and longitudinal study aiming to compare cognitive function in individuals with cLBP and asymptomatic individuals for a three-month period. This study was designed to minimize some of the methodological flaws found in previous studies. All participants will be assessed for pain characteristics including pain intensity, pain phenotype, disability, fear of movement and catastrophizing. Participants will also be assessed for cognitive function using a self-administered computerized test that includes different domains of cognitive function. This study will start as soon as Ethical approval is granted. Meanwhile, the design of the protocol for a 3rd study, a randomized clinical trial, is also underway. It aims to explore the added benefit of cognitive training in the rehabilitation of patients with cLBP.

These studies may further elucidate on the association between cLBP characteristics and cognitive function and provide recommendations for the assessment and management of patients with LBP in the future.

Keywords: chronic pain, cognitive function, low back pain, cognition.

PICK UP ? Personalised Community-based Physical activities for patients with chronic obstructive pulmonary disease

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Abstract. *How to measure free-living physical activities-related intensity in people with COPD? Results from a systematic review*

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People with chronic obstructive pulmonary disease (COPD) are less physically active than their healthy peers. Several studies have emerged to tackle physical inactivity in this population, nevertheless, their results are inconsistent, in part, due to the incompleteness of the description of PA-related intensity. Measuring PAs-related intensity is mandatory to ensure people with COPD meet PA guidelines, whilst guaranteeing their safety. Several tools and outcome measures have been proposed to quantify PAs intensity, however, the use of different methodologies may result in different estimates of PAs intensity, hindering accurate PA interpretation and prescription. Thus, we conducted a systematic review to identify which outcomes, outcome measures and instruments have been used to measure single free-living PAs-related intensity in people with COPD. Additionally, we explored the agreement between the intensity levels yielded by different outcome measures.

*A systematic literature search was conducted on PubMed, Scopus, Web of Science, Cochrane Library and EBSCO. We included original studies with people with COPD, assessing and reporting single free-living PAs-related intensity (single PAs, that pertained to leisure, occupation, home or transport domains, and were performed at participants' own pace within a restricted period of time). We used the following formula: number of agreements between two measures [same intensity level]/ number of comparisons using both measures*100, to establish agreement between the different outcome measures.*

This systematic review included 43 studies, with a total of 1282 people with COPD (66 years, 65% men, 49%FEV1%pred). Thirteen outcomes, 46 outcomes measures and 22 instruments have been used to assess single free-living PAs-related intensity in COPD. Among them, the Borg score to measure dyspnoea perception through the Borg 0-10 scale, were the most frequently reported; followed by heart rate to measure cardiac function, using heart rate monitors, and VO₂ to assess pulmonary gas exchange using portable gas analysers. Percentages of agreement between the different outcome measures varied greatly (0% in the case of %VO₂peak vs. METs; %HRpeak vs. Fatigue Borg; METs vs. walking speed; to 100% for %HRreserve vs. dyspnoea Borg; fatigue and exertion Borg vs. walking speed). The highest intensity level was consistently generated by VO₂ measures (peak and reserve).

A wide variety of methodologies to measure PAs intensity was found. The most used intensity outcome measure was dyspnoea measured with the Borg. Future recommendations on how to accurately measure single free-living PAs-related intensity are pressing needed to ensure patients' safety, optimise PA-based interventions and ascertain that people with COPD fulfil PA guidelines.

Unsupervised physical activity interventions for people with COPD ? are they effective? Results from a systematic review and meta-analysis

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Abstract. *Chronic obstructive pulmonary disease (COPD) is a major individual, social and economic burden worldwide. People with COPD spend most of their time in a sedentary behaviour and present lower levels of physical activity (PA). Physical inactivity has been associated with poor health outcomes in people with COPD, being an independent risk factor for hospitalisations due to acute exacerbations and early mortality. Improving PA is, therefore, fundamental in this population. PA is a non-pharmacological intervention with well-established benefits in people with COPD, however, despite the unequivocal benefits, increase PA in this population is highly challenging. Barriers to engage in PA include, but are not limited to, limited access to PA interventions, time requirements and travel issues. Unsupervised PA interventions might have a role in the management of COPD, addressing barriers to engage in PA, but evidence about their effectiveness is still scarce. Thus, this study aimed to identify and synthesise the effects of unsupervised PA interventions in people with COPD.*

A systematic search was conducted on the Cochrane Library, Pubmed, Scopus, Web of Science and EBSCOhost databases, in April 2020, with weekly updates until September 2021. Randomised controlled trials and quasi-experimental studies comparing unsupervised PA with usual care, were included. Two independent reviewers screened studies, extracted data and assessed the quality of evidence using the Quality Assessment Tool for Quantitative Studies. Inter-rater agreement analysis was assessed using Cohen's kappa to explore the consistency of the quality assessment. The effect direction plot was performed to synthesise results. Meta-analysis with forest plots were conducted for the Chronic Respiratory Disease questionnaire dyspnoea domain (CRQ-D), 6-minute walk distance (6MWD) and incremental shuttle walk distance (ISWD).

Eleven studies assessing 14 outcomes with 44 measurement tools in 900 participants with COPD (68±10 years; 58.8% male, FEV1 63.7±15.8% predicted) were included. Four studies were rated as strong, three as moderate and four as weak quality. Inter-rater agreement was substantial (Cohen's Kappa=0.72; 95% CI=0.37-1.07; p=0.003; percentage of agreement= 82%). All interventions were conducted at home, most with daily sessions, for 8-12 weeks. Walking was the most used component. The effect direction plot showed that unsupervised PA interventions improved emotional function, fatigue, health-related quality of life, muscle strength and symptoms of anxiety and depression. Meta-analysis showed statistical, but not clinical, significant improvements in dyspnoea (CRQ-D, MD=0.12, 95% CI 0.09-0.15) and exercise capacity, measured with 6MWD (MD=13.70, 95% CI 3.58-23.83). Statistical and clinical significant improvements were observed in exercise capacity, measured with ISWD (MD=58.59, 95% CI 5.79-111.39). None to minor adverse events and a high adherence rate were found.

Walking was the most common unsupervised PA intervention in people with COPD. Unsupervised PA interventions are effective in reducing dyspnoea and improving exercise capacity, emotional function, fatigue, health-related quality of life, muscle strength and symptoms of anxiety and depression in this population. Such interventions should be considered for people with COPD who cannot or do not want to engage in supervised PA interventions or as a maintenance strategy of PA levels.

EARLYMOTO | Early mobilization after stroke with MOTOMed®: effects in functional recovery and quality of life during acute and chronic phases

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Abstract.

The main idea of this scientific work is the effects of early mobilization after stroke on functional recovery, with the aim of evaluating the impact of an early intervention to rehabilitate patients with ischemic stroke, using MOTOMed, on the neurological status, functional status, and quality of life of these patients, in HGB.

In the first phase, we studied 80 patients with stroke, who were in the emergency room between December 2021 and February 2022 in a universe of 1562 patients.

The methodology applied in this first phase of the study was observational, descriptive and cross-sectional using the questionnaire used in the hospital. As for the technique of data collection was due to convenience, with priority the patients who entered the BU with schematic stroke. And from this work we conclude the following:

1-That male individuals or came to the emergency room in greater numbers. Most of these patients were hospitalized immediately after observation and computed tomography.

2 - That as for the location of the stroke, most patients according to the CT scan were located in the internal carotid artery.

3 - According to the provenance, the municipality of Lobito had the largest number of stroke patients, and most were military personnel.

4-which the main cause of stroke, and high blood pressure.

5-According to age, the category between 56-74, years of age was more predominant.

6 - Depending on the treatment in the emergency room, Thrombolytic are used in schematic strokes before 4 hours of the beginning.

7 - When patients who go to the emergency room after stroke, reduced the risk of complications.

The second phase the study, will be conducted on the basis of the Department of Neurology in the aforementioned hospital. This prospective study will be open, Longitudinal, controlled and randomized, we will use two (2) study groups in the first group we will make an early mobilization with different sections of exercises of the lower and upper limbs to the patients who will enter the neurosurgery department with ischemic stroke, and in the other group we will work with the patients who will enter the General hospital of Benguela after stroke for the separation of physiotherapies, using the same working instrument with clearly different sections for the patients in the chronic phase, so that in the end we can evaluate the effects of early mobilization after stroke on the functional recovery and quality of life of our patients.

Giving voice to people – experiences during mild to moderate acute exacerbations of COPD

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Abstract. *Giving voice to people ? experiences during mild to moderate acute exacerbations of COPD*

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Background: Acute exacerbations of chronic obstructive pulmonary disease (AECOPD), which are defined as an acute worsening of respiratory symptoms that result in additional therapy, have a negative impact on people's health status and disease progression. Nevertheless, these are heterogeneous events in terms of pathobiological mechanisms, severity and clinical presentation, which leads to different prognoses, management needs and therapeutic strategies. A comprehensive understanding of people's experience during AECOPD is therefore needed to develop person-centred interventions, such as pulmonary rehabilitation (PR). This study aimed to explore people's experience during mild to moderate AECOPD, and their thoughts on PR during this period.

Methods: Short, semi-structured individual interviews were conducted with people with mild to moderate AECOPD treated in the community, within 48h of the diagnosis. Interviews were audio recorded, transcribed and analysed by deductive thematic analysis using the Web Qualitative Data Analysis software. The criteria of credibility, transferability, dependability and confirmability were used to ensure rigor and trustworthiness.

Results: Eleven people with AECOPD (9 male, 67±10 years, FEV1 41±16%predicted) participated. Four themes and seventeen subthemes were identified: impact of AECOPD (symptoms, physiological changes, limitations in activities of daily living, social constraints, psychological and emotional challenges, family disturbances); dealing with AECOPD ([not] depending on others, planning and compensation strategies); main needs during AECOPD (breath better, feel less tired, get rid of sputum, be able to walk); and (un)certainly about PR (lack of knowledge, get better, exercises, design and timing, trust in health professionals).

Conclusion: AECOPD, even when not requiring hospital admission, have a huge negative impact on people's lives. Symptoms were reported as the main feature, thus interventions focusing on symptomatic relief are needed. Further impacts were found on a physical, functional, psychological, emotional, social and family level, highlighting the importance of comprehensive assessments and interdisciplinary PR programmes. People with AECOPD considered PR beneficial but lacked knowledge about the intervention, highlighting the need to raise awareness to PR within this population. This study contributes with a foundation for the development of tailored and meaningful person-centred interventions during AECOPD.

Breastfeeding and Infant and Young Child Feeding Practices of Refugee and Migrant Mothers in Portugal – Easybite Project

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Abstract. *Research challenges: The COVID-19 and the war on Ukraine have halted the progress on achieving the United Nations Sustainable Goals. Especially, breastfeeding as an enabler to ending poverty, promoting economic growth, and reducing inequalities are extremely important in such vulnerable situations. During this last year, this project aimed to analyze the perspective of refugee and migrant mothers allocated in Portugal about breastfeeding and to compare their practices with global available data and those of the native countries.*

Research methods and techniques: A cross-sectional survey was conducted using two questionnaires designed specifically for the purpose of this study. A Sociodemographic questionnaire was created, as well as a Breastfeeding Knowledge, Attitude, and Beliefs, and Behavior questionnaire to gather information regarding baseline breastfeeding knowledge, attitude and beliefs, and behaviour towards breastfeeding since forced migration and refugee status are negatively associated with breastfeeding behaviour. In the first phase of the study, the content of the Breastfeeding questionnaire was validated, by a panel of six experts and calculated the content validity index. In the second phase, the data collection was conducted on refugee and migrant mothers.

Available relevant results: The content validity index was 0,83. A total of 20 mothers responded (mean age = 35,3 (?7,8). 10 (50%) mothers were found to have fair breastfeeding knowledge, 16 (80%) had fair attitudes and beliefs, and 12 (60%) had fair breastfeeding practices.

Current impact: This project's results indicate that universal interventions, regardless of migrant or refugee status, are essential to increase breastfeeding exclusivity rates and continued duration up to two years. The findings will be submitted to a scientific journal.

Keywords: *Sustainable Development Goals (SDG); breastfeeding and complementary feeding; malnutrition; refugees; migrants*

SCIMBIONT – Spinal Cord Injury Rehabilitation: gut dysbiosis and immune biomarkers as functional prognosis tools and new therapeutic targets

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Abstract. *Background and aims: Spinal cord injury (SCI) is a complex and devastating neuropathology with consequences on multiple organs and systems that reduces patient's functionality and quality of life. Among the highly incident complications and comorbidities that greatly impact SCI patients? is neurogenic bowel dysfunction, and potentially gut dysbiosis. This has been correlated to immune and neurological functions and can highly impact the patients? health status.*

Aims: Characterize the microbiome and the gut dysbiosis of a cohort of subacute SCI patients, pre- and post- a comprehensive rehabilitation program, and correlate these with neuromotor and functional recovery.

Methods. An observational longitudinal case-control prospective study is being performed in adult traumatic SCI patients, >T6 level, AIS A?D, enrolled when admitted as inpatients for rehabilitation (early subacute phase). Collection of clinical data and feces samples took place at admission (PM2) and discharge (PM3). Bacterial DNA was extracted from fecal samples and the 16S RNA sequences of the gastrointestinal microbiome determined. Main outcome measures: clinical data (including AIS classification and functional assessments), gut microbiome and neurogenic bowel management.

Results: The microbiota of this cohort is being characterized, and associations studies are being performed between clinical and microbiota data, to improve our understanding on the impact of gut dysbiosis in subacute SCI, namely on these patients? rehabilitation.

Conclusions: The gastrointestinal microbiota of the sub-acute traumatic SCI patients is altered and has deleterious effects. A therapeutic intervention on the gut dysbiosis can be a viable ?non-spinal centric? alternative that increase SCI patients? rehabilitation.

PhAS – Physical Activity and Sedentary Behaviour in Adults with Chronic Stroke

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Abstract. *Summary: Worldwide, stroke is prevalent, costly, and disabling. The World Health Organization, in the most recent guidelines, recommends promoting physical activity (PA) and reducing sedentary behaviour (SB) as a cost-effective and feasible strategy for people with stroke. However, people with stroke are often physically inactive as well as sedentary. So far, levels of PA and SB, assessed by self-reported and accelerometer methods, have not been studied among the Portuguese stroke community. The barriers and facilitators of PA after a stroke episode are also unclear by individuals and their caregivers. Furthermore, there is little evidence on the relationship between PA and SB levels among the stroke population and health outcomes to cover their heterogeneity. High-quality research with sample stratification and long-term follow-up is required.*

Aims: To characterize the PA and SB levels of Portuguese adults with chronic stroke community-dwelling and identify barriers, facilitators, and predictors of PA and SB among them. Also, to quantify the longitudinal changes in PA and SB patterns at 6, 12 and 18 months after a stroke.

Study design and methods: Three studies will be conducted: i) cross-sectional study (n=799); ii) digital qualitative study with online focus groups (n=40, 20 adults with stroke and 20 informal caregivers); iii) prospective cohort study with assessments at 6-, 12- and 18-months post-stroke (n=92). Recruitment will be performed in the community for the first two studies. For the third, recruitment will take place at a hospital. Levels of PA and SB will be assessed by the IPAQ-LF questionnaire and ActiGraph GT9X Link. Other variables include sociodemographic, anthropometric, and clinical data (e.g., fear of falling, severity of fatigue and impact of stroke).

Keywords: Physical Activity; Sedentary Behaviour; Stroke; Community; Rehabilitation.

Characterisation of the institutionalised elderly population to guide physiotherapy practice – preliminary results

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Abstract. *Elderly population has grown substantially in recent years and is expected to continue to grow in the next fifty years due to increase in life expectancy. Elders face a wide variety of physical and cognitive health problems that may adversely affect the ability to function independently. Thus, dependency on others among the elderly population is expected to increase from 29.6% to 51.2% in 2070. Need for institutionalisation will be even more evident than currently. One of the aims of physiotherapy in the elderly population is to preserve or restore functional independence, thus a comprehensive understanding of the individual healthcare issues and subsequent treatable traits might guide physiotherapy interventions, ultimately leading to quality of life and well-being improvements of this population.*

Aims: This study aims to characterise the institutionalised elderly population through the analysis of treatable traits based on simple, clinical measures commonly used in physiotherapy practice to guide personalised interventions.

Methods: A cross-sectional study with elders living in nursing homes was conducted. Sociodemographic, clinical, anthropometric data, vital signs were first collected to characterise the sample, followed by the assessment of Health-related physical fitness (HRPF) and functional status. Health-related physical fitness (HRPF) was assessed with the Senior Fitness Test (SFT). Functional status was assessed with the Physical Performance Test (PPT) and the Grocery Shelving Task (GST). The number and percentage of elders below the cut-off values previously established to determine the treatable trait was obtained. The cut-off values used were: Body Mass Index (BMI) >30, 30 seconds Chair Stand Test <8 reps; 30 seconds Arm Curl Test <10 reps; Chair Sit and Reach <-5cm; Back Scratch <-10cm; 8ft TUG >9,6s; 2 minute Step Test <55 reps; Physical Performance Test (PPT) <20; Grocery Shelving Test (GST) >36s.

Results: Sixty elders from 3 institutions participated (85.6±7.1 years, 24 males). The number and percentage of elders below the cut-off values was: BMI: 26 (43.3%); 30 seconds Chair Stand Test: 29 (48.3%); 30 seconds Arm Curl Test: 32 (53.3%); Chair Sit and Reach: 27 (45.0%); Back Scratch: 56 (94.9%); 8ft TUG: 47 (78.3%); 2 minute Step Test: 47 (78.3%); PPT: 42 (70.0%); GST: 59 (100.0%). Significant differences were found between male and female elders in BMI ($p=0.03$) and 2 minute Step Test ($p=0.02$). The number of male elders ($n=7$) above the cut-off of BMI was lower than the number of female elders ($n=19$). And the number of female elders ($n=32$) performing the 2 minute Step Test slower than the determined cut-off was higher than the number of male elders ($n=15$).

Conclusion: These preliminary findings are a contribution to the characterisation of the institutionalised elderly population.

Effectiveness and Mechanisms Associated with Neural Mobilization Delivered to Older Adults with Musculoskeletal Chronic Pain

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Abstract. *Background:* The life expectancy in Portugal has increased in the last decades. Alongside this growth, the emergence of non-fatal, but disabling health conditions have also become more frequent. One of the most prevalent health conditions in older adults is chronic pain, which is associated with an increase in disability and decreased quality of life. Previous studies have demonstrated the effectiveness of neural mobilization (NM) techniques to improve pain and functioning in adults, but studies investigating older adults with musculoskeletal (MSK) chronic pain are rare. *Main aim:* The main objective of this project is to assess the effectiveness of NM in improving functioning and decreasing pain in older adults with MSK chronic pain and explore related mechanisms of action associated with NM. *Study designs and specific aims:* The project encompasses four studies: a systematic review (study 1); a feasibility study (study 2); a randomized controlled clinical trial (RCT) (study 3); and a secondary analysis of data from study 3 (study 4). The aim of study 1 will be to synthesize existing evidence about the effectiveness of NM on pain, physical performance, and functional status in adults with MSK chronic pain. For study 2, we will assess the feasibility, acceptability, and potential adverse events associated with NM in older adults with MSK chronic pain, in addition to exploring different doses and modes of NM in this population. In study 3, we will investigate the effectiveness of NM on pain intensity, perceived functioning, sensory acuity, and physical performance in older adults with chronic MSK pain. Finally, in study 4, we aim to determine which factors at baseline (Study 3) are independently associated with a successful response to treatment. *Expected results:* We will make recommendations regarding further research and treatment of MSK chronic pain in older adults using NM.

Characterization of functional capacity and impact of health determinants of the elderly in Luanda

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Abstract. *Global life expectancy has doubled since 1990 and continues to rise, despite some countries in Africa having the lowest life expectancy rates in the world (WHO, 2020). Health-related studies, particularly studies characterizing the functional capacity of the elderly are scarce in Africa. Consequently, the World Health Organization (WHO, 2015 & WHO, 2020) has developed guidelines to promote greater knowledge about the aging process and its impact on the functional capacities of the elderly. Objectives: This study aims to investigate the functional capacity of the elderly in Luanda, the influence of social and economic resources, mental health, physical health, activities of daily living and functional tests, and the impact of an 12 week exercise intervention program. Study Design: The design of the first study will be cross-sectional, observational analytical, carried out with a sample of about 395 elderly over 60 years old, the second will be longitudinal, randomized and controlled. Methods: The research will be submitted to the Research Ethics Committee of Clínica Múltipla, Luanda. Data will be collected through the OARS (Older Americans Resources and Services) questionnaire functional tests 6- minute walk test (6MWT), Four Square Step Test (FSST), assessment of calf circumference (CP) and hand grip test. Four studies will be developed: the cross-cultural adaptation of the OARS for the Angolan population; a descriptive epidemiological study of the functional capacity of the elderly in Luanda; an observational, analytical, cross-sectional study to verify the correlation between the 5 dimensions of the OARS and the results of functional tests; and a randomized controlled clinical trial to verify the effect of an 12 week multivariate intervention program in a group of elderly people in the community.*

Keywords: Aging, Self-perception, Functionality, Health.

Assessment of freezing of gait in patients with Parkinson's disease

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Abstract. *Background:* Parkinson's disease (PD) is an incurable, progressive and multisystem, neurodegenerative movement disorder. The clinical characteristics of PD are both motor and non-motor symptoms. FOG is one of the most debilitating and difficult symptoms to treat and it is associated with the severity and progression of the disease. This symptom causes a paroxysmal inability to generate effective stepping and consequently to produce an effective forward stepping, usually triggered by turning, gait initiation and walking through narrow passages. FOG is very difficult to assess and predict with the current methods / instruments.

Aims: The aim of this project is to identify changes in gait pattern of PD patients prior to a freezing episode using wearable inertial sensors. A secondary aim of this project is to identify possible gait characteristics that are specific to FOG.

Methods: This project will be comprised of three phases: 1) An initial preparatory phase; 2) an exploratory study; 3) a well-designed confirmatory analysis. A systematic review and translation and cultural adaptation of the N-FOGQ will be conducted on the preparatory phase. During the second phase a case-control will be performed to measure gait variables (for example: stride length, gait velocity, cadence, step length), using wearables sensors in order to identify a pattern. A confirmatory study, which aims to identify a pre-FOG stage in a home context will be part of the third phase.

Results: During the PhD project, we expect to produce at least four publications: a SR, a translation and cultural adaptation of a questionnaire, an observational study and a confirmatory study. Acquire more knowledge about the current forms to assess FOG, introduce a clinical validated questionnaire are expected results from the first phase. Finally, the identification of a FOG gait pattern will be possible to translate into clinical valuable information towards a more effective treatment of FOG.

Effectiveness of Body Weight Support Treadmill Training on Gait in Patients with Multiple Sclerosis

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Abstract. *BACKGROUND: Walking is frequently impaired in patients with multiple sclerosis (MS) in an extent that, fifteen years after the start of the disease, in over 50% of the cases walking assistance is still needed. Treadmill training (TT) with body weight support (BWSTT), has been incorporated in rehabilitation programs with positive results for MS patients. However, it is not clear that the results based on functional measures could effectively evaluate the biomechanical changes introduced by BWSTT. Systematically examining of different percentages of BWS, intensities, frequencies, durations, and types of training using combination of kinematic, kinetic and metabolic outcome measures could develop optimal training protocols that maximize benefits for a variety of MS patients with different clinical needs. OBJECTIVE: To evaluate the effectiveness of BWSTT in functional gait improvement in MS patients. METHODS: Three studies will be conducted: a) Study I - a randomized, controlled, prospective study, with crossover design will be performed to compare BWSTT and TT intervention in a sample in 12 MS patients with EDSS 4.0 to 6.0, to determine, based on clinical features, the subjects that benefit most from BWSTT; (b) Study II - a cross-sectional observational study will be performed in subjects with MS, EDSS 4.0 to 6.0, to determine the influence of BWS percentage variations in treadmill training to improve gait quality index and efficiency; c) Study III - a randomized, controlled, prospective, longitudinal study, with crossover design, to analyze the effectiveness of a customized BWSTT based on gait biomechanical and clinical features on gait independence regarding the individual functional evolution of the subjects over time, in patients with MS with EDSS 4.0 to 6.0. EXPECTED RESULTS: Knowing which patients benefit with BWSTT and defining accurately the protocols to use could provide more information on the impact on gait in MS patients to allow gains in the recovery potential of patients. Dissemination and knowledge transfer resulting in the publication of three studies in international journals and communications in international meetings are expected.*

Key-words

Multiple Sclerosis, Walking Impairment, Exercise, Bodyweight Support Treadmill Training, Rehabilitation

The contribute of workplace health promotion in workers performance and absenteeism : An occupational health intervention on manufacturing industry

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Abstract. *Several European Union countries have put great focus on the development of a healthy workforce, in response to the epidemic of ?lifestyle? disease. The burden of non-communicable diseases, such as cardiovascular diseases, is rapidly increasing worldwide. They are also associated with high absenteeism and low productivity, in the labor context. This is particularly problematic, in a decade which the company's productivity is highly dependent on the human capital. Given that adults spend more than 50% of their day at work, workplace is an important setting for health promotion initiatives. Most occupational health studies focus the reduction of work-related musculoskeletal disorders; few used a comprehensive approach aiming to also decrease the burden of cardiovascular diseases. This project aims to assess the effects of an occupational health and wellbeing intervention in absenteeism rate, individual performance, quality of life, social skills, work-related musculoskeletal disorders, and cardiovascular health of industry workers.*

Environmental sciences and engineering

Engineering soils with biochar to maximise soil water and combat desertification (WATERDESERT)

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Abstract. *WATERDESERT aims to engineer the sponge function of Portuguese soils to sustainably combat desertification. WATERDESERT's main innovative aspect is the focus on the soil sponge function COMBINED with screening for potential trade-offs - such as germination, soil ecotoxicity ? to maintain sustainability. Desertification is a crosscutting issue of the soil threats: i) erosion; ii) decline in SOC; iii) salinization; and iv) decline in soil biodiversity. Therefore, to study sustainability trade-offs, dose-responses of biochar treatments for these soil threats are paramount. Three key research questions (RQ) capture the work plan: RQ1. At what concentration do biochar treatments cause sustainability trade-offs with soil biota? RQ2. How can biochar improve soil hydrology and erosion? RQ3. What is the optimal biochar treatment to achieve soil hydrology/erosion improvement (RQ2) without causing negative side effects (RQ1)? The approach combines lab, lysimeter, and field experiments with quantitative meta-analysis and development of carbon and water footprint methods.*

Ozone uptake by Mediterranean grapevines: a modelling approach

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Abstract. *There is concern in the wine industry regarding climate change as a potential threat to wine production, mostly focusing on atmospheric variables, bioclimatic and extreme indices. Current ambient ozone levels can have an effect as a strong phytotoxic oxidative agent on yield and quality of a key crop for Mediterranean areas such as the grapevine. Ozone precursor?s emission control measures might be offset by climate change, phenological advance and cultural practice. A Chemical Transport Model has been used to simulate high-resolution ozone deposition over the Portuguese Demarcated Region (DDR) during a field campaign monitoring growing season. The study aims to advance knowledge on which key factors and model reformulations should be considered to successfully reproduce grapevine ozone uptake under the local Mediterranean conditions. Results provide evidence for sustainable strategies to preserve high-quality wine production in a context of climate change.*

Eco-hydrological modelling of eucalypt-dominated catchments for climate change adaptation

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Abstract. *In Portugal, eucalyptus plantations account for 9% of the total area being mainly linked to the paper and pulp industry. Climate changes are expected to impact the hydrological and erosive response of forested catchments. The projected impacts foresee shifts in rainfall distribution, hydrological responses and surface water quality, as well as impacts on ecosystem integrity, crop yield, plant's physiological rhythms and land management operations.*

The objective of this study is to assess the hydrological responses of eucalyptus-dominated catchments, for present day conditions and under climate change scenarios. To this end, the SWAT ecohydrological model will be use to assess the impacts of climate changes on hydrological responses, water availability and biomass production of eucalypt-dominated catchments. SWAT will simulate adaptive land management strategies that reduce environmental impacts while improving the resilience of stands to water scarcity. This work is expected to be a valuable decision support tool for forest managers.

SOILFORCER - Integrated impact assessment of CERTified Eucalypt FORest management on SOIL quality and functions

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Abstract. *Having emerged in the 1990s, forest certification schemes are now widely implemented across the world, including for eucalypt plantations in Portugal. Compliance with the social and economic standards of certification schemes has become well-established but the same is not true for their environmental standards. This is especially true in relation to indicators of soil functions and typically reflects a lack of strong scientific support on the direct and indirect impacts of (non-)certified management practices. SOILFOR(est)CER(tification) aims to address this knowledge gap and can count with the support of three major players of the eucalypt sector in Portugal, especially for selecting pairs of long-certified vs. non-certified eucalypt plantations in Central Portugal. Through pairwise site comparison, SOILFORCER will assess the impacts of certificated practices on four key soil functions: water regulation, erosion, soil carbon sequestration and soil biodiversity. Furthermore, SOILFORCER will quantify the effectiveness of erosion mitigation measures prescribed for (continued) certification.*

Keywords: *eucalypt plantations; water regulation; soil erosion (mitigation); soil carbon sequestration; soil biodiversity*

ODS:

13: Climate Action

15: Life on land

Adoption and diffusion of Nature-based Solutions in urban areas: a comparative study of Latin America and Europe.

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Abstract. *Climate change can affect the local infrastructure of cities, put inhabitants at risk, and affect human health and well-being. In Europe, it is expected that climate change will increase the intensity of heat waves, floods, and droughts. On the other hand, several Latin American countries will also suffer the consequences of climate change, specifically the tropical parts such as the Central America Region, which is considered a ?hot spot? for climate change impacts. One of the potential climate change adaptation measures for urban areas is implementing Nature-based solutions (NBS). The assessment of the rate of adoption and diffusion of NBS in urban areas can be a tool that helps stakeholders and local decision-makers to find opportunity areas for NBS implementation, helping cities to reach resilience and sustainable goals in an easier way.*

Valorisation of saline residues into added-value by-products

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Abstract. *Brines(liquid) and contaminated salt(solid) produced in tannery and cod industries have a significant negative environmental impact and inherent high treatment costs, due to their high concentrations in sodium chloride and organic matter. On the other hand, large quantities of saline water (7.5-8.0% wt.NaCl) are used by the tannery industry in the pickling stage. In this light, this work aims to study an alternative for valuing such wastes through the application of hybrid methods, i.e., two or more methods of the following methods: screening/settling, electrochemical, thermochemical and membrane separation. Along with principles of an industrial symbiosis, a treatment will be developed that allows to transform waste into a product with commercial value (purified brine and salt) that can be used in the tannery industry (skin conservation and pickling). This work is in line with the principles of circular economy and the reduction of waste and water discharges into the environment.*

Should future cities be compact or sprawled? Development of an eco-indicator to assess future urban planning strategies

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Abstract. *Urban planning strategies can help mitigate climate change effects in cities by providing a more sustainable development. However, there is still a debate on whether cities should be compact or sprawled.*

This study aims to develop an eco-indicator to assess parameters affected by urban morphology -air quality, urban heat fluxes, urban heat island, mobility, ecological footprint and human exposure- to evaluate the most sustainable urban planning strategies under future climate. For that, a numerical modelling approach will be applied, including the WRF-UCM-CAMx air quality modelling system, adapted to urban areas with high spatial detail, the traffic model VISUM, and a carbon balance, for the Aveiro Region case study. The innovative outcomes of this work, eco-indicator and land use pre-processor for CAMx, will serve both the decision maker and research communities, overcoming the existing gaps in this scientific field and supporting the best planning strategies for a healthy environment and wellbeing.

*Keywords: Air quality; Climate change; Urban Areas; Sustainable Development
SDG 11, 13*

Assessing the effects of nature based solutions on water quality and related ecosystem services

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Abstract. *The global population is constantly migrating to the cities, leading to rapid urbanization worldwide. In these environments, toxic agents from industrial activity, as well as traffic and agricultural non-point pollution destabilize surface water quality, becoming a risk for ecosystems and human health alike. One way to combat this trend is to use Nature Based Solutions (NBS), nature-inspired infrastructure designed to mitigate environmental issues while providing additional economic and social benefits to communities. In this study, modelling software is used to assess the potential effects that different NBS can have on water quality in three case study cities of Europe, in the context of the UNaLab project. These results are then used to estimate economic benefits in two ways: using a benefit transfer approach to calculate the value of water-related cultural ecosystem services, and using a cost-effectiveness method to calculate avoided decontamination costs.*

Nature-based solutions for climate change adaptation: impact on heat island effect and air quality

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Abstract. *Nature-based solutions (NBS) can provide effective answers to current and future environmental problems in urban areas, linked to climate change and increasing urbanization. NBS benefits include urban cooling, air quality improvement, enhancement of cities' resilience to climate change, and improvement in the health and well-being of citizens. However, NBS should be tailored to specific locations and challenges, to provide the full range of benefits while avoiding undesirable indirect effects.*

The main objective of this work is to assess NBS impact on urban heat and air quality, under present and future climates, for three European cities with different climates and context-adapted solutions: i) Eindhoven, The Netherlands; ii) Tampere, Finland; and iii) Genova, Italy. This thesis aims to improve the knowledge regarding NBS implementation in an urban environment, providing evidence-based results with very high-resolution simulations with a state-of-the-art mesoscale air quality modelling system to better understand their effects and support the decision-making process.

Keywords: Nature-based Solutions; Climate Change; Air Quality; Urban Areas; WRF-CHEM; RCP4.5

Smart valorisation of organic side streams for food and feed by the Black Soldier Fly using a circular economy approach

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Abstract.

*Among insect species reared as alternative protein sources, *Hermetia illucens* (Black Soldier Fly, BSF) is, probably the one with the greatest potential, due to its composition, bioconversion rates and versatility in feeding substrates. This experimental work focuses on the potential effects of suboptimal feeding under different temperature and substrate moisture conditions that may occur in a continuous feeding regime. To assess this, seven different isolated vegetables were used, as feeding substrates, and evaluated BSF performance and bioconversion parameters.*

*The results showed that some substrates should be avoided when rearing *Hermetia illucens* on mono-stream of vegetable wastes. The knowledge regarding using feedstock as insects' feed, and recovering essential nutrients, is paramount to achieving a valid circular economy framework, in line with United Nations Sustainable Development Goals. This work delivers relevant results for black soldier fly reared on a continuous feeding system using vegetable feedstock substrates and their potential trade-offs.*

Valorization of pyrolysis oils through fuel-blends

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Abstract. *Oils from fast pyrolysis of hydrocarbon-based solids are promising alternatives to conventional fuels. However, some common undesirable properties of pyrolysis oils make it impossible to directly use them as high-grade fuels. Although great efforts are being done to develop pyrolysis oils upgrading routes to produce renewable transportation fuels, current techniques are far from reaching technological maturity and, consequently, their feasible commercial application. Moreover, the depletion of the conventional fuels and the increasing European and National pressure to reduce greenhouse gas emissions and waste landfill, combined with the awareness of population to the environmental concerns, have been led the energy companies to search for alternative solutions. Thus, this research work aims to optimize an integrative upgrading approach based on fractionation and subsequently blending of pyrolysis (bio) oils fractions with conventional fuels as an attractive mid-term solution to transit to an eco-friendly energy supply. High-grade fuel-blends are the expected outcome.*

Combining membrane bioreactors and engineered nanomaterials to mitigate fouling and improve the treatment efficiency

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Abstract. *Although membrane bioreactors are among the leading technologies for the treatment and reuse of complex wastewaters, membrane fouling remains the most important challenge for its commercialization. The application of engineered nanomaterials (ENMs) is proposed for a more efficient fouling control to guarantee the long-term performance of the system. Three hypotheses will be tested: (i) Pre-treatment of complex industrial effluents with ENMs can enhance the overall treatment efficiency while mitigating the subsequent fouling process; (ii) Coating of commercial polymeric membranes with ENMs can considerably mitigate the fouling process and improve water quality; (iii) Pre-treatment with ENMs or application of ENM-coated membranes can be considered sustainable strategies for dealing with complex industrial effluents treatment. Hence, membrane-fouling reduction is not the only goal of this research, but also the development of a sustainable methodology for membrane fouling mitigation, contributing to water circularity. The experimental studies will be supported by statistical analyses.*

Novel and sustainable carbonaceous nanomaterials for the separation and storage of hydrogen from industrial wastewater-derived biogas

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Abstract. *Renewable energy plays a significant role in the world's energy supply. Growing energy needs for growth and development, along with some issues such as declining fossil reserves, have pushed countries towards renewable energy production. Also, increasing the production of renewable energy is one of the promising strategies to deal with global warming. In this regard, hydrogen (H₂) capture and storage (C&S) can play a key role, and nanomaterials are envisaged as effective players, with high performance in C&S due to their unique properties. Furthermore, among nanomaterials, carbon nanotubes (CNTs) emerge as one of the best candidates. The recent discovery of the high adsorption power and reversible hydrogen storage capacity of CNTs make such a promising system. Although their synthesis can be expensive and energy-consuming. This synthesis issue will be addressed in this study using biomass waste materials as a carbon source and microwave-based synthesis as a sustainable method.*

Feasibility study of the biohydrogen production, storage and application in Portugal

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Abstract. *Feasibility study of the biohydrogen production, storage and application in Portugal*

ABSTRACT

The development of renewable energy resources has been considered among the most important strategic plans of various countries all over the world. Generation of hydrogen from biological wastewater treatment systems (biohydrogen) is one of the most attractive technologies in this regard currently under transfer from lab-scale to daily use applications. In this stage, a feasibility study concerning all the possible aspects is required to facilitate this process and to aid carbon dioxide mitigation plans. In this proposal, various aspects of feasibility of biohydrogen production in Portugal will be investigated including a) Technical Feasibility, using advanced techniques concerning production processes assessment, design and prototyping of the required facilities (including storage technologies), and raw material sourcing, 2) Economic Feasibility, concerning the production and storage costs and the potential to compete other types of renewable energy resources in Portugal, 3) Applicability assessment using standard tools and approaches to determine the availability of the facilities/infrastructures to implement the biohydrogen energy in large scales in Portugal and how to overcome the existing barriers. 4) Environmental and Legal feasibility using advanced techniques to identify the environmental footprint as well as the existing legal issues for the commercialization of the biohydrogen production technologies in Portugal. According to the results achieved from various stages of the feasibility assessments in the present study, a framework will be prepared and recommended for the commercialization of biohydrogen production, storage and application in Portugal.

KEYWORDS:

Biohydrogen Storage Technologies (bio-ST) Economic, Environmental and Technical (EET) assessment; anaerobic digestion, Biomass, renewable energy, brewery wastewater

Development, testing and implementation of a forecasting system for forest-fire smoke

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Abstract. *Forest fires close to populated areas tend to lead to very high exposures to air-pollution, often resulting in peaks of hospital admissions and unhealthy cities. In order to mitigate these effects wildfire smoke forecasting has been implemented in some countries, usually alongside daily air- quality forecasts. The provided information can be employed by stakeholders and the public to e.g. reduce outdoor activities or postpone events at critical moments. However many challenges are still interfering with the quality of such forecasts. This thesis will address those challenges, searching for more efficient ways of modeling the underlying phenomena of wildfires, emitted smoke and its dispersion in the atmosphere. An improved forecasting system will be developed and its capabilities assessed through case studies and comparisons with measurements. After a testing period in forecasting mode, wildfire forecasts will be delivered in real-time for the Portuguese territory.*

Planning instruments to mitigate negative impacts and potentiate expected benefits of Nature-Based Solutions for urban global change adaptation: an integrated environmental, economic and social analysis

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Abstract. *Accruing from the current urbanization patterns and climate change impacts, it is essential to assess the environmental, economic and social impacts of NBS that have proven to increase urban resilience. Moreover, there is a need to assess the effectiveness of policy instruments to mitigate negative impacts and potentiate expected benefits of NBS for urban global change adaptation.*

Indoor and Outdoor Air Pollution in Bragança: Causes, Inhalation Exposure and Toxicity

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Abstract. *Air pollution is the single largest environmental health risk in Europe. In Bragança, an exhaustive multipollutant assessment has never been performed, covering indoor microenvironments and ambient air. Continuous monitoring of multiple gaseous pollutants and particle size distributions, together with the collection of particulate matter < 10 µm (PM10) samples, will be conducted in different dwelling and in the outdoor air. A vast array of cutting-edge analytical techniques will be applied to PM10 samples to obtain the detailed organic and inorganic composition. The application of the Positive Matrix Factorization receptor model to the datasets will enable to identify the different sources and estimate the respective contributions to the measured levels. Based on the chemical composition, cancer and non-cancer risks will be estimated and a dosimetry exposure model will be applied. PM10 samples will be subject to a bioluminescence bioassay to find out which constituents and sources contribute the most to toxicity.*

Assessment of sustainability of plastic products compared to alternative products

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Abstract. *Plastic is one of the most widely used materials and is among the most widespread and persistent pollutants on the planet, constituting a serious problem for society. Several policies have been implemented in order to limit or ban some plastic products, but there are Life Cycle Assessment (LCA) studies that show that alternative materials may not be better than plastics in environmental terms, and that the environmental performance may depend on the technical, geographical and methodological conditions of the studies. In addition, social and economic impacts have been often disregarded when plastics are compared with other materials. The objective of this proposal is to evaluate the sustainability of the life cycle of plastic bags, tablewares and bottles, and compare them with products produced from alternative materials, for the same function, in the Portuguese context, using the Life Cycle Sustainability Assessment (LCSA). Methodological development in LCA and LCSA is also foreseen.*

Key Words: Single-use plastics; Alternative materials; Life Cycle Assessment; Life Cycle Sustainability Assessment; Social indicators; Economic indicators

Sustainable Development Goals (SDG):

? SDG 12: Responsible Consumption and Production

? SDG 14: Life below water

Assessing air quality in cities under climate change scenarios: a source apportionment approach

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Abstract. *This study aims to develop a modelling approach able to assess the impacts of future climate and projected emissions, including the relative contribution of different source regions/categories, on air quality at urban scale. Weather conditions and atmospheric emissions from different sources are the main causes of air pollution, thus the implications of climate change on air quality need to be better understood. Air quality modelling, associated with climate change scenarios, is a powerful tool to understand and assess the physical and chemical processes occurring in the atmosphere. For that, an air quality modelling system, with source apportionment and process analysis tools, will be applied to the Aveiro Region. This work will overcome the existing gaps in this scientific domain and support decision makers to define the best mitigation and adaptation strategies to reduce climate change impacts on air quality.*

This research is pertinent, complex and multidisciplinary and it is in accordance with the Horizon Europe Cluster 5 - Climate, Energy and Mobility. The objectives and the approach defined are also aligned with two goals of the 2030 Agenda for Sustainable Development, namely: Goal 11 - make cities and human settlements inclusive, safe, resilient and sustainable; and Goal 13 - take urgent action to combat climate change and its impacts.

Keywords: air quality; urban areas; climate change; source apportionment; numerical modelling; Aveiro Region

Water-wise-cities and circular-economy – roadmaps through governance and co-creation pathways.

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Abstract. *Under a constantly changing world, increasing environmental costs of population growth and urbanization, prioritized the circular economy on political agendas. Nevertheless, the development of water-circular-economy (WCE) national strategies worldwide, is still limited. Simultaneously, water-wise-cities (WWC) initiatives, seeking sustainable and resilient communities, started to emerge. Synergies between these two concepts are, however, poorly explored in literature and can be influenced by legislation, stakeholders' perceptions and associated networks, among others. Thus, further efforts are required to develop integrated approaches by cities, including institutions as municipalities, water utilities and citizens. This research proposal aims to explore how synergies can be shaped between the concepts of WCE and WWC initiatives at the city level. A conceptual model is built to assess current strategies to implement these concepts and to identify barriers and drivers to foster the development of integrated initiatives in cities through co-creation of roadmaps and governance pathways.*

Air Quality in Retail Stores: A Focus on Particulate Matter

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Abstract. *Indoor air quality is an essential factor in the quality of life and well-being. With the increase of time people spend indoors, several air pollutants have become relevant due to their adverse effects on health, comfort, and productivity. In this thesis, the focus will be on aerosol monitoring and aerosol sampling in retail franchises for further physical and chemical characterization. To achieve this objective, optical equipment will be used for continuous monitoring of particulate matter, and gravimetric air sampling will be applied for particulate matter characterization. Measurements will be performed indoors and outdoors to verify the relationships between the two atmospheres. Carbon dioxide, carbon monoxide, volatile organic compounds and the local weather conditions will also be monitored. The composition of particulate matter, its main sources and potential health effects will be identified, providing critical data for emission control and improvement of air quality in the workplace.*

Keywords

retail stores; IAQ; particulate matter; sources; dosimetry.

Improving trade-offs of Ecosystem Services through Ecosystem Based Management to face future scenario of local stressors and climate change

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Abstract. *Trade-offs analysis of ecosystem services can identify optimal decision points to balance the diverse uses of ecosystem services. The aim of this study is to understand and inform trade-offs of ecosystem services within an Ecosystem-Based Management approach to face future scenarios of local stressors and climate change in Ria de Aveiro. A systematic review of ecosystem services focused on known links to climate change and previously identified local stressors will kick off the study. Then, an ecological risk assessment will be done in the study area. Moreover, to understand the role of stakeholders in resource mobilization, a spatial multi-criteria analysis will be conducted. At last, modeling approaches such as InVEST- Integrated Valuation of Ecosystem Services and Tradeoffs, will be used to discuss the impact of future scenarios of climate change and local stressors in ecosystem services trade-offs. The result aims at providing management options toward optimal Ecosystem Services delivery.*

Keywords

Natural capitals, Risk Assessment, Spatial Multi-Criteria Analysis, Ria de Aveiro, Climatic Phenomena, Trade-offs

This research work will contribute to the following target made by the UN under UN Sustainable Development Goals 2030.

? Goal 13: Take urgent action to combat climate change and its impacts

? Goal14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development

? Goal 15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

? Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Business and economics

Intellectual capital and knowledge management in a mobility context

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Abstract. *Intangible aspects such as intellectual capital and knowledge have gained importance as the most valuable sources of competitive advantage for organisations. Therefore, organisations that operate at an international level started to increase their investment in international assignments to gain global knowledge that guarantees competitive advantage. However, there is not a defined mechanism to manage knowledge from international assignees in the context of knowledge-intensive organisations to develop intellectual capital*

This work aims to answer to this gap through a multi-method explanatory single in-depth case study of a Portuguese knowledge-intensive organisation, BIAL. Through this work, it is expected that the impact of mobility on knowledge and intellectual capital management in international organisations can be understood along with the development of mechanisms to promote its efficient management.

For that purpose, the work will follow the next sequence. First, a systematic literature review of the existent work will be developed. Second, considering what was found in the review and through interviews in the organisation, the goal is to develop a conceptual model to analyse knowledge and intellectual capital management, in international assignments. Third, this model will be validated. Lastly, considering what is already known and the results from the previous works, the aim is to develop the mechanisms that allow managers to be more efficient in managing knowledge and creating capital, to add value for the organisation.

Measuring Local Entrepreneurial Ecosystems in Portugal

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Abstract. *Entrepreneurial Ecosystems have become a buzzword among researchers and policymakers. Nonetheless, there is still a lack of empirical studies, most focusing on national or regional analysis. Nevertheless, every location is thus distinct, and its socio-cultural environment, networks, available resources, or geographical conditions shape the interactions between the stakeholders and the success of entrepreneurship and innovation strategies. This study aims to contribute to EE literature by providing a quantitative analysis of EEs at the sub-regional, using data from 25 Portuguese sub-regions (NUTS-3) and building upon previous EE research at the regional and local level. We calculate the Portuguese Local EE Index using Stam and van de Ven (2021) framework, 17 indicators and a Penalty for Bottleneck methodology. Most ecosystem elements show strong and positive correlations with each other, confirming the systemic nature of local entrepreneurial economies. The results highlight that the urban/high-density sub-regions of Portugal have a more developed EE. On the other hand, the inland and outermost territories have lower EE quality. The results also highlight a high variability within each region confirming the need for a local perspective when developing EEs. Regarding the outputs and outcomes of the EE, the regression analyses performed showed that the EE has an important role in the birth rate of startups and medium-high technology firms. Moreover, it plays a relevant role in the population change over the last ten years, and in the GDP per capita. On the other hand, the EE index is not correlated with the quality of life or regional resistance to the first year of the pandemic. The analyses and results are compared with previous EE literature and discussed within the Portuguese entrepreneurship and innovation context, providing important implications for public policy to better diagnose, understand and improve local entrepreneurial economies.*

Impacto da gestão de talento na retenção de colaboradores: estudo de caso da universidade aberta isced (UNISCED) Moçambique

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Abstract. *o presente projecto de tese tem como tema de pesquisa, Impacto da gestão de talento na retenção de colaboradores, trata-se de um estudo de caso da universidade aberta isced moçambique, o mesmo tem como objectivo estudar o Impacto das práticas da gestão de talento na retenção de colaboradores da Unisced.*

Mapping Risk Governance Intellectual Structure and future research agenda

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Abstract. *Risk governance has been sanctioned as a line defense to forestall future financial crisis. The paper synthesizes fragmented risk governance literature, identify research gaps and offers direction for future research. Our rigorous systematic literature review protocol yielded 151 articles sources from Scopus and Web of Science spanning 1960-2021. Our findings show consistent growth in risk governance scholarship. Our analysis also revealed risk governance methodological and theoretical choice. Most scholars prefer the use of agency theory and regression analysis to advance risk governance research. We further identified the industry and geographical focus risk governance studies. The financial systems of the United States, Malaysia, Australia, and Nigeria have garnered the most studies although risk governance transcend global financial system. While risk committee studies is popular, chief risk officer research domain is seldom. We developed a conceptual framework and concluded the study with direction of future research. The study present a comprehensive intellectual structure of risk governance to guide regulators, managers and policy makers to foster resilient financial system.*

Fraud and Subjectivity in Financial Reporting - Case Studies

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Abstract. *The Banco Espírito Santo (ES) and the group case remains on the agenda, 8 years after the bank's resolution. However, this is unfortunately not an isolated case. Over the past few decades, several financial scandals have occurred, many of which have forced governments to intervene to limit economic and social damage. More than 20 years have passed since Enron's bankruptcy. Since then, other more or less significant cases have followed, such as WorldCom, AIG, Parmalat, Lemmon Brother, among others.*

IFRS represent one of the most remarkable events in contemporary accounting. They were born in a context of globalization where the need to adopt common and internationally accepted financial information was understood. Financial scandals accelerated its adoption and led to successive revisions. IFRS standards improve the quality of financial information, facilitate its disclosure, reduce transaction costs and increase international investment. On the other hand, the supervision of the financial system and certification of the accounts of large companies took important steps towards the transparency of financial reporting. However, the successive occurrences of financial scandals demonstrate that the system remains permeable to fraud, namely that resulting from accounting manipulation.

This work analyzes the ES scandal from three perspectives. Firstly, it identifies the accounting practices that have hidden the company's economic and financial reality for years. Secondly, it critically analyzes the certification of accounts that objectively endorsed the accounts over successive years, even though there were already sufficient warnings regarding the Group's solvency. Finally, and thirdly, the work analyzes the role of supervision.

The ES case relaunches the debate on the validity of international accounting standards and the need for their revision. This work try to contribute to this debate, pointing out the critical points and signaling solutions. However, without resolving the conflicts of interest between those who certify and those who are certified, it is very unlikely that other scandals will be avoided in the future.

We intend that the contribution of this work is to find a solution of independence for those who prepare the financial report (accountants) and for those who certify it (auditors), because the transparency and neutrality of financial reporting is a path to success.

Sustainability and Clean Energy Competitiveness: The Solar Photovoltaic Industry in China

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Abstract. *Energy is the basic driving force of social development, since the second industrial revolution, electricity is widely used, according to IEA statistics, the world per capita electricity consumption since 1990 to 2018, increase from 2.1MWh/person to 3.3MWh/person, the world total electricity consumption increase from 10897.9TWh to 24738.9TWh (Table 1) . The rapidly growing demand for electricity also brings huge environmental problems, as can be seen from (Table 2), the world's CO2 emissions mainly originate from the power sector; from 1990 to 2018, the world's CO2 emissions grew from 7622Mt to 13373Mt . China produces 27.21% of the global CO2 emissions from the power sector. The tension between China's desperately growing demand for electricity and the environment is growing. Therefore, PV as the cleanest source of electricity is crucial for both the world and China.*

DETERMINANTS OF PERFORMANCE IN PRIMARY HEALTH CARE

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Abstract. *The last reform of primary health care in Portugal started in 2005. It was marked by the creation of Family Health Units (USF) - multidisciplinary teams that are voluntary and self-organized, with technical and functional management autonomy and personalized health care provision. The Global Performance Index (IDG) has been used as a multi-axial measure of the performance of functional units.*

The aim of this thesis is to find the determinants of functional units (FU) performance in primary health care (PHC). It is intended to study the impact of the organizational model, leadership, motivation and personality traits of the members, on the performance of PHC teams.

We plan to develop an observational, cross-sectional and quantitative study in functional primary health care units.

This research study aims to contribute to the area of clinical governance in primary health care, increasing knowledge in the area of organizational management and thus improving the efficiency of the national health system.

Digitalization on MFIs and Public Policy Incentives

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Abstract. *In recent years, the emergence of digitalization in organizations has grown rapidly, more and more institutions are moving to new business plans and adopting new digitalization techniques to reduce risk, increase competitiveness and improve performance. In order to better deliver their products and services, and to reach more poor people, MFIs must also follow this trend. Therefore, we will study the determinants of the adoption of digitalization in MFIs, the impact of ICT in the financial and social performance of MFIs and how the government can encourage MFIs in the adoption of digitalization.*

Key words

Digitalization, ICT, MFIs, Public Policy Incentives, Game theory, TOE, African MFIs

The impact of public debt on economic growth in Mozambique

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Abstract. *The study investigated the impact of public debt on Mozambique's economic growth, from 1997 to 2021. The study uses an econometric approach approach after verify the stationarity of the variables, Granger causality, and Bounds tests were applied. The explanatory variables proved to be statistically significant to explain the model, except for public debt, and was verified the existence of unidirectional causality between public debt service and the CPI with GDP, GDP with debt service, and finally, of the public debt with the CPI. Thus, there was no evidence of co-integration among the variables, considering the Gross Domestic Product (GDP) as the dependent variable. The variables public debt and the Consumer Price Index (CPI) showed a negative relationship with GDP, while debt service showed a positive relationship. Public debt contraction could be to finance investment projects whose returns are greater than the debt itself, and so, to ensure the generation of wealth and the economic stability of the next generations.*

Keywords: Public debt, Economic growth, ARDL, Mozambique.

Augmented Reality in the experience of consumer in Portuguese shopping centres

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Abstract. *Commerce has suffered a major economic impact in the last two years, with Covid-19 and the growth of online shopping, taking it away from traditional commerce and shopping centres. The aim of the study is to draw a detailed picture of the Portuguese reality, in the universe of shopping centres, regarding the use and role of Augmented Reality (AR) solutions in the consumer experience (CX). As results are expected to formulate informed and scientifically supported perspectives that demonstrate strengths, weaknesses, opportunities and threats of AR adoption in consumers' experience, in their relationship with space and brands in shopping centres, building a detailed picture of the Portuguese reality, in the universe of shopping centres in Portugal, regarding the use and role of Augmented Reality solutions in the consumer experience.*

PERCEPTION OF ORGANIZATIONAL SUPPORT, SOCIAL CAPITAL AND INNOVATIVE ATTITUDES OF WORKERS IN BRAZIL AND MOZAMBIQUE

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Abstract.

In recent years, the market, organisation and workers have presented new trends in the management and implementation of labour policies, and have required the entire set of innovative practices for both management and functionality of the work environment, condition which, seeks greater structure and dynamics for the development and socio-labor implantation in the management process (Denning, 2011; Tachizawa, 2015), this condition, which requires evaluating the intra and inter-organizational processes. Thus, considering the need to evaluate the perception of organizational support, organizational social capital and innovative attitudes and the relationship between these variables in distant labor cultures.

In this way, the present work has as general objective, to verify the relationship between organizational support, social capital and innovative attitudes in workers in the Brazilian and Mozambican labor context and, regarding the specific objectives, aims to identify the psychometric quality of constructs (for example, organizational support, social capital and innovative attitudes) depending on the cultural context of Brazilian and Mozambican workers; Analyze the difference in organizational support, social capital and innovative attitudes in Brazilian and Mozambican workers.

An analysis of a descriptive, exploratory and correlational approach will be developed, of a quantitative nature, through a questionnaire that includes these scales and socio-emographic data, which, sent by electronic means inserted in the google access platform Forms to Brazilian and Mozambican workers; these will be analyzed in the statistical package SPSSWIN, in version 25.0, for tabulation and performing descriptive statistical analyses and Pearson's correlation calculations, Student's t-test and Cronbach's alpha, multiple regency analysis and Manova. Based on the theoretical and empirical proposals of this thesis project, it is expected that the organizational support construct influences social capital and this, in the attitudes of innovation. As well, it is believed that such associations between these constructs differ by comparing them to the Brazilian and Mozambican labor context.

Keywords: Organizational support, social capital, social capital scale, and innovation

The Entrepreneurial Intention in the Context of Digital Businesses

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Abstract. *The main goal of this project is to develop an extension of the explanatory models of entrepreneurial intention behaviors, applying them to students at Portuguese higher education institutions, to understand what promotes or inhibits the creation of digital businesses.*

For this purpose, a mixed methodological approach will be used, using qualitative and quantitative methods, thus betting on the competent methodological complementarity. Furthermore, in-depth interviews and student questionnaires will be applied as research instruments.

It is expected that this project will contribute to (1) the development of adequate instruments to improve the degree of adjustment of the variables under study, (2) the elimination of potential study design errors through the introduction of new explanatory variables that allow the identification of new determinants of entrepreneurial intention, and (3) ensure compatibility between measures and variables.

This study will have relevant theoretical implications by filling gaps in the literature on behaviors in entrepreneurial intention and practical implications related to the stimulation and development of entrepreneurship programs.

Análise da capacidade preditiva dos modelos de previsão de falência das empresas do setor energético

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Abstract. *O principal objetivo proposto para esta pesquisa é responder à pergunta - Quais são os modelos de previsibilidade mais precisos para empresas falidas do setor de energia? Como o assunto é multidisciplinar, o trabalho está dividido em três ênfases: técnicas estatísticas, redes neurais e modelos alternativos. O trabalho identificará os determinantes das empresas em falências e os melhores modelos de previsão pela curva ROC (receiver operator characteristic curve). O principal desafio da pesquisa é a contribuir para a relação de desempenho da empresa e algum fator que não seja controlado pela empresa. Prováveis variáveis dos modelos são activo circulante, Passivo, Total de activo, EBIT, capital próprio, volume de negócios, juros suportados, proventos operacionais, dívidas a terceiros, variáveis ambientais, variáveis macroeconômicas e variáveis regulatórias.*

The Art of Well-Being

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Abstract. *Human beings are increasingly living on autopilot mode, always running, erasing the boundary between professional and personal life, which has led to an increase in cases of anxiety and burnout, leading to well-being becoming a common goal for many consumers. Since the arts are considered an asset to health and well-being, but there is a gap in studies in social contexts, this study aims to: understand what are the impacts of the arts on consumer well-being in a general social context; understand if the LOHAS (Lifestyles of Health and Sustainability) consumer is an art consumer; and understand what are the impacts of the arts on the well-being of a LOHAS consumer.*

The revolution of new working methods and its impact on employee retention

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Abstract. *The new working methods inherent in the digitalization process that has been taking place have revolutionized how organizations are organized and operate. It is crucial to assess how these same forms will impact retention, satisfaction, and the organizational climate. Thus, this plan has an object of study that explores new working methods and their influence on employee retention in national intersectoral organizations and has as its primary objective to understand this impact and relation.*

This issue is identified as a priority on the European agenda (European Institute for Gender Equality, 2022). However, no known studies focus on the relationship between new working methods and their impact on retention, so it is intended to study this focus using structural equations. It is expected that the results can influence the decision-making of the five-way helix to implement solutions for a new social and economic reality with a direct impact on the workforce.

A GESTÃO DA QUALIDADE NO ENSINO SUPERIOR ANGOLANO

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Abstract. *A gestão da qualidade no subsistema do Ensino Superior em Angola tem sido alvo de crescente interesse motivado pelo impacto na performance das instituições do setor. As instituições de ES em Angola, considerando que são instituições de carácter multidimensional, isto é, envolvem uma diversificação de funções e atividades (ensino e programas académicos, investigação, recursos humanos, estudantes, infraestruturas e meio académico) deveram procurar instrumentos necessários para o auxílio da melhoria dos serviços que prestam a comunidade académica.*

A educação constitui o sector mais determinante para o futuro de uma sociedade. Esta importância aumenta com o nível de desenvolvimento do País ou da região, nomeadamente porque a competitividade exige níveis de qualificação mais elevados, que não são possíveis de alcançar sem que os sistemas de ensino-aprendizagem obtenham a eficácia de satisfazerem as necessidades da comunidade em quantidade e qualidade que se pretende.

Com a presente pesquisa pretende-se contribuir na melhoria contínua do subsistema do ensino Superior, bem como ajudar a compreender a importância da gestão da qualidade nas IES.

Palavras chave: Ensino Superior, Sistema de Gestão da Qualidade, Norma ISO 9001:2015, Angola

Corporate Social Responsibility (CSR) Practices in Portuguese Family Firms: Current state and challenges

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Abstract. *The theme of Corporate Social Responsibility (CSR hereafter) has gained importance over the years, whether for investors, consumers, or society in general (Carroll, 2021). Companies are expected to take initiatives to improve the environment around them, whether these initiatives are social, environmental, philanthropic, or even of another character. It is remarkable the number of companies that already adopt CSR practices, which makes this issue practically mandatory when analysing the company's strategy.*

The impact of CSR on family firms turns out to be even more peculiar than for non-family firms. Several studies state that these practices may be more important for family firms since the firm's reputation is strongly related to the family's good image (Alzate-Gómez et al., 2020; De La Cruz Déniz Déniz & Suárez, 2005; Nekhili et al., 2017; Zeng, 2020). Thus it is important to understand whether family firms effectively behave differently from non-family firms concerning CSR practices.

The main objective of this project will be to understand the current reality of Corporate Social Responsibility in Portuguese Family Firms and the challenges that arise from CSR. Prencipe et al. (2014) state that Family Businesses are responsible for 70-90% of world GDP, which makes it extremely important to analyse the behaviour of this type of company since they assume great importance in the business and economic framework. In Portugal alone, the Associação das Empresas Familiares estimates that over 70% of companies are Family Firms, responsible for 50% of employment in the country and 65% of GDP (Associação das Empresas Familiares, 2021).

Therefore, this project aims to study a subject in constant development, such as CSR, in combination with a predominant reality in our country, such as Family Firms.

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Education-job mismatches in the transition from Higher Education to employment and the persistence of its effects: the Portuguese case

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Abstract. *A literatura económica aponta que os desajustamentos educação-trabalho no início das carreiras dos recém-diplomados do ensino superior, apesar de diminuírem ao longo do tempo, existem e assumem efeitos persistentes ao longo das carreiras destes ao nível da diminuição dos retornos salariais e da maior dificuldade de transição para um emprego perfeitamente ajustado. Os efeitos da continuidade num estado de desajustamento podem ter consequências ao nível da satisfação com o emprego, da progressão da carreira e até da produtividade das empresas, com assinaláveis efeitos de género.*

Assim, esta investigação pretende caracterizar estes desajustamentos e medir e quantificar a magnitude da persistência destes efeitos nos rendimentos dos recém-diplomados ao longo do início das suas carreiras, olhando atentamente também para as diferenças de género daí resultantes e esperando, no final deste projeto, identificar e dar um contributo no domínio das políticas públicas para o desenvolvimento de mecanismos que possam atenuar estes desajustamentos.

Standard, and transformative guidance for Distributed Ledger Technology in SMEs from as-is ? to-be.

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Abstract. *The transparency, trust, traceability, and accountability associated with Distributed Ledger Technology (DLT) can transform the intra-organizational processes. The diverse market for DLTs has its own features and system architecture. The empirical findings say that blockchain is not a panacea, nor is it a suitable tool for improving internal processes based on the available evidence. The Gartner report stated that 90% of blockchain projects are driven by fear of being left behind. Thus, my research aims to provide practical solutions by answering two research questions. The first objective is to establish standardized configurations that specific manufacturing SME industries can use. Second, to guide digital transformation by utilizing a model and description of how to implement the DLT system in their organization. My research could bridge the knowledge gap between academics and practitioners. An industry-specific standard framework could be introduced with the use of this information by policymakers.*

Influence of Technology on Country's Image

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Abstract. *With the emergence of the internet and networks, cyberspace has become a charitable place for criminals, whereby individuals, organizations, institutions, and even countries are vulnerable to information insecurity. Most developed nations have significantly improved their protection skills against cyber war, and it has helped them to maintain a good relationship with other countries as well as protect their image abroad. Despite that, most African leaders understand the importance of a positive image as a gauge for building an international profile. It is unfortunate to note that many African countries are still striving to earn a positive image because of their unpopular policies and corruption. A close-ended questionnaire was developed for 418 sample populations for the data collection based on a model developed to best explain Nigeria's international image, and the measurement of variables was tested and analyzed with possible data from 190 respondents who neatly and completely filled out the questionnaire. A smartPLS was adapted for analyzing the data and validating the results. The result shows that the Nigerian government needs a new law and security strategy to protect its cyberspace in order for the country to regain its battered image.*

The Life of Consumption Communities: A Study on Vegan Communities

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Abstract. *This Ph.D. project aims at understanding how consumption communities are created and extended over time and the different styles in consumers? interactions within the community. The main research question is: How can a vegan community endure over time and promote the engagement of its members? In the endeavour, the study design consists of two parts: study I combines a non-participatory ethnography with semi-structured interviews, whereas study II consists of an experiment. This thesis will hopefully contribute to the literature and practice in consumer behaviour by defining typologies of consumers and consumption communities, and by discovering mechanisms for community retention that can be applied to other research contexts*

Accounting

Contabilidade Internacional: Influência no processo de Harmonização Contabilística em alguns Países da Lusofonia, Angola, Moçambique e Portugal

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Abstract. *De acordo com o progresso e os benefícios das IFRS na atualidade, tem havido vários estudos comparativo sobre contabilidade elaborado com base nos aspetos técnicos de informações financeiras (Georgina et al., 2018). Nesse sentido, a presente investigação pretende alargar os estudos numa análise comparativa sobre a contabilidade baseada nos fatores histórico, político, legal, contexto cultural e económico de Angola, Moçambique e Portugal, com o intuito de explicar a existência de valores culturais compartilhados no âmbito contabilístico entre os países, ou seja para se observar como estes aspetos norteiam os países no enquadramento das IFRS dentro da comunidade de língua Portuguesa.*

A Systematic Review in Financialization and Corporate Governance

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Abstract. *Hoje é possível recorrermos a Metodologias Quantitativas baseadas em índices bibliométricos que nos facilitam a identificação e seleção das publicações relevantes a incluir numa Revisão Sistemática. Com o recurso às Metodologias ProKnow-C (Ensslin, Ensslin, Lacerda and Tasca, 2010; Ensslin, Dutra, Ensslin, Chaves, and Dezem, 2015) e Methodi Ordinatio (Campos, Pagani, Resende and Pontes, 2018; Pagani, Kovaleski and Resende, 2015) foi realizada uma Revisão Sistemática no tema "Financialization in Corporate Governance"*

The Relationship between Artificial Intelligence and Intellectual Capital

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Abstract. *Technology is proliferating across professionals and industries, and the pace of technological change in its dispersal, reach, and magnitude of impact is indescribable. Thus, it becomes imperative for organizations to reinvent themselves digitally in order to stay relevant and ahead of the competition.*

Artificial Intelligence systems have the ability to learn and replicate through experiences present in Big Data very quickly, which makes it clear that globalization and digital transformation have put companies in different competitive situations where knowledge and effective behavior have been providing the competitive advantage. Thus, companies have turned to Knowledge Management to develop the Intellectual Capital needed for success.

Therefore, it is clear that as new computer technologies have emerged in recent years, this requires companies to have sufficient Intellectual Capital to survive fierce competition. This way, it has become the key for companies' survival.

Consequently, how computer technologies are used to improve the quality of companies' Intellectual Capital and promote their development is very important, and the following research question arises: What is the relationship between Artificial Intelligence and Intellectual Capital?

CORPORATE GOVERNANCE COMPLIANCE

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Abstract. *After decades of many corporate scandals and financial meltdowns, the quest for effective corporate governance and firm performance has raised the concern of a lot of academicians, practitioners, and researchers regarding articles written on this issue. This study seeks to review corporate governance and firm performance articles written in Ghana under the author's keywords in order to fulfill the objective. The goal is to identify the research trend and then to suggest the idea of future research directions. The study has conducted a review of corporate governance research by searching at Scopus and Web of Science research databases from 2006 to 2020 to prepare the list of articles. A comprehensive review of recent corporate governance and firm performance literature is essential because it provides a basis for comparing Ghana's corporate governance research experience with other emerging economies in other continents. The findings reveal that two keywords on corporate governance analysed in this study - board composition and ownership - have many written articles, while compensation has the least number of articles. However, in the future, gender diversity and audit committee may be investigated since it has received global attention*

The Impact of Tax Incentives for Foreign Direct Investment in Africa Sub-Saharan -Guinea Bissau Case

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Abstract. *Analyze the impact of tax incentives in attracting FDI in Sub-Saharan African countries with Guinea-Bissau evidence. Analyze the structural problems encountered by the least developed countries in order to eradicate poverty, achieve the development goals adopted at the international level and allow the country (Guinea-Bissau) to leave this category, thus recognizing their enormous potential for global economic growth, guaranty stability and produce prosperity*

Os níveis de desempenho e relato contabilístico em contexto religioso: O caso do Patriarcado de Lisboa.

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Abstract. *Este projeto visa estudar os níveis de desempenho e relato contabilístico do Patriarcado de Lisboa, e contempla três objetivos: (1) compreender as práticas contabilísticas ocorridas na prestação de contas do Patriarcado de Lisboa à Santa Sé (1929-1971), (2) compreender a estruturação da informação contabilística prestada anualmente pelas paróquias ao Patriarcado de Lisboa (1929-1971), e (3) compreender como a informação contabilística financeira e não financeira foi utilizada no processo de reestruturação do Patriarcado de Lisboa (1966-1971).*

A metodologia consistirá na recolha e análise de um vasto conjunto de informação documental disponível no Arquivo Histórico do Patriarcado de Lisboa.

Este projeto tem potencial para contribuir para a escassa literatura em história da contabilidade em contextos de organizações religiosas, bem como para debates contemporâneos relacionados com a normalização de informação contabilística não financeira e com as influências de atores de diferentes níveis institucionais em processos de institucionalização de práticas contabilísticas.

Essays on Environmental, social, and governance (ESG)

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Abstract. *Going back in time, the only important milestone that mattered to an investor was the steady increase in the company's profit. But then, things began to change, especially when climate change proved to be more than just an imaginary scenario. As a result, businesses have experienced lesser profits, which has affected their laborers, in addition to the impact of COVID-19 on the global economy. These factors have led to pressure on companies to integrate ESG into their business due to the increased vigilance and demand for climate action among investors, and thus, adopting ESG measures is now more critical than ever for companies of all sizes.*

Consequently, the study tries to shed light on the effect of ESG on accounting conservatism practices, company value, and dividend policy.

Integration of Business Intelligence systems with the construction of a Balanced Scorecard

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Abstract. *A very important challenge for organizations is to have an integrated measurement framework that defines performance measures, financial and non-financial, and connect them with the organizations' strategies, then to analyze and report the results effectively and efficiently.*

One of the main components used in Performance Management is Business Intelligence, a technology-driven process used to analyze and process data, analyze the movements of the competitive and anticipate markets developments.

Combining the analytical efficiency of business intelligence with the strategic clarity of scorecard dashboards allows to save time and actually turn data into meaningful information for corporate management.

Business Intelligence systems may be able to implement new measurement and management systems more easily, giving rise to a positive relationship between the capabilities of the current information system and the successful implementation of the Balanced Scorecard model.

The adequacy of accounting education to the new challenges of the profession

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Abstract. *The accounting profession is going through a phase of change and transformation due, in particular, to increasing technological developments. The teaching of accounting cannot remain oblivious to these changes. The literature highlights that there is a gap in education in the development of core competencies required by the market. HEIs must renew and adapt their curricula so that students acquire the competencies that will enable them to face the future challenges of the profession. It is the responsibility of HEIs to ensure that the educational content meets market needs. Thus, this study is organized into four trials. The first intends to collect the conclusions of studies on curricular programs, teaching and learning methodologies and assessment methods. The second essay collects market perceptions about the functions, areas and skills of accountants through a questionnaire. The third is to survey the curricula of accounting courses in Portugal and international reference HEIs. Finally, the fourth essay, based on the evidence gathered in the previous essays, elaborate a curricular proposal for a degree in accounting.*

ESSAY ON AUDIT QUALITY AND EARNINGS MANAGEMENT: EVIDENCE FROM PORTUGAL

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Abstract. *This is a study about the main AQ determinants related to Portuguese audited companies. It also wants to understand the relevance of QA on EM practices, including the supervisor and governance enforcements.*

Essays on non-financial information disclosure

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Abstract. *The main objective of the Thesis is to analyze the companies' motivations for voluntary non-financial reporting and verify the effects caused by the introduction of mandatory regimes, such as Directive 2014/95/EU. To this end, we propose to carry out five essays, as follows.*

The first essay consists of a conceptual literature review, with the objective of presenting a systematization and delimitation of the concepts inherent to non-financial reporting as well as providing a view of the evolution of non-financial reporting regulations and standard setters and the most recent developments in this area. The second essay aims to identify the motivations for the voluntary reporting of non-financial information, based on a sample of Portuguese non-listed companies that prepare non-financial reports voluntarily and disclose them on their websites. The third essay consists of a literature review on the effects of the introduction of mandatory regimes for non-financial information disclosure, particularly Directive 2014/95/EU. The objective of the fourth essay is to analyze the effects on the quality and quantity of non-financial information disclosure of the transition from a voluntary to a mandatory reporting regime, particularly the Directive 2014/95/EU, based on data from a sample of European listed companies. Finally, the fifth essay aims to identify the factors that determine the quality and quantity of non-financial information disclosed by European listed companies in the context of Directive 2014/95/EU, based on the same sample of Essay 4.

Several data collection methodologies will be applied: content analysis of documents selected through Scopus and Web of Science databases (first and third essays); survey (second essay); content analysis of corporate reports (fourth and fifth essays) and search of financial and economic information in specific databases. The data processing and analysis methodologies involve content analysis and codification and, for the fourth and fifth essays, the use of quantitative methods using relevant statistical techniques, such as regression analysis.

The study, as a whole, contributes to the growing literature on the perception of motivations for voluntary non-financial disclosure and is the first study to apply this approach in Portugal. There are several studies on the effects of the transition from voluntary non-financial reporting regimes to mandatory, however this study contributes to the growing literature by adopting measures of quantity and quality, simultaneously, and through a longitudinal analysis of which there is no knowledge in Europe.

Implementation of Accrual Accounting in the Mozambican Public Sector: Current Situation and Future Perspective

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Abstract. *Given the desire to understand the factors that make it difficult for public sector entities in Mozambique to adopt and implement accrual accounting, the proposed study intends to provide current data from the position of main actors in that country towards accounting reforms in Public Administration. Based on the objectives described, the research questions to be answered in this project are: (1) what factors determine public sector entities from emerging economies to adopt and implement accrual accounting? (2) what is the perception of information producers about the implementation of accrual accounting in the Mozambican context? and (3) what is the perception of policy makers of the impact of its adoption on the Mozambican Public Administration? Thus, to answer the first question, in the first paper, we carried out a systematic literature review. For the second paper, we will assess the opinions and perceptions of information producers about the transition to accrual accounting through the application of questionnaires. In the third paper, the empirical research will use structured and semi-structured interviews with the main stakeholders involved in the functioning of accounting systems, formulation, implementation or policy review in Mozambique. Based on the systematic literature review, we emphasize that the world of accrual accounting is certainly the best way to improve public sector management and increase its efficiency, providing transparent and high-quality information for the decision-making process and enabling a greater comparability across countries through the harmonization of reporting. On the other hand, there is a significant increase in costs associated with the implementation of the new accounting regime in our analyses.*

FISCAL STRATEGIES OF COMPANIES AND THEIR RELATIONSHIP WITH CORPORATE SOCIAL RESPONSIBILITY

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Abstract. *In the literature there are several investigations on the relationship between the disclosure of CSR and the aggressive tax strategies of companies, however there is still a high scarcity of scientific articles related to the Portuguese reality. In this sense, the main objective of my doctoral thesis is to contribute to Portuguese scientific literature and also to motivate companies to increase their value, credibility and transparency through the dissemination of their tax strategies.*

My doctoral thesis will be structured in three scientific articles. The choice to use this method is due to the fact that it makes it possible to cover several subjects in the same theme. The first article will be carried out with the objective of revealing and analyzing the state of the art on the relationship between tax strategies practiced by companies and their CSR practices, highlighting the main fields of research related to this relationship and discovering possible fields of research. The methodology adopted will be a systematic literature review and the method chosen will be classification and coding with the objective of evaluating and synthesizing the evidence of the studies, in a broad and impartial way.

The sample selected for the second and third articles will be companies listed on the PSI 20. These companies were chosen due to their size because the probability of integrating CSR initiatives is greater (Giannarakis, 2014).

The second article will be carried out with the objective of verifying if there is any relationship between CSR and the aggressive tax strategies of the companies in the sample. This article will use secondary data from financial reports. The period under analysis will be from 2019 to 2021 and the data will be analyzed using multiple linear regression in SPSS (Mangoting, et al., 2019).

The third article will be carried out with the objective of investigating how Portuguese companies disclose information regarding their tax planning in their sustainability reports, to understand whether the new GRI standard has driven Portuguese companies to disclose their tax planning and to investigate to what extent companies disclose their fiscal sustainability related to the GRI 207 standard. The data collection methodology will be the sustainability reports of the sampled companies, the data will be analyzed through non-parametric statistical tests (Faúndez-Ugalde, Toledo-Zúñiga, & Castro-Rodríguez, 2017).

We believe that the questions asked are relevant, clear, feasible and consistent with the problem in question.

DBI - Doctorate in Business innovation

Traceability for Industrial Environments based on a High Tamper Proof System Enabled by Blockchain Technology

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Abstract. *The world is changing, consumers are more informed and more demanding. There is a need to track products and their origins. Transparency plays a key role in the moment of choice of a product. High customization is struggling the value stream and the supply chain. Manufacturers need to track efficiently their products and processes and give real time information for all interested parts internally and externally. Many challenges need to be addressed on a plant shop floor. This work proposes a decentralized network architecture approach to track and trace physical and logical assets on an industrial environment, by means of a tamper proof system, using blockchain technology, based on data capture on the field using identification and IoT devices. Discusses how to deal with concerns like security & privacy; efficiency & latency.*

3D Printing Capacitive Touch Sensors: A Comparison Study

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Abstract. *Additive Manufacturing (AM) is a group of technologies that deposit materials layer by layer to manufacture solid objects from digital models.*

AM of electronics comprises the printing of electronic devices by AM technologies. Thus, AM allows the manufacture of products with complex geometric structures and a great freedom of design. By depositing the materials only in the areas to be printed, material waste is avoided while favoring innovative designs and space optimization. These conditions allow resource-efficient and cost-effective production, and faster time to market for products in small volume.

State-of-the-Art Review in Modular Construction Technology

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Abstract. *The purpose of this paper is to review the current state of the art research on prefabricated modular construction in the building industry. Since this research area is very broad, this state-of-art review focuses mainly on and examined the aspects of design and design process, sustainability and reusability, cost comparison and BIM. Through an SLR, over 100 research articles were selected and evaluated in the Web of Science database. The result shows that the aspects design, sustainability, cost comparison are discussed many times but mostly independently from each other. A holistic approach describing an innovative design process of a building element, which includes all aspects in terms of design, pre-fabrication, assembly and reusability, sustainability, costs and BIM was not found and this basis for further research.*

The author of this paper is himself involved in a construction-tech project whose building concept, based on a structural defined and prefabricated lightweight elements made of a UHPC frame structure, being transferred from a concept to a marketable product.

Thesis preparation and planning, a first year as a DBI student.

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Abstract. *Highly unstable business environments have a negative impact on organisations. Businesses require productive and motivated people, especially in challenging times. This paper investigates knowledge management impact on change readiness in pharma business environments and the new possibilities technology provides for spontaneous and self-paced knowledge and skill acquisition to further increase the impact on change readiness. The question if specific factors can be identified to build a learning organisation that prepares people in knowledge worker roles better on unplanned change events will be answered in the proposed research.*

Keywords: Knowledge Management, antecedence of change, learning, Self-Determination Theory

The Development of an Information Technology Architecture for Automated, Agile and Versatile Companies with Ecological and Ethical Guidelines

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Abstract. *Based on many years of experience as a management consultant in different industries and corporate structures and cultures, the motivation to use digital transformation in connection with variable corporate goals?such as fluctuating workloads, agile response to customer inquir-ies, and ecological and economic sustainability?results in a process or a product to be developed that intelligently adapts to market requirements and requires forward-looking leadership. Using an AI-based methodical analysis and synthesis approach, the high consumption of economic and human resources is to be continuously monitored and optimization measures initiated at an early stage. The necessary information technology with its infrastructure and architecture is the starting point to accompany the agility and changeability of corporate goals. Researching the relevant documents begins with writing the panorama or the state of knowledge on the topic. This article is about the IT infrastructure based on the requirements for an architecture and behavior that a versatile, agile company needs to accompany the constantly changing framework conditions of the market. The technology used and the available resources, including the human resources, need to be adapted as early as possible. Data now represent the most valuable asset on Earth and future industrial manufacturing systems must maximize the opportunity of data usage. Low-level data must be transformed to make them useful in supporting intelligent decision-making, for example. Furthermore, future manufacturing systems must be highly productive, adaptable, absent of error, and kind to the environment and to local communities. The all-important design should minimize the waste of material, capital, energy, and media. Herein, we discuss the fulfilling of agile cus-tomer requirements involving adaptable and modulated production processes (related to the ?ag-ile manufacturing? and ?digital transformation? perspectives).*

Orchestration Framework to Support Decision Making in Value Stream Oriented Organizations

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Abstract. *Although nowadays organizations have a panoply of data at their disposal, it is becoming increasingly difficult to turn this information into added value and revenue. This thesis work aims at bridging this gap by creating a framework that matches data-driven use cases to a certain data model and appropriate prediction methods. This means that there is no need to start from scratch every time a new use case arises. As of now, these methods have been applied to two different manufacturing case studies: throughput time prediction and bottleneck identification and prediction. These act as a Proof of Concept and are meant to validate the concept beforehand. In the future, these results will be consolidated into the framework itself.*

Design Framework for Pharmaceutical Smart Factory Production

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Abstract. *The presentation proposes an innovative and new framework for guiding design processes in the area of conceptual development towards smart pharmaceutical production. The content has two sections. The first section includes a systematic literature review (SLR) based on a search with the keywords ?Pharma? and ?Industry 4.0?, based on two data collections. One through the lens of today's pharmaceutical production describing the As-Is situation. The other one from a more technological perspective describing a possible To-Be situation by the use of I4.0 concepts. The SLR emphasizes the need for a new design framework, which is described in the second section of the paper. The overall goal of the design framework is to provide a transparent and valid database for pharmaceutical development processes. To evaluate modular and smart pharmaceutical production concepts along their lifecycle including design, deployment and production is beneficial for all project stakeholders. An exploratory literature review about regulatory impact in pharma, design theory and modular machine concepts is basis for the second part of the paper. From Pharma perspective, Quality by Design (QbD) is an essential component of the framework. As design theory, Axiomatic Design (AD) was chosen to give guidelines to the process and maintain LEAN thinking in the process and production designs. The key contribution of this research lays in the exploration of design techniques for smart pharmaceutical manufacturing incorporated in a holistic framework.*

Implementation of a novel ostomy care technology

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Abstract. *In the medical context, a stoma (Greek for mouth, opening) is a temporary or permanent artificial outlet for intestinal contents or urine. It is divided into three different types: Ileostomy (small bowel diversion), Colostomy (large bowel diversion), and Urostomy (urinary diversion).*

The disease pattern, which makes a stoma necessary, can be found in all age groups of the population. In the developed world, 1 in 1000 people will be a stoma carrier at some point in their lives - whether temporarily (for weeks or months) - or permanently. More recent studies suggest a rate of 0.2%, i.e., 2 out of 1000 people, of the global population.

All stomas have in common that the excretions are collected in a pouch worn on the surface of the body. While this makes it necessary to change the pouch about once a day in the case of a colostomy, patients of an ileostomy or urostomy are forced to empty the bag, which is constantly full of liquid excretions, several times a day.

Many stoma carriers suffer great physical as well as psychological problems in their everyday life due to the installation of ostomy products: twenty-four hours a day, seven days a week the patient is tied to planning his or her activities around the cumbersome and potentially embarrassing pouch outside their body which can leak or need change at unpredictable times. Problems arise such as odor nuisance, noises, fear of leakage, impairment of sexual life, and other drastic changes in social life. The author is engaged in a project team of medical experts that want to develop a new solution which would revolutionize the ostomy care field. The proposed solution is a novel ostomy pouch that is no longer worn outside but inside the body.

This new device, project name Stomaplug, shall allow stoma patients to significantly reduce the problems that occur with current outside-body pouches, and in consequence, help them live a better life.

Based on the current state of development of the technology, the author currently works on the following questions and targets them in three distinct papers:

Key question 1 What is the current state-of-the-art of ostomy solutions, specifically inside-body pouches, in terms of academia, product portfolio, patent applications, and technology trends?

Key question 2 What are (unmet) needs in the field of ostomy products, and how should a new product be designed to meet them? Would users accept an inside-body pouch, specifically the Stomaplug concept?

Key question 3 What are the characteristics of the existing ostomy care market, and how can it effectively be entered in case of a new solution?

Autonomous driving management system to fulfill technology and legal compliance for autonomous driving SAE L3 and SAE L4

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Abstract. *ADAS & AD systems for SAE L3 and L4 functions require a permanent field surveillance and a continuous SW updateability. Key reasons are safety at any time and function expansions during the whole product lifecycle. The latter to enhance the ODD and increase the automated driving features within cars and trucks over the whole digital product lifecycle. But safety and security are the more relevant. It is eminent to ensure full safe functionality of the AD SAE L3/L4 functions within the trucks, to reduce downtime in the system chain and a malfunction within the E/E system. The first basis is laid by the new UNE ECE regulation frameworks for Cyber Security (R155) and Software Update (R156). They already have placed the necessity of technology management systems. The new UN ECE regulation for Automated Lane Keeping System (R157) for SAE L3 functions requires the fulfillment of these two regulations, but doesn't consider the handling of the complexity of advanced & non-deterministic SW (e.g. Deep Learning Algorithm) for ADAS & AD functions. These features require a more sophisticated approach, which concludes processes and methods to for an adequate incident & problem-solving management, anomaly detection, scaling of new SW AD feature and the management of field data (for improving). This leads to an holistic AD Management System (ADMS) framework ? it defines the safety, security and quality frame in terms of processes, methods, tools and organization through the whole digital lifecycle of a truck or a bus. It concludes the requirements from the safety & security norms like SOTIF, Functional Safety, Cybersecurity and Automotive Spice and ensures an advanced risk and threat management, which will be continuously adapted, a change and configuration management, which requires a fast incident reaction and function validation. The term of an AD management system addresses the challenges of operations of SAE L3 and L4 application considering the whole development phase and sets the organizational structure. Keywords: technology compliance, autonomous*

Innovation in the ocean's decade ? an analytical perspective

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Abstract. *The ocean has an immense economic and environmental interest in different countries, being the link between different production chains. A field of knowledge growing at the same pace as its commercial use. In the opposite direction, public conservation policies are advancing slowly in relation to the need for technological development and marketing rules.*

Different movements at a global level are taking place aiming at adopting public policies capable of following the marketing and technological research and development needs in the so-called blue economy sector; among them we highlight the Declaration of Belem (2017), the current United Nations Decade of the Oceans and the formation of the All-Atlantic Research Alliance ? AORA (2015).

In this unique context, this research project aims to understand the innovation process in the blue economy, among the countries that make up the AORA, during the last five years, and assess the role of the quadruple helix made up of public authorities, companies of different sizes, academia and NGOs.

This information together can constitute an economically viable option, from the economic perspectives, technological development and innovation, environmental, enabling economic and sustainable growth related to the oceans.

Investigation of sustainable Design Thinking for SMEs

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Abstract. *The increasing momentum and popularity of design thinking are driven by the corporate interest of organizations and culture in innovation (Calgren, Elmquist, & Rauth, 2016). Innovation is the key enabler for forward-thinking companies and for the prospects of success in making products and services competitive. The fact is that 90% of innovations fail (Kuester, Konya-Baumbach, & Schuhmacher, 2018). This shows that many companies are dissatisfied with the currently known innovation approaches or cannot integrate them directly into their project (Nakata & Hwang, 2020). Therefore, the biggest challenge for companies is to increase innovation performance internally to be established in the market for a long time (Buhl, et al., 2019). Design approaches are becoming more and more popular, so they are integrated into the value chain (Kahn, 2018). Despite the growing interest, we still know little about whether design thinking leads to better innovation performance in practice and, if so, how this happens, especially in SMEs (Robbins & Fu, 2021). Much of the existing work on design thinking is conceptual and exploratory. Most research is aimed at large companies (Robbins & Fu, 2021). Therefore, the research focuses on the direct measurability of design thinking in SMEs. This paper aims to demonstrate the practical application of design thinking in SMEs. Design thinking serves as a tool for the management of innovation projects. Interest in the innovative approach is also high in academia. Takeovers of design agencies by large consultancies are the best example of the increasing attention here (Dell'Era, Magistretti, Cautela, Verganti, & Zurlo, 2020). In this paper, an explorative study on Design Thinking in SMEs, from the perspective of management consultancy, will be conducted to find out whether Design Thinking can be applied directly with success or whether the implementation is not yet far advanced. Expert interviews will be used to determine the extent to which Design Thinking is integrated in SMEs and whether a sustainable positive development of the approach can be identified. The explorative study focuses on the perceived performance effects of Design Thinking. These interviews are intended to provide practical evidence of influence and to explore the different perspectives on SME development. The results should show clarity and diverse possibilities for small and medium-sized enterprises to structure their innovation process and to be able to develop service innovations systematically and creatively. The implementation in companies of the projects should result in which role Design Thinking, that above all the organizational structure and culture plays for the success of institutionalized innovation management. A transparent description of possible hurdles and missteps can help to save costs and time in the implementation of the approach. The aim is to show whether this approach has direct practical relevance in SMEs. The fundamental advantages that the procedure presented here offer for research are, firstly, the possibility of transferring knowledge from the research context into companies with direct practical relevance and, secondly, to transfer the knowledge gained back from the closed knowledge base of the companies into the scientific knowledge base, since the knowledge and practice generated in companies are usually withheld from the scientific discourse due to company interests. This makes it possible to offer all actors the opportunity to benefit from the proposed approach. This research aims to explore the possible uses of design thinking as a tool and examine whether it can be used as an instrument to check the sustainable development work of SMEs for the necessary innovation competence and corresponding options for action.*

Development of an Industry 4.0 maturity model for the operational unit in SMEs.

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Abstract. *The high benefit of Industry 4.0, once launched as a buzzword, makes it increasingly necessary for small and medium-sized enterprises (SMEs) to address the topic. While large companies can build primarily on market power and existing resources, the entry for SMEs is associated with many hurdles such as high costs, unspecific information, overwhelmed employees, lack of strategy, which not infrequently culminates in overwhelm, sometimes even resignation and capitulation. However, the future is not standing still and waiting. This dissertation focuses on gathering insights and recommendations for the introduction of Industry 4.0 in SMEs from a systematic literature review (SLR) and incorporating them into a newly developed maturity model that focuses on the Operational Unit (production, logistics and related administrative areas) of SMEs. This provides companies with a tool with which they can determine their current Industry 4.0 status and subsequently derive the steps to achieve the desired target level.*

The Challenges of Digitalisation - the Role of Leadership, Culture and Technology

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Abstract. *Many companies facing digitalisation lack a digital target model or transformation/implementation roadmap. Multinational companies as well as SMEs have to deal with different global market trends. Besides volatility, uncertainty, complexity and ambiguity [VUCA], companies' business models are constantly being influenced by disruptive technologies and solutions. And all this comes along with Industry 4.0 and digitalisation itself. Yet I4.0 and digitalisation are in many companies still buzzwords and lack substance. Assuming that the level of digitalisation of an enterprise has been defined, the main question is: "What does the digitalisation journey look like, and what are the transformation roadmap and the interdependencies?" This paper investigates whether, when and which of the interdependencies of company's functions are being neglected in the implementation of digitalisation. In a systematic literature review, gaps were identified especially in three previously defined categories that are directly related to the implementation of digitalisation, namely corporate culture, leadership and technology. After identification of these gaps, the missing link between these categories was discussed. In this way, the gaps revealed in the literature could be filled. The further scientific elaboration will primarily serve as a guide for SMEs to ensure a smooth implementation of digitalisation in the company.*

Keywords: SMEs; Digitalisation; Transformation Roadmap; Culture; Technology; Leadership; Industry 4.0;

Retail Investors – Needs And Capital Market Offerings In Sustainable Investments

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Abstract. *This thesis project follows a paper-based structure with the overarching topic of sustainable investments. This first paper is dedicated to (prospective) retail investors' attitude towards sustainable investments, with a focus on gender differences. The research is based on a dataset provided by the Portuguese Securities Market Commissions. To test the hypothesis of equalness, chi 2 testings are applied and a multinomial logit regression to identify determinants of sustainable investment knowledge and experience. The results suggest that there are gender differences in the attitude towards sustainable investing like the higher relevance of values for women. Moreover, well known gender differences in general investment knowledge and behavior are being confirmed. The second paper analyses the offerings of sustainable mutual funds and the first impact of new EU regulations on the classification of sustainable funds. requiring including ESG preferences in investment advice that will come into force at 2nd of August 2022. The third paper will identify potential gaps between investor expectations and market offerings and develop ideas to close these gaps.*

Overview of existing technologies and principles for water extraction from air

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Abstract. *Within the article, an overview of the technologies for water extraction from the air is given. A total of thirteen different main approaches were listed, described and their main advantage and disadvantage are identified. The technologies considered were divided into three main groups: direct water harvesting, vapor and humidity harvesting and byproduct water harvesting. Focus of the analyzed systems was always on the efficient extraction of water from the air. Furthermore, only some aspects, such as the production of drinking water, have been evaluated so far. For example, in none of the technologies was a water filtration system considered. This led to the research gap to develop a basic, robust and simplified overall system for harvesting drinking water from the air. Altogether three possible new systems are shown, which are analyzed based on prototypes within the entire thesis.*

Design

Publicidade e Design do Desapego para soluções sustentáveis.

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Abstract. *O ser humano está subordinado a um processo de atualização contínua, uma vez que o futuro já não é um objetivo, mas uma realidade ao serviço do presente (Branzi, 2006). Associando esta perspectiva, o Design do Desapego surge em intersecção entre a economia circular, a durabilidade ou longevidade emocional e design de serviço, no qual coloca o consumidor como protagonista do processo de reeducação do consumo numa sociedade holística. Este conceito defende o uso transitório dos objetos, ou seja, centra-se no usufruto e não na posse, num comportamento desprendido do objeto ou bem, enquanto coisa, mas não de suas experiências e vivências conjugadas como memórias afetivas no contexto de uso, por exemplo. Os objetos e serviços passam a ter valor situacional e quem os usa já está ciente disto, exercitando um?comportamento desapegado?.*

Posto isto, a comunicação publicitária pode ser o vetor para uma informação mais educativa explicando o que é a proposta do Design do Desapego e estimulando um compromisso para o debate, pois precisa ser relevante, sedutora e informativa sem ser demasiado entediante, estabelecendo conceitos para a compreensão de que os produtos ou bens possuem um potencial para além do pré-estabelecido. Paradoxalmente o excesso de conteúdo produzido hoje pode acarretar a dispersão de atenção e cansaço da audiência.

Deste modo, por exemplo, máximas como Economia Colaborativa, Comércio Equitativo, Economia do Desempenho, Economia Circular, crowdfunding, sharing, dentre outros, propõem reparar os deslizos e ineficácias de uma arquitetura económica robusta que se impõe há tempos. No mesmo sentido, Manzini (2004) considera a perspectiva de que ?o sucesso de soluções sustentáveis e o facto de serem adotadas globalmente pela sociedade depende de uma mudança na nossa ideia de bem-estar e na maneira como agimos para alcançá-lo? (Manzini, 2004:20).

Ainda em curso na pesquisa do doutoramento, decorre a elaboração de um guião que funcione como uma cartografia para se pensar um projeto de comunicação com aplicação do Design do Desapego desenhado, por exemplo, a partir do estudo de casos de algumas campanhas vigentes com abordagem sustentável.

Design furniture for collaborative workplaces. Notes from an ongoing research.

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Abstract. *The lifestyle changed and the evolution of mobile technology made it possible to introduce new nomadic ways of working. The future of work lies in a hybrid model between remote and presential work. Covid-19 accelerated the change to more hybrid and flexible work models already foreseen, for more hybrid models. The exponential increase in remote work and the creation of new work models has resulted in an increase in global flexibility. In fact, the workplace requires more flexibility and conditions to stimulate collaboration, socialization and sharing between teams and the community, to provide moments and experiences that they cannot have when working at home. Furniture design must approach flexibility and modularity as essentials to create more efficient and dynamic multifunctional workplaces that ensure the stability of workflows.*

In the last Research Summit 2021, the global framework of this research was presented, which has a case study the Design Factory Aveiro and the execution of furniture prototypes in partnership with GUIALMI (Empresa de móveis metálicos S.A.), strengthening the approach of scientific research with Portuguese industry. For the Research Summit 2022, it is intended to present the framework regarding the design process of the project, with the objective to create furniture systems to sustain sceneries of collaborative working.

This research contributes to the open science since its target is to design and prototype a flexible and modular office furniture system to create contemporary scenarios of collaborative work in collaboration with industry, including a comparative study of concrete examples of coworking spaces and other collaborative and flexible workplaces. And in addition to the contents and publications already made available, it intends to offer new insights to promote the design of future furniture systems and strengthen partnerships and collaborations between academy and industry.

Augmented Narratives: Research Progress

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Abstract. *The following research project aims to explore the potential of digital technologies, particularly Augmented Reality, in the construction of narratives in Information Design. This research is framed within the project Design Obs. - Towards a Design Observatory in Portugal: Models, Instruments, Representation and Strategies, which aims, on the one hand, to collect data, organize information and develop strategic research on the Portuguese design ecosystem, and, on the other hand, to design, develop and test new strategies for representing that information. It is in this second purpose that research concerning the representation of information with augmented reality technologies lies. In this research project, augmented reality is assumed as a support to the cultural mediation that Design can provide, similarly to other media, which have the potential to shape the content in a characteristic way. Under this premise, we intend to know in a first moment: How can augmented reality technology, as an ?invention material?, affect the configuration or conformation of a content; to, in a second moment, inquire: what are the narrative possibilities that augmented reality brings to information design. This research follows a practice-based approach, generically falling under the Research Through Art and Design typology and intertwines the development of a new artefact with reflection on it, based on its application in context and implications for design.*

In this edition of the Research Summit 2022, a quick review of the work done in the last year is made, in which we particularly pursued the purpose of understanding the conformation to which informative content is subject when represented in an augmented reality system. For this purpose, we developed, implemented, and tested the prototype of an augmented reality application for tablet. The app FLOC - Floating Companies allows the visualization of data regarding design companies in Portugal collected in the scope of the project Design Obs.. FLOC was initially developed for tablet and tested in the scope of the traveling exhibition "Design Observatory in Portugal - Situation" in December 2021 at the Faculty of Fine Arts of the University of Lisbon. The usability test in a real-life context carried out in this phase drove the reflection on data visualization in the hybrid space and enabled further development iterations of the prototype. In a new design iteration, among other changes, the FLOC application was adapted to a head mounted display, the Oculus Quest 2, and a narrative component was introduced. The new version of the FLOC prototype was showcased at the Design OBS exhibition held at the Faculty of Fine Arts of the University of Porto in late May 2022, where it was again tested by visitors attending the exhibition. The current moment involves the analysis of the data collected, but also a review of the work conducted so far, to organize future action.

Education

Images of languages and the Other: from and towards the community

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Abstract. *In the last two decades, and drawing on the concepts of 'social representation' derived from the area of Social Psychology and 'language representations' from Language Sciences and Sociolinguistics areas, the field of Language Didactics has developed the concept of 'image' as a form of thinking of and acting towards languages and people from other cultures. These images can have an impact on language learning and influence the contacts we establish or avoid with languages and people. Since images are socially constructed, our project intends to analyse the images of languages and the Other of a school community (9th grade students, guardians, teachers, staff and management bodies) and identify the interrelations between the images of these educational actors. After the diagnosis of the images by means of questionnaires and interviews to the whole community, data will be subjected to qualitative analysis (content analysis) and quantitative analysis (statistical, descriptive and inferential). The results will support the intervention program which will be constructed collaboratively with the community, with the following preliminary objectives: i) raise awareness towards the languages and cultures of the world; ii) promote the deconstruction of potential negative images. The sessions and activities of the intervention program will be recorded and the transcriptions will be subjected to content analysis. With this case study, we aim to delineate and implement proposals for an educative intervention concerning awareness to linguistic and cultural diversity in Portuguese schools. Since we take collaboration as a core value of our research, we consider moments of open science as opportunities to disseminate our work and reach school agents as a way to promote spaces of: i) dialogue about circulation and interrelation of images of languages and the Other in school communities; and ii) collaboration in the construction and dynamization of activities regarding language and cultural awareness in educational contexts.*

Growing up without walls: Articulation of educational practices between a nature education program and a kindergarten

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Abstract. *This research aims to design, implement and evaluate a Collaborative Training Program, in Preschool Education, in an exclusively online format, integrated in the project "Invisible Limits: Education in Nature Environment".*

The research question is: "What are the potentialities and limitations of the articulation of educational practices developed in a Program of Education in Nature: "Casa da Mata Program"(PCM) and in a Kindergarten?", with the purpose of co-constructing a "bridge"between these contexts, in collaboration with the respective kindergarten teachers.

The project emerged, on the one hand, from the need to foster collaboration between PCM and kindergarten teachers, and, on the other hand, from concerns raised by current research regarding the lack of opportunities for children to interact with nature, and, therefore, the need for articulation between outdoor spaces/nature and kindergarten classrooms. This problem is aggravated by confinement measures and has implications in terms of health, cognitive, socioemotional and motor development, and environmental awareness of the child.

Given the pandemic context and the consequent need to distance the five educators participating in this study (two from the PCM and three from a kindergarten), the Collaborative Training Programme is based on a digital platform, with reserved access, allocated to the website "Crescer sem Muros"(Growing without Walls, 2022), of public access. These digital resources are exclusively created and programmed according to both the research and Collaborative Training Programme goals, and to the needs of the study contexts.

The Collaborative Training Programme lasts six weeks, coincides with the twentieth PCM and is structured in six asynchronous sessions, five synchronous sessions and one synchronous session open to the community, with the participation of an international expert in Nature Education.

Through a qualitative case study, we intend to assess the contributions of the Collaborative Training Programme, on the one hand, in redirecting the educators' educational conceptions and practices, before and after their participation, using multiple data collection techniques - the researcher's diary, pedagogical documentation, semi-structured interviews, participant observation, written and photographic records, and data emerging from the digital platform. And, on the other hand, on the quality of the educational offer at the time of the observations, by assessing the levels of emotional well-being and implication of 16 children participating in the study, before, during and after the Collaborative Training Programme, through video records and the emotional well-being and implication scale of Portugal and Laevers (2018). The collected data are analyzed using the techniques of document analysis and content analysis, with support from the WebQDA software, which will allow its triangulation.

The study may contribute to the development of innovative educational and training strategies in Portugal and leverage the construction of scientific knowledge on the articulation between outdoor, nature and indoor contexts, with a view to promoting the diversity and quality of early childhood educational offers.

Reading and writing game in the teaching of English in a collaborative environment: a case study in Primary education

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Abstract. *This presentation, grounded on an ongoing PhD project, focuses on the impact of gamification on the promotion of learning reading and writing in a collaborative problem-solving context in Primary English classes. This is a qualitative case study that relies on different data collection techniques and instruments and their triangulation, to make its conclusions more consistent and provide it with scientific validity. It pursues two objectives: i) to identify and analyse the influence of gamified activities on the learning of reading/writing in Primary education and of its implication for their resolution; 2) to identify and analyse the impact of these activities on the development of collaborative work skills in a problem-solving context, namely: i) understanding, exploration and resolution; ii) groups? organisation and cohesion.*

The preliminary results analysis have made it possible for us to ascertain that: i) learners were engaged and motivated for English language learning; ii) the improvement of pupils' performance in reading and writing activities; and iii) the contact with reading and writing activities in English, stimulated by the principles of the gamified pedagogy, aiming to solve real world problems, seemed to foster the development of soft skills, such as creativity and critical thinking and also the deployment of group work strategies.

Social In(ex)clusion pathways in Vocational Education and Training: the project and its possible contribution to Open Science

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Abstract. *The communication aims to present the research project Social In(ex)clusion pathways in Vocational Education and Training: Towards a socio-educational proposal with and to its protagonists?, its current status and possible contribution to Open Science.*

The investigation main goal is to develop a socio-educational proposal with and for Vocational Education students and graduates, which promotes their empowerment as critical social actors, concerning to objective and subjective conditions that constrain the paths of social mobility, in favor of inclusion and against exclusion, targeted by this subsystem.

The in-depth literature review has contributed to the structuring of the theoretical framework in its micro, meso and macro dimensions. The problems of diversity, equity, social inclusion and exclusion (meso dimension) are, in fact, associated to the topic of biographical, school and post-school pathways of Vocational Education and Training students (micro dimension). Literature also shows us the relevance of the theory of social and cultural reproduction, the theory of linguistic codes and the dispositional theory as the main sociological frame of the investigation (macro dimension).

The research fits itself into the sociocritical paradigm and a qualitative approach is being developed, using the methods of Life Stories and Participatory Action-Research. Exploratory interviews were made to Vocational Education and Training students and school leaders and the analysis of the results discloses relevant findings to the study of the image of this educational subsystem and the students' trajectories.

On the other hand, the communication also highlights the project possible contribution to Open Science, due to the open dissemination of knowledge and the investigation participatory methodological options that aim the co-construction of a more inclusive and equitable society.

A Educação para a Diversidade Linguística e Cultural: Sistematização de conhecimento e Sustentabilidade da investigação

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Abstract. *O conceito de Educação para a Diversidade Linguística e Cultural (EDLC) tem orientado as políticas linguísticas educativas europeias e nacionais e, conseqüentemente, investigações que o tomam como princípio orientador têm obtido elevado financiamento. Contudo, verifica-se uma escassez de estudos que sistematizem criticamente o conhecimento emergente dessas investigações, existindo uma carência relacionada com a compreensão dos percursos efetuados, nomeadamente no que concerne à sustentabilidade e impacte dos resultados. Assim, a presente investigação surge para colmatar essa lacuna. Assente num paradigma interpretativo e numa natureza qualitativa, ela tem como finalidade propor linhas orientadoras para o desenvolvimento de estratégias de sustentabilidade que potenciem o impacte dos projetos em EDLC. Por conseguinte, procura responder a três questões de investigação: (1) ?como se caracteriza o conhecimento construído, nos últimos 20 anos, no âmbito de projetos financiados na área da EDLC?; (2) ?qual o impacte dos projetos e seus resultados nos discursos das instituições e dos sujeitos neles envolvidos?; e (3) ?que estratégias de sustentabilidade potenciam o impacte dos projetos em EDLC nas instituições e nos sujeitos participantes??. Para lhes dar resposta, traçaram-se objetivos e procedimentos metodológicos, que passam por: identificar e caracterizar, através de meta-análise, projetos financiados em EDLC que integram investigadores portugueses e se debruçam sobre contextos educativos nacionais; perceber as perceções dos diversos atores envolvidos relativamente a impacte e estratégias de sustentabilidade dos projetos, através de entrevistas e focus groups; e discutir as suprarreferidas estratégias com os participantes do estudo, entidades financiadoras e outros investigadores, através de um seminário.*

A banda desenhada na comunicação e educação em ciência: desenvolvimento de um recurso didático interativo

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Abstract. *Essa investigação tem como objeto de estudo a construção de um recurso didático interativo em banda desenhada que visa a comunicação e educação em ciência. O público-alvo são crianças do 1º Ciclo do Ensino Básico e integrará estratégias didáticas direcionadas para o desenvolvimento de aprendizagens e competências-chave em Saúde e Bem-Estar. O recurso será desenvolvido (desde a sua conceção e passando pela implementação e avaliação do impacto) num espaço de educação não-formal de aprendizagem das Ciências ? a Fábrica Centro Ciência Viva de Aveiro ? envolvendo os potenciais utilizadores (crianças e monitores) e especialistas da área (professores de ciências, designers, investigadores em didática e investigadores da saúde). A metodologia de investigação adotada é do tipo Investigação e Desenvolvimento (I&D), sendo de natureza qualitativa. Espera-se que este projeto possa contribuir para orientar profissionais da educação quanto ao uso da banda desenhada na comunicação e educação em ciência.*

STEAM and creative thinking: a formative proposal for initial teacher training

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Abstract. *This research project aims to develop, validate and evaluate a training proposal, in b-learning mode, with a STEAM (Science, Technology, Engineering, Arts and Mathematics) approach that promotes the creative thinking of future primary teachers, in order to allow them to teach science, promoting the creativity of their students. This qualitative study intends, through Design-Based Research (DBR), to elaborate, validate and freely make available the online course for teachers and future teachers of the primary school. Furthermore, it aims to contribute to the design of Curricular Units within the scope of Science Didactics with a set of recommendations on the promotion of the STEAM & Creativity dyad in the Initial teachers Training.*

Health Education in the first school years in Portugal – a perspective based on official Portuguese curriculum documents

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Abstract. *Segundo a Organização Mundial de Saúde, o conceito de Saúde envolve o estado de completo bem-estar físico, mental e social e não apenas a ausência de doença ou enfermidade. Do mesmo modo, a Educação para a Saúde também possui um conceito amplo e com desafios permanentes, que visa equilibrar a Educação com a investigação médica que a fundamenta, com efeitos socioculturais que culminam na promoção da Saúde em todas as suas dimensões. Um longo caminho tem sido percorrido neste sentido pela UNESCO, com o compromisso de fortalecer a ligação entre a Educação e a Saúde, recorrendo-se da interação entre o Objetivo de Desenvolvimento Sustentável (ODS) 3, que visa a globalização do acesso à saúde de qualidade, e o ODS 4, que visa a globalização do acesso à educação de qualidade. Portanto, este estudo visa identificar os conteúdos curriculares que estão relacionados com o tema 'Educação para a Saúde', no 1.º e 2.º Ciclos do Ensino Básico. A questão de investigação é: que áreas da saúde estão a ser contempladas nos documentos curriculares e de referência de Portugal? Para tal, foi realizada uma revisão de literatura para perceber o que a comunidade científica entende sobre o tema e quais são os objetivos de aprendizagem relacionados com o mesmo. Por fim, procedeu-se à análise documental dos documentos curriculares portugueses Aprendizagens Essenciais de 2018 e de 2021. Os resultados indicam a presença da Educação para a Saúde nos documentos curriculares portugueses, mas sem interligação das diversas áreas do saber e com pouca exploração de certas categorias definidas em documentos internacionais orientadores da Educação para a Saúde. Conclui-se que Portugal considera a Educação para a Saúde como parte integrante do currículo, mas pode ainda melhorar a abordagem e distribuição das áreas da mesma.*

Regulação local da educação em Portugal: configurações e desafios da relação entre o município e os agrupamentos de escolas

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Abstract. *Quer por razões de natureza político-normativa, advindas de opções governativas, quer por iniciativas à margem do poder legislativo, que resultam da alteração da normalidade da vida das populações tem-se assistido a uma intervenção crescente da participação dos municípios no domínio da educação. Aos municípios portugueses, sobretudo a partir da década de 80 do século*

anterior, vêm sendo reconhecidas responsabilidades na área da educação. Este processo de atribuição tem passado por várias fases, geradoras de tensões e desafios, culminando com o alargamento de competências consagrado em normativos recentes, de 2018 e 2019, os quais evidenciam orientações políticas no sentido de reforçar a atuação de municípios e entidades intermunicipais na educação.

Com esta pesquisa, e tendo como enquadramento os processos de descentralização, municipalização e territorialização, procura-se, através do cruzamento de olhares (dos agentes municipais e escolares) compreender como, num dado município, se desenvolve a relação entre município e agrupamento(s) de escolas. Para tal, o estudo adota uma natureza qualitativa, sustentando-se no estudo de caso.

Co-construindo um third space: plurilinguismo e interculturalidade na Raia luso-espanhola

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Abstract. *As zonas de fronteira caracterizam-se pelo seu elevado grau de diversidade linguística e cultural (DLC), podendo ser percebidas como ?cicatrices da História?, ideologia que tem sido reiterada pela atual conjuntura de crise sanitária e humanitária, ou como propícias para a construção de um ?third space?, no qual os sujeitos reconheçam as suas identidades plurais e perspetivem as suas diferenças como potencialidades.*

Adotando esta última perspetiva, e considerando a intercompreensão decorrente da familiaridade entre as duas línguas românicas de escolarização implicadas (português e espanhol), a fronteira luso-espanhola constitui-se um locus privilegiado para a promoção de múltiplas convivências e de coesão social que reforcem, no tempo e no espaço, relações simétricas bilaterais entre os países vizinhos. É perante este contexto que emerge o Programa Escolas Bilingues e Interculturais de Fronteira (PEBIF), promovido pela Organização de Estados Ibero-americanos para a Educação, a Ciência e a Cultura em articulação com os governos de Portugal e Espanha, e no qual se insere o nosso projeto.

Através do estabelecimento de parcerias entre quatro grupos de escolas-espelho de ambos os lados da fronteira luso-espanhola (Bragança-Zamora, Guarda-Miróbriga, Elvas-Badajoz-Cáceres e Vila Real Santo António-Huelva), e num contexto de formação contínua, os professores, juntamente com formadores e outras entidades das comunidades educativas locais, desenvolveram e implementaram projetos de aprendizagem (PA) colaborativamente em turmas do 1.º ao 6.º ano de escolaridade. Propomo-nos compreender o valor educativo dos PA enquanto promotores de práticas pedagógico-didáticas e aprendizagens plurilingues e interculturais, bem como seus constrangimentos e potencialidades para a extensão do PEBIF a outros contextos de fronteira. Para tal, procederemos à análise: dos PA dos grupos de escolas-espelho, focando-nos nas aprendizagens, recursos e atividades planificadas, atendendo a referenciais teóricos na área e ao quadro de políticas educativas linguísticas europeias; dos relatórios reflexivos redigidos pelos professores-participantes; dos materiais gerados pelos alunos do grupo Vila Real Santo António-Huelva, que acompanhamos no decurso do projeto; e da perceção dos diversos stakeholders sobre os contributos do PEBIF para as aprendizagens dos alunos e para a valorização da DLC do contexto socioeducativo da região, através da realização de um focus group.

Cientes da responsabilidade social e da relevância da ciência aberta para uma visão mais integrada da investigação, o trabalho colaborativo entre e com diversas entidades (académicas e não académicas) constitui um dos eixos nucleares do PEBIF. De modo a reforçar essa abordagem, prevê-se a cocriação de um documento com linhas orientadoras sobre práticas educativas plurilingues e interculturais numa ótica de sustentabilidade e extensão do projeto. Espera-se, assim, contribuir para a construção de quadros de referência e princípios de atuação na área visada, replicáveis a outras escolas de fronteira.

Mobilidade Transnacional de Alunos do Ensino não Superior em Portugal: um estudo de caso

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Abstract. *O processo de europeização da educação relaciona-se com o processo de integração europeia e com a elaboração de políticas educativas nacionais, assistindo-se ao incentivo da União Europeia à mobilidade dos cidadãos, concretizada através de programas educacionais. Estas políticas educacionais são interpretadas e recontextualizadas nas organizações escolares, nelas operando interesses diferenciados e potencialmente divergentes entre os vários atores da organização escolar, nomeadamente na implementação de programas educacionais. Este estudo propõe compreender como se desenvolve e ressignifica a mobilidade transnacional de alunos do ensino não superior no âmbito do Programa Erasmus+ (ação-chave KA2) num Agrupamento de Escolas/Escolas Não Agrupadas de Portugal. A investigação, decorrente da questão geral e dos objetivos, contém duas vertentes: uma extensiva, que permitirá obter o mapeamento dos Agrupamentos de Escolas/Escolas Não Agrupadas que aderiram ao Programa Erasmus+ (ação-chave KA2) no ensino não superior em Portugal, e uma intensiva, através do design de estudo de caso, que possibilitará compreender como um Agrupamento de Escolas/Escolas Não Agrupadas ressignifica e recontextualiza o Programa Erasmus+ (ação-chave KA2) no contexto da sua ação concreta. Enquadra-se no paradigma interpretativo e a metodologia assume uma natureza mista, com predomínio qualitativo, uma vez que se analisarão dados, através das técnicas de análise de conteúdo e de análise estatística descritiva, obtidos pela análise documental, entrevista semiestruturada e inquérito por questionário. No final, far-se-á a triangulação dos resultados. Será organizada em duas partes: uma primeira, com o enquadramento teórico, político-normativo e contextual do estudo, e uma segunda parte, pelo trabalho empírico.*

Let's talk about Grief: Building a theoretical framework for Grief Counselling with systematic literature review

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Abstract. *Grief is an inherent phenomenon of life. Every human being will experience it at a given moment in their life. In literature, it is defined as a normative, natural and healthy process, which results from the loss of an affective bond that can be real, when due to the death of a loved one, or symbolic, in the case of the loss of an expectation or fantasy of affection. To be considered grief, in addition to the loss, it must present the response, namely the set of symptoms and strategies adopted by the bereaved person that, when adaptive, define Normal Grief. Grief Counseling is a therapeutic method of intervention in healthy grief, carried out by education, psychology, health, and social work professionals, - called Grief Counselors -, to support the bereaved in adapting to loss and facilitating harmonious adjustment to the new reality. This therapy accelerates the grief process that, although natural, was being prolonged in time, thus preventing the onset of Prolonged Grief Disorder or mental illness. This study aims to co-create a curricular program of continuous and specialized training in Grief Counseling for the Portuguese context. We set out to build a theoretical framework with a focus on the concepts of Normal Grief and Grief Counseling through two systematic literature reviews. In the first, on Normal Mourning, we found 95 articles published between 2017 and 2021, in the Scopus, Eric, and PubMed databases. Eight met all eligibility criteria. The second systematic review, on Grief Counseling, identified 228 articles published between 2017 and 2021, in the same databases and WoS, and selected 12. The literature defines Normal Grief as a normative process that takes place after a life-changing event to adjust to the new reality, characterized by a set of different symptoms (physical, cognitive, emotional, behavioral, and spiritual). The response to these symptoms, if adaptive, indicates normal grief as opposing complicated grief. Grief Counseling is a specialized therapeutic intervention carried out by professionals in the social and human sciences and the life and health sciences, whose objective is to improve the adaptive strategies of the bereaved person to facilitate adaptation to the new reality and prevent complications from the grief process. Normal Grief is a universal life experience that affects children, young people, and adults, and implies cultural and transversal diversity in personal and professional relationships. The bereaved benefit from Grief Counseling for the prevention of grief pathologies, improvement of adaptive and resilient capacity, personal and social development, and aiming for the normativity of the new reality.*

The integration of Didactics in the training of Accounting teachers in higher education

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Abstract. *The social and technological changes that society is facing require accounting teachers to invest in innovative educational strategies and resources that may promote, in addition to the scientific training of students, the development of transversal skills crucial to the exercise of the profession.*

We are convinced that such a challenge cannot be separated from an adequate preparation of the teachers in the area of Didactics.

In this context, there is an urgent need for further research into new forms of pedagogical development for Accounting teachers. Thus, this project aims to understand and interpret the reality of the Didactic Training of Accounting professors in Portuguese public institutions

And to improve and transform this reality through the development of a training program in Didactics of Accounting addressed to Accounting professors in higher education. Thus, contributing to the advancement of scientific knowledge in research on accounting didactics, and being one more reference for the training of teachers in higher education institutions.

As a cyclical research process, which alternates action and critical reflection on that action, the research is guided by a Research-Action methodological plan and is divided into two stages.

The first stage, of exploratory nature, will make it possible to clarify the research field and make a first diagnosis of the situation, through the following procedures:

i) systematic review of the literature on the "state of the art" of training in Accounting Didactics in higher education and other areas; (completed - accepted ICET - International Conference on Education and training / Submission of paper in international journal)

ii) documental analysis of the national and international official documents that guide higher education in Accounting in Portugal; (concluded, with paper under production)

iii) documentary analysis of undergraduate and graduate courses (bachelor, master and doctorate) in Accounting from Portuguese public institutions, in particular the course units (CU) related to training in Didactics of Accounting; (concluded, with paper in production)

iv) Collection of representations and practices explained by:

iv-1) experts from the Ordem dos Contabilistas Certificados (OCC) and the Ordem dos Revisores Oficiais de Contas (OROC) through a survey by semi-structured individual interview;

iv-2) key actors (directors and coordinators) of undergraduate and graduate accounting courses (bachelor, master and doctoral) through a focus group survey;

iv-3) Accounting professors (in collaboration with the Portuguese Accounting Research Network (GRUDIS)), through the application of an online questionnaire survey.

The collected data will be analyzed using the content analysis technique (Bardin) with the support of the WEBQDA software.

Taking into account the results obtained in stage one, exploratory, in stage two, interventional, it is intended: Design, implement and evaluate the Training Program through: a) of the researcher's participant observation during the process of developing the Training Program; b) of the survey by semi-structured individual interview to all the participants of the Training Program (researcher, teachers and those enrolled, in this case, teachers of the Accounting area)

Global citizenship education and intercomprehension: proposals for early school years

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Abstract. *Thinking about curriculum implies a reflection not only about how can we educate, but also why do we educate, what we educate for, who we educate and who we need to be as educators. Although these topics have been discussed for a long time since they are at the core of understanding what Education is, they require, in fact, a continuous never-ending contemporary adaptation. Globalization has brought diversity and hybridity as trademarks of contemporaneous societies, namely western/neoliberal democracies. Both diversity and hybridity can be identified in social and political struggles such as immigration, global border crossing, capital and labour, and the changing nature of cosmopolitan democracies namely through (unethical) technological change and economical and financial (blind) development. Also, the way we understand what it is to be human today has been transformed through the imposition of a neoliberal ethical and moral through the expansion of the free markets and the global economy.*

Such transformations imply the construction of a new understanding of education. Therefore, and as the literature developed on the subject has portrayed, education needs to transform itself, in order to respond to what can be understood as the main social function of public schooling: the education of critical citizens capable of participating in an active way in the local and global community, towards the construction of more sustainable and democratic societies.

The educational perspective that we call Global Citizenship Education has currently been the subject of growing interest by different actors: supranational entities and bodies such as the United Nations or the North-South Centre of the Council of Europe; Non-Governmental Organizations such as Oxfam (international) or the Global Citizenship Education Network (national); governments such as Portugal, Singapore, the United States of America or Poland; or even by numerous researchers and academics. All this interest, as expected from a fruitful and interdisciplinary investigative field, has raised countless questions, doubts and possibilities, portrayed, namely, within the research carried out by the latest actors mentioned above. Although we were able to observe some growth in the number of publications about GCE since 2012, it is the year of 2015 that marks a considerable in the number of publications about GCE, especially in Europe (Digest 2020, 2021).

From the explorative study that preceded this research we were able to conclude how Intercomprehension plays an important role since the first years of schooling in the development of children's identities. Namely, through its multimodality and pluri-functionality Intercomprehension presents itself as an educational aim that intends an education that prepares citizens to deal with the Diversity and Hybridity that characterizes contemporaneous global societies. It does so by putting side-by-side both languages and cultures, both language diversity and cultural diversity. In this sense, we argue that a Global Citizenship Education that from the first years of children's education is implemented in articulation with Intercomprehension constitutes an adequate, relevant, and pertinent way for children's development and learning about themselves, the Other and the World.

Considering the above this research aims to understand how we can educate for global citizenship through intercomprehension in the first years of schooling. To this end, in collaboration with a group of teachers we developed and implemented two different sets of activities with children in primary education in Portugal. Data collected is composed by children's learning portfolios (drawings, writings, pictures, ?). Furthermore, we were able to collect teacher's portfolios (Pre- and Pos- inquiries, individual and group reports, ?) which was done for the purpose of us being able to propose a sustainable, scalable, and relevant curriculum for Global Citizenship as it is inte

Inclusion of children with Special Needs in Arts Education Programmes: form Research to Action

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Abstract. *Inclusion of children with Special Needs in Arts Education Programmes:
form Research to Action*

In order to contribute to the Inclusive Education of children with Special Needs in Arts Education Programmes, an action-research project began in September 2018. With this project, it is intended to find solutions so that children with motor disabilities resulting from Cerebral Palsy who enter the Arts Education Programmes of Music, in the First Cycle of Basic Education, can develop their potential and artistic skills using Digital Technologies. In this research the following actions have already been carried out:

i) Several bibliographic reviews, in order to know what the literature can tell us about this subject (state of the art); ii) Different interviews to both parents and professionals who work with children with Cerebral Palsy and Music Teachers, in order to obtain information about the characterization of children with Cerebral Palsy, to understand their needs, to obtain information about Digital Technologies and Support Products they use, especially about educational software and to know the perceptions of the interviewees about the inclusion of these children in Music Education, namely in Arts Education Programmes of Music; iii) an initial training proposal was outlined to raise awareness of this theme among professionals in Arts Education Programmes of Music and Inclusive Music Education, health technicians and others, enhancing interdisciplinary collaborative work and, iv) Doctoral Training Course (six months) at the Department of Computer Science of the University of Milan, Italy, with the purpose of getting to know the different Technologies they use in favour of the inclusion of children with Special Needs in the Teaching/Learning of Music.

At this moment we are waiting for the approval of the Long Duration Training Project by the Pedagogical Council of Continuous Training in Portugal. This Training will be held in the Artistic School of the Conservatory of Music Calouste Gulbenkian Aveiro, with repercussions in other educational establishments. At the same time, an Intervention Project will be started with a view to the effective inclusion of the child with Cerebral Palsy that originated our study, who the aim of transforming the Arts School of Music in an Inclusive School for all.

Interculturalidade na formação contínua de professores. O caso do Projeto Escolas Bilingues e Interculturais de Fronteira

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Abstract. *A nossa investigação insere-se no Projeto Escolas Bilingues e Interculturais de Fronteira (EBIF), um projeto de co-opeção bilateral entre os governos de Portugal e de Espanha e as Comunidades Autónomas, tendo a OEI - Organização dos Estados Ibero-americanos - como parceira estratégica e a Universidade Complutense de Madri e Universidade de Aveiro como coordenadoras científicas e responsáveis técnicas.*

O objetivo geral do projeto EBIF é promover a cooperação entre Portugal e Espanha no desenvolvimento educativo, social e económico de territórios de fronteira, através da criação de uma rede de escolas e do desenvolvimento de um processo de formação contínua sobre o bilinguismo e interculturalidade, voltado aos professores destas escolas fronteiriças. Entre seus objetivos destacamos ainda o de contribuir para a investigação educativa e inovação pedagógica, pelo qual se resguarda uma importante dimensão investigativa do projeto, onde está aportado o nosso estudo.

Adotando uma metodologia de investigação-ação-formação, o PEBIF estrutura-se em 4 fases: i) identificação dos participantes, escolas/professores do 1º/2º CEB, organizados em pares de escolas de fronteira, denominadas 'escolas-espelho', ii) formação dos professores, iii) construção e implementação pelos professores, em processo de formação, de projetos de aprendizagem, com acompanhamento dos formadores e iv) extensão do bilinguismo/interculturalidade nas escolas de fronteiras.

Implementado, entre outubro de 2021 e maio de 2022, o projeto EBIF envolveu 4 pares de escolas-espelho, em 4 diferentes regiões de fronteira (Bragança-Zamora, Guarda-Miróbriga, Elvas-Badajoz-Cáceres e Vila Real Santo António-Huelva). Nosso estudo debruçou-se sobre duas dessas escolas, situadas na fronteira ao norte, entre Bragança/Portugal e Zamora/Espanha, com o objetivo de compreender, através de uma investigação do tipo estudo de caso etnográfico, as potencialidades e os contributos emergentes da formação contínua realizada no Projeto EBIF, relativamente ao desenvolvimento profissional docente e à (re)significação da prática pedagógica, voltada à interculturalidade e ao bilinguismo nas raias luso-hispânicas.

Para o efeito, recorreremos à análise documental e à observação participante, numa abordagem sócio crítica e qualitativa da investigação e como resultado, esperamos reunir fundamentos que contribuam para a constituição de quadros de referência, incidentes sobre novas propostas de formação contínua docente, que sejam potenciadoras da educação plurilíngue e intercultural em outras regiões de fronteiras.

Nesse último ano dedicado à investigação, foi-nos possível alcançar resultados relevantes. O último avanço determinante no processo do nosso trabalho refere-se à finalização da fase de produção de dados, os quais foram consubstanciados em uma narrativa multimodal e enviada aos professores participantes para validação. Ademais, foi-nos possível dar a conhecer o nosso estudo através da participação em diferentes eventos académicos, com apresentação de trabalhos e publicação de resumo e/ou texto completo.

Em prosseguimento, passaremos à análise dos dados e temos planeado outras ações que objetivam a comunicação do nosso estudo junto à comunidade académica, mediante a participação em eventos científicos.

Ainda na vertente da divulgação e transparência no processo investigativo, tendo em conta que nossa investigação está a ser desenvolvida numa dinâmica que implica a colaboração dos professores participantes na qualidade de atores e (co)autores, estamos a elaborar colaborativamente um artigo, visando a primeira publicação em coautoria. Acreditamos, assim, estar a construir um bom caminho na produção do conhecimento científico e a contribuir para a edificação de uma ciência aberta, político e socialmente responsável.

Educating for biocultural diversity in first years of schooling: A path to sustainability

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Abstract. *Thinking about education currently requires action focused on themes and issues that we face in our daily lives, with sustainability being one of the significant goals of education for the 21st century (see Agenda 2030). In this sense, several studies have been developed in an educational context, both in terms of research and training, to solve problems, promote actions and transform contexts, and integrate discourses, practices, and political agendas of tomorrow. Recognizing sustainability and its multiple spheres as one of the significant global priorities not only at the political but also at the economic, social, cultural, and environmental levels, for example, requires us to rethink education with the aim of (re)orienting it towards response to current challenges, which today are characterized by their volatility, uncertainty, complexity, and ambiguity. Thus, we understand education as a fundamental means to face these challenges, being essentially an educational activity focused on the development of skills, that respect, promote, and value the well-being of all species, guaranteeing the quality of life.*

As such, the present investigation arises to understand how an action focused on biocultural diversity, that is, on the interdependent and co-evolutionary relationships existing between languages, culture, and biological diversity that surround us can contribute to sustainability, ensuring a better quality of life for all species, through environmental protection, social equity, and economic viability. This study focuses on a multiple case study in development with a diverse audience. At first, there was training about education for sustainability with the theme 'dialogue, diversity and inclusion' for teachers of kindergarten education and 1st cycle of basic education. In a second phase of the investigation and implementation of this empirical project, two teachers (one from kindergarten education and the other from the 1st cycle of basic education) who participated in the training and their groups of children are expected to work. This intervention will focus on education issues for biocultural diversity to contribute to sustainability. Thus, through a set of intervention projects designed by educators of the 1st Cycle of Basic Education on education for sustainability and which include resources and strategies related to biocultural diversity, we aim to understand how we can contribute to an education that, by embracing this perspective, directly contribute to sustainability issues and rebuild the projects, re-implementing them so that we can monitor the learning of children and teachers.

For data collection, we foresee the use of the following techniques and/or instruments: a) initial questionnaire survey to teachers to identify their representations; b) document collection - planning of project sessions; c) document collection - reflections of the teachers; d) document collection - resources produced by children. Through these techniques and instruments, we intend to answer the research question 'How to educate for biocultural diversity in education processes for sustainability in the first years of schooling?'. Given the research question, the objectives that support the development of the study emerge, which are: O1: analyze the role of education for biocultural diversity in the first years of schooling from the theoretical and normative framework that supports the investigation; O2: build knowledge on the integration of educational practices for biocultural diversity within the scope of education for sustainability in the first years of schooling; O3: design and implement education projects for biocultural diversity; O4: analyze learning related to education for sustainability.

The investigation will last four years and was designed in five phases. The first phase concerns the development of a theoretical framework around the key concepts, capable of sustaining the investigation and that extends throughout the in

Local Built-Heritage in Mobile Game for development of key skills related to Education for Sustainability

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Abstract. *Sustainability is associated with the need of valuing heritage, whether natural or built, human or cultural. Sustainability is very involved with issues of environmental, social and economic nature, and related to natural resources, however, from the 21st century on, it has become a more comprehensive field, since the concept itself has evolved (Giovannoni & Fabietti, 2014).*

One of the areas that now appear highlighted in the multi-complexity of Sustainability, is the one related to Built Heritage (UNESCO, 2020; Hosagrahar et al., 2016), linked to the principle of this being a non-renewable resource (Hosagrahar et al., 2016). Based on this premise and on referentials from international organizations, such as UN or UNESCO, not only the appreciation of the Built Heritage is fundamental, but also essential to highlight it as sustainable human development, highlighting the role of Education in designing the future, which, even complex, need to be balanced and sustainable. However, the literature on the correlation between Education for Sustainability and Built Heritage is limited, making it necessary to deepen and publish about it.

This investigation, will contribute to the development of key Skills for Education for Sustainability (Wiek et. al, 2011), based on the valorization of the Art Nouveau Heritage of Aveiro, taking advantage of the educational potential of mobile learning (Pombo & Marques, 2019), through the development of a mobile educational game for Basic and Secondary education levels students, through a Mixed Methodological Research, to be developed in five stages, guided through a sequential exploratory design.

Civil engineering

Circular economy approach to construction materials incorporating paper & pulp industry wastes

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Abstract. *The construction sector consumes a lot of natural raw materials and other resources (water and energy). In addition, ecosystems are not balanced due to increase of waste production and CO₂ emissions. On other hand, the pulp and paper industry is a large producer of wastes that are most of them deposited in landfills. These sectors have followed a linear economy approach (take-make-dispose), but this model is not feasible to promote sustainability. In the opposite direction, circular approach is necessary to preserve the natural resources and our life in the planet.*

In this work, the research involved a literature review on pulp and paper and other wastes used as alternative raw materials in construction products as well as a review on circular economy, sustainable construction and on life cycle analysis on construction materials.

The case study based on incorporation of wastes from pulp and paper sector to produce precast concrete and road pavements in order to assess this circular model and operation sustainability (environmental, economic and social dimension). The first case, natural filler was replaced by lime ash waste to produce precast concrete and this material was used to built three porticos (6 columns and 3 beams) of an industrial pavilion. Although, the second case, dregs and grits were partially used to replace fine aggregate (0-4mm) in a bituminous mixture (AC 14 surface) to produce a 250m of the surface layer in a road.

These pilots had a laboratory and in situ control, to evaluate the main properties that are usually included in the CE marking datasheet. At the same time, LCA analyses were performed to evaluate the impacts and benefits from the environmental, economic, and social levels.

The incorporation of wastes as alternative raw materials in these construction materials was possible and delivered gains in sustainability without affecting technical performance.

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Constitutive models for numerical analysis of the short- and long-term behavior of geosynthetics and mechanical damage

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Abstract. *The objective of this research is to analyse the tensile response of geosynthetics, apply constitutive equations, and propose values for model parameters to represent the nonlinear behaviour of these materials in the short-term and the long-term. Data for specimens submitted to mechanical damage, abrasion damage, and mechanical damage followed by abrasion damage will be analysed. Nonlinear regressions of the experimental results will be performed to fit the load-strain curves to constitutive equations. For each geosynthetic, the results of damaged specimens will be statistically compared to those of the undamaged specimens to observe the influence of the induced damage on the tensile behaviour of the materials over time. Experimental results will be statistically compared with those obtained by the constitutive models to verify if the tensile properties and the model parameters are properly estimated.*

Building Condition Assessment Applied to Public Buildings

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Abstract. *The main objective of this thesis is to develop a new practical, reliable and unified platform for Sustainable Asset Management. For this purpose, a Building Condition Assessment (BCA) strategy, based on quantitative and objective tools like Key Performance Indicators (KPIs) and on a Machine Learning Model is being developed to maximize the building's material longevity. The BCA strategy and the Machine Learning Model, as well as the researched sustainable maintenance solutions and processes during the FM/AM phase, will be integrated into a collaborative Building Information Modelling (BIM) software.*

Guidelines for Artificial Nourishments Interventions: Improving Design Processes

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Abstract. *Worldwide, coastal erosion is one of the main issues in coastal environments that causes loss of territory and put people and goods at risk, being estimated that 24% of the world sandy coasts are under erosion. In Portugal, 45% of the sandy beaches are facing the same problem. To mitigate coastal erosion, in the last decades artificial nourishments become one of the main coastal intervention strategies, allowing to reduce the sedimentary deficit on the coastal zones. This strategy consists of the addition of large volumes of sand to a coastal area, acting directly on the cause of erosion, allowing the beaches to maintain their protective and recreational functions. After being deposited, the sediments are redistributed due to the hydrodynamics actions at the placement site. The performance and longevity of the intervention is dependent on several parameters related to volume, frequency, placement site, sediment dynamics, sediment sources, complementary strategies, etc.*

Coastal erosion mitigation requires effective strategies, planned in a long-term perspective. In this context, numerical modelling is an important tool. However, due to the complexity of the coastal processes, each model focuses on specific type of processes, being generally divided into models of long-term (years to decades), considering longshore processes (shoreline evolution), and short-term (days to months, or few years), related to cross-shore processes (beach profile evolution), and usually the long term models do not merge cross-shore and longshore processes.

To study the impact and the longevity of the artificial nourishments to mitigate coastal erosion in a long-term perspective is the main objective of the proposed research. The research method defined is based on numerical modelling, since the results provided by the models allow to compare solutions, supporting the decision-making process. However, due to the complexity of the coastal processes, the existence models focus on specific type of processes, being generally divided into models of long-term and short-term and the models of long-term do not merge cross-shore and longshore processes. Thus, the research method comprises two main objectives. The first is related to improve the long-term numerical modelling abilities of one model that was developed in the University of Aveiro, named LTC. The goal is to implement the cross shore processes in the LTC and this way to obtain an innovative long-term model able to merge longshore and cross-shore processes. The second is to apply the model to study the performance of artificial nourishments projects and to bring forward proposals of nourishments design based on its cost-benefit analysis.

The preliminary results obtained in the scope of the PhD work, published in journal papers and conferences, using as study case the Portuguese coastal stretch Barra-Vagueira, demonstrate that unless specific actions are implemented, in the future the shoreline will continue to retreat. Mitigation measures that allow to decrease the sediment deficit, such artificial nourishments, are one of the most effective strategies to mitigate the risk of erosion. However, there are still knowledge gaps in understanding the performance of the intervention related to design parameters and its impacts on the sediment dynamics. Therefore, further studies and analyses should be undertaken in order to define design guidelines for artificial nourishments interventions that maximize the benefits of the interventions and decrease its costs

The developed research aims to contribute to the objectives of the open science since the targeted research that is being performed tries to contribute to develop knowledge about coastal erosion mitigation strategies with the goal of being shared with the scientific community and society to achieve a most effective management of sandy coasts.

Fire design of tapered steel members

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Abstract. *The present thesis describes a numerical parametric study on the stability of steel web-tapered I-section members in fire, with the ultimate goal of proposing safe, practical and accurate methodologies for the safety check of these members at elevated temperatures.*

Currently, the verification of non-uniform members at normal temperature is done in clause 6.3.4 of Part 1-1 of Eurocode 3, also designated as the General Method. On the other hand, the fire part of the norm (Part 1-2) provides no further indication regarding its applicability at elevated temperatures, apart from adapting the methodology to fire using the standard reduction factors for steel material properties.

However, it has been demonstrated in the scope of the present thesis that such adaptation is not enough to account for all the nuances of the structural behaviour of steel in these conditions, being unsafe for tapered columns and overly conservative for beams and beam-columns.

Supported by approximately 50000 GMNIA analyses (Geometrically and Materially Non-Linear Analyses with Imperfections), proposals for the calibration of the General Method for the verification of these members have been developed in this work, leading to safe and more accurate predictions by the methodology in fire, in line with the design philosophy of the Eurocode 3.

Geosynthetics for sustainable cities: 3D models and mechanical damage

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Abstract. *Geosynthetics have increasingly been used as a reinforcement material in a variety of geotechnical engineering applications (e.g., roadways, foundations, steep slopes). Reinforced soil relies on the transference of stresses from the soil to the reinforcement elements. Thus, it is key to understand how mechanical damage of the geosynthetics influences the stress-strain-time response of soil-geosynthetic interaction.*

This thesis includes collecting high-quality experimental data and performing laboratory tests on the deformation response of geosynthetics and soil-geosynthetic composite, before and after damage. Then, numerical tests, using the finite element method will be implemented with relevant constitutive equations. The tests will be validated using the experimental data collected. Parametric numerical tests will be performed. Finally, a general approach will be described to model common geosynthetic structures, for a more efficient use of both geosynthetics and natural resources.

Partition walls: Innovative approach through sandwich panel

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Abstract. *The construction industry faces new challenges in the 21st century such as large volume construction and high-performance buildings, requiring technology breakthroughs such as modular and prefabricated systems. As a result, a wall-solution based on a modular sandwich panel system was developed, which is thinner, lighter, and more durable than traditional ones. Experiments in the disciplines of structure, fire, and acoustics were conducted. The results suggest that the modular sandwich wall has the potential to be used in a real-world setting. This method was critical for optimizing the final solution and delivering a high-quality proof-of-concept that adheres to the most recent scientific literature as well as European partition wall criteria.*

Characterization and Monitoring of the Batalha Monastery

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Abstract. *This project intends to develop a dataset on an online platform that will share data collected and the ongoing works of the Batalha Monastery, that will allow all stakeholders to visualise, explore and download these data. Among Our Data, it is provided collection, analysis and systematization of information, such as non-destructive tests, monitoring data construction and restoration phases, and material properties. Through the survey using laser scanner technology, Our Data will be available in a 3D view where is possible to do a virtual tour in the Batalha Monastery and to explore results from studies developed previously, attached to the places where they were performed.*

Risk mitigation for earthquake and subsequent fire on reinforced concrete structures

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Abstract. Earthquakes can cause several secondary effects, such as soil liquefaction, landslides, tsunamis and fires. The consequences of post-earthquake fires in urban areas can be even worse than the consequences of the earthquake itself. To analyse the post-earthquake fire behaviour on reinforced concrete frames it was developed several numerical models using the software SAFIR. The frames developed are representative of the Portuguese building stock. The results showed that heavily damaged frames have considerably lower fire resistance when compared with undamaged frames. After a large earthquake the rescue teams are very likely overloaded and consequently have higher response times. This aspect in conjunction with a lower fire resistance of the damaged structures can ultimately lead to the loss of lives and infrastructures. Therefore, it is essential to improve the understanding of post-earthquake fire behaviour to be able to provide recommendations that can ensure a safer performance of the reinforced concrete structures to these events.

Improvement of cladding wall panels on precast reinforced concrete buildings in seismic prone areas

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Abstract. *Several studies and reports showed that even well designed precast industrial buildings present deficiencies in the connection between the cladding wall panels and the main structure under earthquake events. The collapse of these non-structural elements can result in important losses of human lives and also have a large economic impact on society. Severe damages can limit its reparability after earthquake events, resulting usually in its demolition and reconstruction when repairing and retrofitting costs are considerably high. Thus, the main goal of this theses is the seismic assessment of existing precast industrial buildings and to research a suitable solution to improve the connection of the panels in existing industrial buildings.*

Study of Ravines in Collapsible Soils of Luanda, Angola

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Abstract. *This work will focus on the study of the various forms of water erosion (rills, gullies, and ravines) that have been occurring on the "muçequê" or red sand soils that dominate the top of the Luanda plateau. The red sands are soils with collapsible characteristics and unstable structures that have caused many settlement problems in the surface foundations of buildings, roads and airfields, as well as gully problems that have caused socio-economic consequences for the Angolan population in several provinces of Angola. The research to be developed is part of the course unit Research Project Seminar of the PhD Programme in Civil Engineering entitled "Study of Ravines in Collapsible Soils of Luanda, Angola". However, this study aims to contribute to a deep understanding of the nature of the gullying phenomenon of this particular type of soil (red sands) and, consequently, to generate prevention/mitigation measures of the negative impacts resulting from the gullying problem. It is important to note that this study also intends to analyse some techniques of gully treatment and verify/test their use in muçequê soil.*

Radiant Floor Systems with optimized design and innovative solutions for high-end performance buildings

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Abstract. *Indoor heating and cooling are the major cause of buildings energy consumption. As EU focuses on reducing buildings' energy consumption and greenhouse gas emissions by improving its energy efficiency, Radiant floor systems (RFS) comprise unique characteristics which can perform a key role in attaining the EU ambitious goals. RFS are experiencing an expansion in the EU, currently installed in 30-50% of new buildings. The sustained market growth associated with the EU framework towards a low-carbon economy and an increasing awareness regarding climate change mitigation are stimulating reasons for the development of energy-efficient indoor heating and cooling solutions. This PhD research intends to develop a innovative RFS incorporating phase change materials (PCM) and with optimized design, improving current systems in the following domains: (i) entire year operability, considering cooling mode to assess growing overheating periods; (ii) overcome thermal losses of conventional systems by incorporating innovative materials, combining different PCMs for enhanced thermal inertia; (iii) holistic approach towards optimization of operating conditions, water supply temperatures, PCM latent capacity, temperature control set-points, and working schedules to maximize energy efficiency and indoor thermal comfort; (iv) adaptability to wet and dry constructive systems.*

Climate Change: Study of Road Behaviour in Sofala-Mozambique

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Abstract. *In recent decades, Mozambique has continuously experienced the evolution of climate change impacts and extreme events, with more incidences of floods and cyclones, particularly in Sofala province in the central part of the country. Floods in Sofala occur annually in a cyclical manner, providing floods that reach up to 24 days in extreme cases, inducing surface runoff and groundwater flow that percolates generating mass movement, and deteriorating the surrounding roads. However, the structural and functional integrity of roads in Sofala depends on the rainfall regime associated with topographic factors, the geomorphology, and the tide level. However, the present work will focus on the study of the behaviour of roads in Sofala province in the face of climatic and temperature changes, where zoning of road vulnerability will be carried out, and the determination of climatic aggressiveness factors will be included in the design of typical roads for vulnerable zones.*

Estruturação de um sistema de gestão de pavimentos para a rede rodoviária nacional de Angola

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Abstract. *Com este trabalho pretende-se desenvolver uma estrutura que permita fundamentar e apoiar a tomada de decisão durante as fases de conceção, construção e exploração dos pavimentos rodoviários nacionais de Angola.*

Industrial engineering and management

Absenteeism and Ergonomics in the Cork Industry: some insights and tools to improve working conditions

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Abstract. *Absenteeism is a serious problem that organizations have to deal with. This study was based on studying the high absenteeism of a company in the cork sector and relating the musculoskeletal problems of its workers with the ergonomic conditions of some workstations.*

A Simulation-based Approach to Enhance Operational Decision-Support in Healthcare 5.0

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Abstract. *The evolution of smart healthcare has paved the way for remote healthcare services, which has resulted in a reduction in the number of patients who would otherwise be physically present in the hospital. However, improving healthcare quality while minimizing costs is a constant problem. As a result, it is critical that decisions be taken at both strategic and functional levels to improve the operational performance of various healthcare systems and services. To allow a resilient smart healthcare operation, healthcare practitioners require appropriate tools. The goal of this research is to provide a simulation-based dashboard containing important KPIs from multiple simulation methodologies to aid operational decision making in the healthcare 5.0 concept. In this study, we employed an applied research method based on a hybrid (qualitative and quantitative) methodological technique to conduct the research. The projected simulated findings will facilitate the desired decision support for a resilient healthcare 5.0 systems operation.*

Keywords: *Simulation, Healthcare 5.0, KPI, Decision-Support, Modelling; Discrete Event Simulation, System Dynamics, Agent-based Simulation*

Proposta de uma Framework para a implementação da Qualidade 4.0 em Pequenas e Médias Empresas

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Abstract. *Assiste-se atualmente a uma nova revolução industrial, associado ao surgimento de um novo paradigma industrial, designado Indústria 4.0. Este novo paradigma, muito centrado no papel revolucionário das novas tecnologias, tem e terá no futuro um impacto ainda mais significativo em diferentes áreas da gestão das operações, incluindo na gestão da qualidade. Esta nova realidade traz consigo desafios relevantes para os profissionais da área da qualidade, que poderão ser ainda maiores no caso das Pequenas e Médias Empresas (PME). Com uma limitação significativa no que diz respeito a conhecimentos e recursos, implementar a Qualidade 4.0 nas PMEs, será certamente um desafio nos curto e médio prazos. Assim, o trabalho de doutoramento que se pretende realizar tem como principal objetivo compreender como é que se pode evoluir para a Qualidade 4.0 num contexto de PMEs, propondo uma framework de suporte à implementação desta nova lógica da gestão da qualidade.*

Information systems for the development of tourism in the digital era: A framework for Accessible Tourism

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Abstract. *With a new digital era transforming tourism, it is essential to study technological impacts on travel and leisure activities. Also, the topic of accessibility is a trend amongst scholars, generating major economic and social impacts, especially amongst people with disabilities (PwD). Even though the accessible tourism market is rising and presents a great business opportunity, this market is largely ignored, as tourism supply agents fail to disseminate accessible tourism offers. Information systems are potential solutions, improving accessibility through connectivity. The objective is to design, develop, implement and validate a research framework capable of creating a concept of a Web-based Information System (WBIS) to support information management, for the accessible tourism market. Linking technology, tourism management, and social inclusion components, this project presents itself as an interdisciplinary study. In the future, this project could be of high importance for engineering information systems for tourism management and have social and economic impacts.*

Towards energy sustainability and cost reduction of water supply systems through operational optimization methodologies

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Abstract. *Energy efficiency plays a major role in the sustainability of water utilities since more than 35% of the total expenses with water production are being spent on energy. In 2050, water demand is predicted to increase by 55% worldwide, meaning an even higher energy consumption. The main difficulty for the efficiency and operational improvement in water supply systems (WSS) is related to (i) the complexity of the systems, (ii) their non-linear response, (iii) the high level of operational decision variables, and (iv) its continuous real-time update. Therefore, this PhD aims to develop a decision support system to assist the water management companies in the choice of the mathematical formulation to be used (DSS) in the operation optimization of their WSS. This DSS will cope with the previous problems, increase WSS energy efficiency and reduce operating costs. The developed tool will be applied and validated in a real-WSS, as a pilot case-study. This work will allow water management companies to significantly reduce their energy costs and increase robustness in the daily operation.*

Implementing plan of a Project Management Office (PMO) in public Higher Education Institution (HEI) to strengthen inter-institutional and community cooperation

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Abstract. *The author's research proposal intends to approach and develop the hypothesis of the installation of a PMO, or even a VPMO (Virtual Project Management Office), in sectors of higher education institutions that deal with varied projects. These two instruments of coordination and control, both the PMO and the VPMO, are well-known corporate governance methods for Project Management. Both formulations had their intellectual conceptions originated in: "PMI (Project Management Institute), PMBOK® Guide" and "P3O® (Portfolio, Program and Project Offices)". Also, in a PMO, in essence, concepts are applied that meet the premises of good practices of Quality Management, such as: "PDCA (Plan, Do, Check and Act)" and, derived from the international standard ISO 9001:2015 (International Standards Organization), "Continuous Improvement" and "Customer Satisfaction". Added to this is the widespread concept of "Lessons learned" that can be widely applied in other sectors of the Educational Organization. More specifically, the Thesis Project, proposed here, aims to plan the installation of a PMO in the sector of the University of Aveiro named: "UA Cooperativa". Highlighting the main activities of the UA Cooperativa sector, it can be seen that, essentially, this unit deals with diversified projects. The most varied possible projects are identified, however, all classified into three main categories: "Knowledge and Technology Transfer", "Entrepreneurship" and "Intellectual Property". Each of these categories contains those responsible for monitoring the projects ("project managers").*

Accelerating Towards the Circular Economy: The consumer role.

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Abstract. *With the concomitant increase in waste production and resource scarcity, the transition from the linear economy to the circular economy (EC) seems an increasingly imperative solution to ensure sustainability. This transition to EC can either be desired by the consumer, and become one of their requirements as a requirement for the quality of the services or goods they purchase, or be a requirement of society to solve a collective problem.*

The definition of quality is not consensual and has evolved over time, but even so, CE does not appear in most of these definitions. However, there seems to be a consensus that quality means satisfying the expectations of different stakeholders, including the customer, with a higher degree of quality being recognized when more requirements are met.

Despite the various advances towards circularity that companies have incorporated into the services or goods they offer to customers, some of the new characteristics do not match their requirements, nor are they imposed by legal imperatives, and cannot be recognized as an increase in quality. . Thus, it is not surprising that the available bibliography testifies to a low belief in the evolution to CE through the requirements for quality.

Evaluation of dynamic indicators in Urban Logistics in the context of transport, storage and baggage delivery.

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Abstract. *A simulação pode ser usada na análise de qualquer sistema para garantir a qualidade e eficiência de processos estocásticos e complexos que operam em ambientes com recursos limitados. Logo, a simulação pode ser uma excelente ferramenta para problemas relacionados a transporte. Na logística urbana existem diversos tipos de problemas envolvendo a localização e transporte de veículos. Nesse trabalho pretende-se utilizar a simulação híbrida, sendo a dinâmica de sistemas e eventos discretos, na qual a junção de ambas simulações poderá trazer melhores resultados em problemas de transexpedição e localização.*

Ferramentas de análise e avaliação da transformação organizacional

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Abstract. *Not at this stage.*

O teletrabalho e o seu impacto na produtividade dos funcionários: uma análise na transição para os modelos de trabalho digital

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Abstract. *A crise decorrente da pandemia do vírus COVID-19, impulsionou a utilização de novas formas de trabalho, como forma de dar continuidade à atividade econômica mundial. No século XXI, conhecida como a era digital, fez com que estimulasse ainda mais a utilização da tecnologia digital nas organizações, como forma de sobrevivência. Com essa crescente implementação tecnológica na gestão dos processos organizacionais, novos métodos de trabalho estão sendo inseridos no cotidiano das empresas atualmente, um deles é o teletrabalho. A transição desse novo procedimento de trabalho, pode gerar complicações, em razão de diversos fatores que podem afetar a sua implantação e adaptação. Diante desse cenário, o presente trabalho tem como objetivo, identificar e analisar a produtividade do colaborador, na transição do novo método de trabalho digital, o teletrabalho. A metodologia adotada na pesquisa inclui o estudo de caso, aplicado em uma empresa no setor de telecomunicações, a coleta de dados se dá por meio de uma ferramenta de avaliação capaz de medir a produtividade do colaborador. A pesquisa está caracterizada como aplicada, quantitativa e exploratória descritiva. Os principais resultados entregues nessa pesquisa envolvem um desenvolvimento de indicadores, com a finalidade de auxiliar as empresas em orientar os seus funcionários, considerando a satisfação, segurança, saúde, conforto, produtividade e bem-estar dos mesmos. Como também, apresentar os hábitos e ferramentas adequados para a utilização do teletrabalho, com a finalidade de aumentar a produtividade dos colaboradores, contribuindo ao conhecimento dos funcionários, de acordo com a perspectiva do trabalhador. O presente trabalho apresenta como sugestão de pesquisas futuras, o estudo e análise dos impactos sociais causados pelo teletrabalho, aprofundando o estudo nos efeitos psicológicos dos teletrabalhadores, tal investigação deve ser realizada por profissionais da área.*

The impact of Leadership behavior on the WCM Excellence

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Abstract. *More than a vision, this study arises from the motivation that has grown along the academic path. Organizations, people, and their roles in the organization have always been very present. The organizational context is, without a doubt, a common element in industry and management. Organizations are created by people and only work with people; people who plan, organize, define strategies, manage, and execute tasks.*

It is the people who make the organizations. Different organizations are the result, among other things, of different people, with different functions, who can be leaders or non-leaders, but all with their contribution to the success of the organization. In this context, it is important to understand that WCM is more than a set of management tools; it is a business management system that involves all sectors of the organization. To implement the WCM, it is essential to have competent leaders and the long-term commitment of top management to the goals of eliminating waste and creating competitive organizations. These goals can only be achieved with the involvement of people.

The role of a leader can mean the success or failure of an organization. To better understand the reality, this study aims to prove that leadership is the key to a successful WCM program and that the leader's behaviors and characteristics influence the performance of an organization with this philosophy implemented, identifying, in situations in everyday life, the leader's behaviors that they and others perceive as effective and ineffective, i.e., that have contributed to the good and bad results of the organization, respectively.

Human Factor in the Fourth Industrial Revolution: A framework to foster Operator 4.0 working engagement

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Abstract. *Since 2015, when Industry 4.0 emerged, the progress of technology has urged companies to increase their technological capital. This improvement, which is exhaustive and still without properly standardized guidelines, has underestimated the role of the human factor: Companies will have their processes digitalized, but they will not stop having people and, it is essential to adjust the new processes to the human resources that, in fact, will be at the center of innovation. Thus, since we are moving towards the globalization of the workforce, it is opportune to think about retaining the workforce and capital related to organizational knowledge. This project focuses on proposing a framework that encompasses the conceptualization and design of methods and an application aimed at assessing the engagement of employees, while promoting it, with a view to repositioning the human resource in the environment of the digital paradigm.*

Model-Based Systems Engineering: exploring decision support in civil aviation systems

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Abstract. *The research try to develop a method to model decision support systems making use of Systems Engineering concepts, especially the MBSE tool.*

In a more specific view, it is intended to deliver a modeling in which be possible a complete system can be developed, with database, interfaces and all necessities tools to use the required decision support system.

Sustainable Decision Support System Tools for Automated Energy Management in Smart Cities

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Abstract. *The trend of the new urban model called sustainable city has been gaining momentum. The aggregation of the recent technologies, intelligent administration, and conscious citizens allows the cities to actively solve the problems they are facing. Therefore, the need for automated scheduling tools and energy management strategies is rising considerably. This research work aims to develop automated energy management tools for residential and commercial end-users while addressing the concerns of smart cities through the utilization of renewable energy resources. The model will be designed to hedge the techno-economical risks of the end-users while satisfying users' preferences. In this regard, a sustainable decision support system will be made using different data streams, and human knowledge to handle the technical constraints of energy management in the local energy community. The main core of this research is to develop an open-source optimization tool dealing with the needs and expectations of making smart cities more sustainable. Home Energy Management System (HEMS) will be the core of the ongoing decision support tool that will be developed.*

A Data-Driven Framework to support Lean Implementation and Decision-Making

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Abstract. *Many authors speak about the concept/importance of a ?fully integrated Continuous Improvement (CI) company? that performs CI activities from top management processes to the shop floor (or to the final service provider). However, an intelligent, automatic and data-driven platform that merges all operation areas of a company, for a complete CI integration, has not yet been conceived or designed, and most of the practical data-driven solutions found, focus on specific sets of problems/types of data, addressing particular business areas, instead of the company as a whole CI set. Adding to this, most studies addressing Lean and CI applications are based on conventional methodologies of analysis (pen-and-paper or with basic data-driven tools), which are time-consuming and display high results variability.*

Even though the Industry 4.0 Era has been in the spotlight for more than 10 years now, where companies already have systems capable of extracting data from their processes, there is still a huge lack of human resources with the expertise in developing and applying data-driven methodologies with some level of machine learning to automate (and therefore, speed up) root cause analysis and decision-making.

To this extent, this doctoral thesis aims to provide a complete data-driven platform that follows a thoughtful protocol for continuous improvement that embraces all operation areas of a company, to ease and transversely connect root cause analysis and decision-making in a company.

QUALIDADE EM SERVIÇOS - DESAFIOS DE SEMPRE X NOVAS FONTES DE INFORMAÇÕES: O VALOR DA eWOM PARA A AVALIAÇÃO DA QUALIDADE

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Abstract. *A mudança de uma economia industrial para uma economia de serviços é bastante confusa. Os serviços no setor manufatureiro é conhecido como servitização, e o seu crescimento tem evidenciado a importância e a preocupação das empresas em dedicar maior atenção à qualidade dos serviços. O nível de exigência dos consumidores e a concorrência tem aumentado as necessidades de alcançar níveis de excelência em todas as áreas da organização. A análise da qualidade em serviços é feita por meio das expectativas e desejos dos clientes, a conformidade do serviço prestado e a especificação do cliente exige. Esta definição reflete como as necessidades dos clientes devem ser atendidas ou superadas do início ao fim no processo da prestação do serviço. Em condições de mudança e demandas crescentes dos clientes, as empresas de serviços são forçadas a reagir rapidamente e apresentar novas soluções de análises e inovações. Por isso a medição e monitoramento dos serviços tem sido recentemente uma das principais questões das prestadoras de serviços. Como qualidade é definida e atribuída, e quais as ferramentas de medição estão adaptadas, são os principais questionamento das organizações. O desenvolvimento de modelos e medições quem capture as avaliações de qualidade dos serviços prestados aos clientes têm dominado as agendas dos estudiosos e profissionais de gestão de serviços, dado o consenso generalizado sobre a associação com a satisfação do cliente, lealdade e lucratividade, e o reconhecimento da qualidade como uma ferramenta estratégica para atingir a eficácia operacional e o desempenho geral dos negócios. O Electronic Word-of-Mouth (eWOM), também conhecido como boca a boca eletrônico, é muito utilizada pelos clientes/usuários para a avaliar a qualidade do serviço prestado. Ele tem sido amplamente reconhecida na literatura como um meio eficaz sobre a influência nas decisões de consumo dos clientes, como vendas pessoais ou publicidade. Considerando que as análises dos clientes são agora um recurso comum em muitos sites de empresas, os estudos e análises dessas avaliações se mostram cada vez mais necessários, a fim de utilizá-los como uma ferramenta valiosa para informar e embasar a tomada de decisão mais estratégica para as organizações, bem como orientar as ações gerenciais, além de melhorar e inovar o serviço prestado. Logo o trabalho realiza uma revisão sistemática da literatura do eWOM alinhado à gestão da qualidade nos serviços, bem como realiza um estudo exploratório sobre a qualidade em serviços e a relevância da informação on-line/reviews para a sua gestão, além de realizar uma breve análise das principais metodologias e instrumentos que permitam avançar no uso da informação on-line/reviews para o monitoramento e a tomada de decisão em gestão de qualidade em serviços.*

Deepeia: optimization of SME internationalization strategy via innovation engineering

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Abstract. *This thesis progress pitch summarizes the evolution of the authors' research work during the second year of the Doctoral Programme in Industrial Engineering and Management (PDEGI) at the Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT) of the University of Aveiro. Therefore, it identifies the research challenges the authors have faced, the research methods and techniques used, the relevant available results and the current impact of the research. It also specifies the contribution of the research to ?Open Science?, the Research Summit 22 theme and ends by highlighting some of the references that were considered relevant to the present research work. In sum, extensive research on the fundamentals of internationalization and the key variables that determine the success of SME export performance has been done; and several industry experts were contacted for initial interviews, regarding the internationalisation process and the possibility of a solution that could help SME owners internationalize. The authors were able to verify that foreign trade is seen to be a fundamental aspect of Portuguese SME firms' business and that there are certain best practices which may be followed in order to make the process more agile and harbouring less uncertainties. The accumulated experience in this area and shared by experts reveals certain patterns in internationalisation by SME firms that may be modelled in a state of the art solution, available not only to academia, but also to the entire open science community.*

Sustainable Development of Marine Renewable Energies Supply Chain Management in Portugal

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Abstract. *The global trends in harvesting of MREs, the existing gaps and opportunities for further improvements will be identified and discussed based on a detailed scientometric study, as for instance performed by Ahmad Shoaiba and Samuel Ariaratnam. Various sustainability criteria will be identified through a detailed literature review. An international panel of high- quality experts will be utilized to screen and prioritize the criteria identified regarding each step of the supply chain of MREs using efficient models such as Fuzzy-Delphi, as for instance performed by M. Cheng, et al . The specification of Portugal will be considered carefully in the involved in the selection of the criteria and sub-criteria.*

PROPOSTA DE UM MODELO INTELIGENTE PARA APOIAR O PLANEAMENTO MULTI-PROJETO NA DETERMINAÇÃO DE TEMPOS EM CONTEXTO DE PRODUÇÃO METALOMECÂNICA

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Abstract. *A programação de projetos de grande escala requer a implementação de soluções analíticas para efeitos de agendamento de atividades e de atribuição de recursos. O planeamento contempla a execução dos planos desde a sua conceção e a sua operação em diferentes níveis, tendo em conta que realiza ações com base na planificação de cada um dos projetos. A ferramenta associada ao planeamento de projetos denomina-se como Método do Caminho Crítico (CPM). O Método do Caminho Crítico é utilizado por profissionais com o objetivo de planear e controlar projetos de grande escala, especialmente em indústrias como a indústria metalomecânica. Sendo o método de programação de projetos mais utilizado nestes sectores, a CPM centra-se principalmente no aspeto do tempo (Robbins 2019). Uma análise CPM opera tradicionalmente sob a assunção de recursos ilimitados. No entanto, durante o processo de agendamento de um projeto real, a realidade dos recursos limitados deve ser tida em conta, tais como tamanhos limitados das equipas, níveis de equipamento e materiais. As empresas estão focadas na otimização dos tempos e processos em vez na determinação em função da sua realidade produtiva. Os problemas nos atrasos podem estar em fatores internos e externos, as suas determinações focadas na otimização desses fatores, em vez de sua aceitação em cada momento, fazem com que existam grandes desvios entre os prazos orçamentados e os prazos que realmente se verificam. Neste trabalho pretende-se demonstrar através de um demonstrador inteligente, que a determinação das atividades e a consequente duração de projetos, ao serem determinados numa forma dinâmica com um conjunto de inputs que caracterizam o sistema produtivo em cada momento, proporcionará o melhor alinhamento entre o planeado e o realizado.*

Reengineering TPM Model for Industry 5.0

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Abstract. *Industry 5.0 drives technological advances in connected systems that adapt products and processes to increase the company's permanence in the market with the integration and coordination of information from the physical and cybernetic environments in real time. The connection between physical and digital media enables assertive collection and decision-making. However, it is observed that adapting maintenance management can be a challenging task for companies and must include new maintenance strategies with the insertion of technologies that allow quick interventions and remote monitoring. It is critical to improve company results by eliminating large losses and therefore companies seek to adapt TPM to market changes. This work aims to analyze the impacts of Industry 5.0 technologies on the pillars of the TPM (Total Productive Maintenance) method. In order to achieve the research objectives, the Survey method will be used with the application of a questionnaire as a data collection instrument. There was a tendency to use predictive maintenance and technologies such as artificial intelligence and neural networks.*

Developing and validating a scale for measuring consumer perceived service quality in customer-intensive service processes

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Abstract. *This dissertation addresses measurement and management of service quality in customer-intensive service processes where customer participation and Customer-to-Customer Interaction (CCI) play a pivotal role in service creating, e.g., retail, museum, education, health, leisure services, etc. Although it is widely acknowledged that such interactions can substantially enhance customer's perceived service quality, service providers still lack adequate tools to identify the priorities for improving the quality of their offered services; essentially service quality models need necessary dimensions to consider potential outcomes of those interactions. As such, the purpose of this study is to contribute to the expansion of the existing service quality frameworks towards the inclusion of explicit dimensions to assess the impacts of customer participation and CCI. It is envisaged that the results of this empirical research will provide important insights for the design and management of services when customer participation and CCI play a key role.*

Impact of energy cost management on the financial performance of companies by application of exergy concept

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Abstract. *Review of financial, energy & environmental performance indicators to the evaluation of companies*

Absrtact

Financial performance evaluation is a very important concern for companies. The fact that better financial performance leads to the allocation of more resources is unquestionable. Furthermore, the contribution of financial performance to the environmental effectiveness of a company's activities has been proven. Hence, companies incorporate a considerable number of financial indicators in their performance analysis. The aim of this paper is to present the more relevant financial, energy, and environmental performance indicators, through a state-of-the-art of relevant literature. This research intends to help managers to compare and adopt the appropriate indicators which described with regard to their specific concerns. So some financial indicators regarding various factors such as profitability, growth ability, product cost, liquidity, working capital, operating activity are be studied. Also, some of indicators of energy performance which included energy consumption, energy intensity, exergy, and energy efficiency are reviewed. The environmental indicators are also addressed in this study Moreover, the formulae for the calculation of such indicators or concepts of them are presented along with their definitions Results show that such indicators can provide stakeholders with a list that is helpful in evaluating the financial, energy, and environmental indicators performance of different companies and making decisions in the future around important factors such as financial and managerial, which, in the ultimate picture, influence their sustainable development.

Digital Transformation Process in Convenience Stores

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Abstract. *Investment in technological solutions at the service of citizens is increasingly common. In recent years, several locations have become Smart Cities with the support and application of Information, Communication and Technologies (ICT) that contribute to sustainable development, foster social participation and increase the quality of life of citizens. Hence, this PhD project aims to contribute to the accelerated digital transformation, through the development of a service model based on an Information System that will enable the implementation of market solutions focused on consumers in the proximity retail sector in Urban clusters (population groups with a density of at least 300 inhabitants per km²) and thus facing some of the challenges of industry innovation and sustainability in the context of the 2030 Agenda for Sustainable Development Goals. By applying mixed methods during the investigation, the aim is to understand the phenomenon under evaluation from different perspectives in search of convergence and corroboration of results. It will be observed diagnostic processes and implementation of technologies in buy and sell processes and the behaviors of both consumers and retailers regarding the acceptance of these new tools through a socio-technical analysis. Thus, it will contribute to the evolution of this sector through an analysis of recent technological resources that will bring the physical processes closer to the virtual ones in convenience stores retail, enriching the shopping experience and fostering support for local retailers and owners through understanding and analysis of buying patterns of customers.*

Developing Sustainable Business Models for Residual Agro-Forestry Biomass Supply Chain to Foster Economic Growth in Portugal

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Abstract. *Residual Agroforestry Biomass Valorization is a source of cheaper, renewable and greener raw materials and is also known to reduce dependency on non-renewable resources. Apart from this in countries with large forest cover, residual biomass valorization can assist in reducing the fuel load from forest maintenance which reduce the chances of wildfires. Wildfires not only release high amounts of carbon dioxide into the atmosphere but also complexly destroy natural habitats and ecosystems. The haze from the fire can travel for miles polluting the air and causing a public health crisis. In Portugal, wildfires have become an annual hazard as over 30 percent of the national territory is covered by forests. The valorization of the fuel load from forests will reduce the risk of fires and also contribute to the growth of eco-friendly sectors like green energy production and so forth. This PhD study is being developed under the FCT research project, ?Sustainable Biomass Supply Chain Management Model Residual Agroforestry Supported on a Web Platform?. The study began from February 2022 and until now the theoretical background related to the topic have been studied through two reviews?An unstructured literature review that aims to identify the biomass residues produced in Portugal and their potential market value and promote sustainable economic growth. The unstructured review helped to identify the streams of bio residues produced by the agroforestry sector. Through this review a conceptual framework was developed to assist in the development of sustainable business models to convert low value residues to value adding feedstock. The findings of this literature review along with the conceptual framework were presented at the 3rd International Conference on Quality and Sustainability on May 3, 2022 and is scheduled to be published in July 2022. Similarly, a systematic review was conducted to identify the drivers and barriers of residual biomass valorization. This initial list of drivers and barriers will be presented to various stakeholders in the agroforestry sector to choose from to find out what applies to them the most. The future steps in this study will include creation of Delphi questionnaires which will be sent to experts for identification of the drivers and barriers. After which studies will be undertaken to identify supply chain actors, development of a structural method, sustainable business model.*

Exploring Human well-being in Industry 5.0

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Abstract. *The introduction and adoption of industrial revolutions are most times related to changes in the technological and social narratives of an era. Although still in its nascent stage the fifth Industrial revolution is no different. Amongst its core values is ?Human-centricity? as ?Humans? are being given the center stage in industry. Apart from solving core issues of bringing the human touch back to the factory floor via human-robot collaborations, this revolution looks at how advancements in technology can be tailored to improve the wellbeing of humans, not only during manufacturing but in the society at large. Since its introduction, a lot of industries and nationalities (such as the Japanese) are spearheading the creation of new incredible concepts of adapting technology to boost human value. The purpose of this report, which employs the case study technique, is to research at least two sectors of the Japanese economy in order to assemble cutting-edge industry best practices that would facilitate widespread adoption from smart cities toward smart societies.*

Sustainable Performance Measurement System Proposal Applied to Urban Logistics

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Abstract. *É notório os impactos causados pela logística no ambiente urbano, mas não podemos apenas resumi-los aos aspectos socioambientais negativos, ao fator econômico ou aos transtornos à vida na cidade, uma vez que também compete por vias e parkings muitas vezes já saturados, comprometendo assim a mobilidade urbana. Também devemos tratar como uma atividade essencial para um bom funcionamento da cidade, à medida que contribui para seu desenvolvimento econômico, ambiental e social.*

Com a utilização do método Delphi propõe-se extrair conhecimentos, experiências e expectativas no ambiente de aplicação do procedimento. Focado em especialistas na área de estudo, pretende-se obter um nível aceitável de consenso entre os escolhidos.

Development of Supply Chain Management Strategies for the Angolan Cement Industry

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Abstract. *A indústria cimenteira é um setor de atividade com um grande impacto na sociedade. Estima-se que atualmente, após a água, o cimento seja a substância mais consumida pelo homem. Face à sua importância torna-se relevante desenvolver estratégias de gestão adequadas, que suportem o funcionamento desta indústria, e assegurem uma estrutura de cadeia de abastecimento ágil e eficiente, por forma a facilitar os processos logísticos e de distribuição dos produtos provenientes da indústria cimenteira.*

Impacts of human-robot collaboration on occupational safety

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Abstract. *In recent decades, as part of a process of technological change, there has been a progressive introduction of robots in production processes worldwide.*

In this context, the number of workers who develop some type of interaction with this type of machine during the execution of their tasks has been greater with the passage of time. This is an issue that brings multiple challenges for those who study productive systems, considering that the introduction of this type of machines alters the configuration of the environment, the methods and established work procedures.

In this regard, one of the most important issues related to the subject is what refers to the occupational safety of workers, considering that what is sought is an optimal integration between humans and robots to achieve greater productivity and efficiency. Despite this, it is possible that the risks to workers' health remain unchanged or evolve towards new types of risks. Until now, musculoskeletal disorders have been the main cause of problems for the occupational health of workers and consequently enormous annual economic losses are estimated. Therefore, the prevention of this type of pathology is essential for the industry worldwide. In this sense, the evolution of musculoskeletal disorders in the face of the new physical reality that implies the collaborative relationship between humans and robots represents a topic of study of fundamental relevance, also considering that each productive activity represents a specific case of analysis.

But the sustained increase in the industrial use of robots represents a challenge not only in the field of physical ergonomics but also in the framework of what is known as cognitive ergonomics. Thus, for decades mental health problems such as anxiety, bipolarity and acute stress have affected millions of workers worldwide.

In this order of ideas, this research will be based on the study of the impact of human-robot interaction on the occupational health of workers, starting from an analysis of physical ergonomics focused on the evolution of musculoskeletal disorders, but without losing sight of the transcendence of the problems associated with cognitive and organizational ergonomics. To do this, it will use, among other things, process simulation tools as a way of representing the changes in the industrial environment from the integration of robots and will seek to propose technical measures to prevent possible risks to occupational health.

Electrical engineering

Energy Harvesting mechanisms for Smart City Solutions

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Abstract. *Smart Turbine Energy Harvesting (STEH) from Home-Chimney Pinwheels (HCP) is studied in this research. Turbines are essentially used for the conversion of fluid flow energy of wind or water to usable electrical form. Lots are yet to be explored with the use of turbine aerodynamics to harvest flow energy of the wind or water. Here the concern is for powering low energy consuming devices for autonomous purposes such as Internet of things (IoT), and Wireless Sensor Networks (WSN) within the smart city. Most pivotal devices in smart city such as sensors, actuators, Bluetooth Low Energy (BLE) devices, Radio Frequency Identification Tags (RFID), etc, needed to be constantly supplied with energy that is naturally renewable and self-sustaining. In this research, a STEH-HCP was set up, with the view of how to harness ambient environmental energy lying waste by the aerodynamic activities of pinwheels on rooftops. Originally, pinwheels are placed as cover for chimney outlet to prevent intrusion by birds or bats. STEH-HCP is converted to ?stand-alone? smart turbine energy harvesters (STEH), with no battery attached, and no grid connection, and they are installed as attachments to IoT nodes or in close proximity to other points of consumption, thereby making individual IoT or WSN to scavenge its own energy. The STEH-HCP is studied and analysed through experiments as having similar functionality as that of Vertical Axis Wind Turbine (VAWT). In addition, results show that energy is produced at wind speed as low as 6.8Km/hr, as the HCP continues to spin effortlessly on rooftops. The harvested energy is sufficient to power smart city IoT, or other autonomous devices.*

Keyword: energy harvesting; IoT; pinwheels; smart city; WSN

High density Photonic integrated Circuits

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Abstract. *Photonic Integrated Circuits (PICs) enables the integration of several photonic functions on a single chip providing the potential for cutting-edge solutions in terms of space, aggregated functionality, and efficiency. Meanwhile, size reduction exacerbates several problems and limitations, example heat dissipation. This problem not only affects the heat-generating functional block but also its neighboring functional blocks due to thermal crosstalk. This research work addresses paths to model, optimize and reduce the impact of thermal crosstalk between elements inside a PIC. For this purpose, a detailed study of several functional building blocks will be performed followed by modeling them considering thermal crosstalk effects. The proposed plan has a strong emphasis on research, laboratory testing and model development aiming at increasing the data rate reducing size simultaneously without sacrificing functionality. The ultimate result will be a set of design rules for thermal crosstalk minimization and performance optimization of mapping inside a PIC.*

Multi-technology RU for nG Networks

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Abstract. *Different wireless technologies use different carriers frequencies.*

In typical RF implementations, this requires a separate RF chain for each carrier, making this approach expensive and bulky.

An all-digital approach can solve this problem.

Multiple carries can be generated digitally and their frequency can be adjusted in run time.

Moreover, a single FPGA paired with an RF-DAC or an ADT can provide a compact solution for a frequency reconfigurable transmitter capable of multi-band and multi-technology transmission.

Information extraction from biomedical text

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Abstract. *There is a high number of scientific articles being published every day in the biological, clinical, and medical research areas. These contain valuable information that must be linked and explored to facilitate discovering new knowledge for improving worldwide well-being. The automatic identification of biomedical entities such as chemicals and diseases, as well as their interactions, from free text, is one of the most important tasks for effective information extraction, which can lead to potential insights for medicine research. In this work we investigate the use of a neural network transformer-based model for chemical entity recognition in PubMed full-text articles. The proposed model was evaluated in the BioCreative VII NLM-Chem shared task achieving competitive results.*

Advanced Optical communication technologies for 5G and beyond

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Abstract. *In many countries the implementation of 5G has already begun and the first 6G specifications are already appearing, therefore, it is expected that the required data rates will be even higher in the coming years, mainly due to several new applications such as autonomous driving, the internet of things (IoT) and industry automation. As is well known, currently the sub-6GHz spectrum is completely congested, even with efficient frequency and spatial reuse. Therefore, visible light communications (VLC) is seen as a potential future solution to perform wireless communications, since the visible light spectrum has hundreds of terahertz of license-free bandwidth. Thus, it can complement the mobile radio networks currently used in all locations, providing high-capacity connections.*

Adaptive Transceivers for Elastic Access Networks

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Abstract. *The steadily growing traffic demands impose high capacity, low latency and cost-effective solutions for future networks. With the current digital radio-over-fiber approach based on binary modulation, this can only be achieved at the expense of transmitting several channels multiplexed in the wavelength domain. Coherent optical transceivers have been recently standardized for short-reach links because their robustness allows higher order modulation formats, increasing spectral efficiency, potentially solving the fronthaul bottleneck. This will allow the reduction in the number of transceivers while increasing the scaling capabilities to higher data rates, at the expense of more complex digital signal processing and an increase of deployment cost. Therefore, the use of coherent communications will only be preferred if its use reduces both cost and power consumption. The aim of this PhD thesis is to overcome these challenges and enable the use of coherent optical transceivers in future access networks.*

Optimization of Hybrid Structures in Integrated Photonics

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Abstract. *The demand for low-cost but high-speed transmission is growing at unprecedented speed as we approach Zettabyte era and this is a major challenge for future access networks. Services and applications running on 5G networks are bandwidth sensitive, requiring holistic planning to guarantee smooth and low latency transmission. Infrastructure expansion with costly and complex installations cannot be an alternative because access networks are extremely cost conscious since every tenth of a dB and penny count coupled with 5G cost efficiency roadmap. For access networks governed by passive optical networks (PONs), conventional direct modulation laser (DML) and external modulation laser (EML) in photonic integrated circuits (PIC) are challenging in meeting the required bandwidth for 5G and future networks. Such high bandwidth transmission is limited by chromatic dispersion (CD), high inter-symbol interference (ISI) and several other fiber impairments. To mitigate these, we propose an optimization of hybrid integration of DML and EML functionalities and approaches for improve performance. This hybrid modulation (HM) design can be realized on PIC which could guarantee high efficient transmission with no extra cost or complexity when compared with existing technologies. Such model could meet the requirement of 50 Gb/s per wavelength high speed PONs (HSP) in access networks*

Techniques for optically backhauling Internet of things (IoT)

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Abstract. *The scope of this thesis is within the development of the optical wireless links which operate at millimeter-Wave (mm-Wave) frequency, (60 GHz band). This will primarily comprise photonics-based mm-Wave signal generation, detection, and propagation towards the next generation of applications in access networks. The photonics-based (signal generation) approach can support the required high data rate for the next-generation access networks.*

Smart Analog Passive Circuits using Ferroelectric Materials for Software Defined Radio Systems

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Abstract. *Radio System designs are moving towards fully digital transceivers, where the input signal should pass through an analog to digital converter. This thesis proposal approaches the evolution of smart analog circuits, such as input filters, that somehow will limit the existence of potential jammers and allow all signals within the dynamic range of the converter in an SDR approach.*

The innovative features will be focused on the development of input analog RF front-ends that are adaptable in frequency and power, which may vary according to input power, and of ferroelectrics that have predictable nonlinear behavior and adaptability at mmWave frequencies for wireless and satellite communications.

The challenge in need of a solution is to design three functional dimensions (3fD) analog RF front-end that can vary its three functional dimensions (frequency, output power, and bias voltage) and limit the dynamic range by using ferroelectric thick and thin films.

Lane Change Service in Vehicular Network Based on QSMC

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Abstract. *Secure Multiparty Computation (SMC) is a technology that allows multiple parties to cooperate in a secure and efficient manner while preserving their privacy. SMC theory has the potential to offer solutions for security and privacy problems in vehicular networks. However, classical SMC implementations suffer from efficiency and security problems making it unpractical for real-world SMC applications. To tackle this problem, We take advantages of two quantum communication technologies namely Quantum Key Distribution (QKD) and Quantum Oblivious Key Distribution (QOKD) which provide us fast and secure inter-vehicular communication. Afterwards, we integrate these quantum technologies with Faster Malicious Arithmetic Secure Computation with Oblivious Transfer (MASCOT) protocol to form a Quantum Secure Multiparty Computation (QSMC) framework.*

To validate our framework, we implement a lane change service in which vehicles can broadcast information about the appropriate time to change lane and exit the highway. Additionally, we analyze computation and communication complexity of the quantum protocols and then we compare the result with classical approach. Our result shows that the quantum approach significantly improves efficiency and security when compared to the classical implementation. Finally, as vehicular network applications can not tolerate latency, we provide a latency evaluation of the proposed lane change service.

Timely and reliable localization based on optical camera communication

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Abstract. *Indoor positioning technologies have long been the focus of research, mainly given that technologies such as GPS do not perform satisfactorily in this context. Since most established alternatives are either prohibitively expensive or not sufficiently accurate, a new alternative has been explored, using visible light sources as the positioning references. When using a camera as the receiver, this allows for inexpensive and accurate indoor positioning systems. Furthermore, it allows for the transmission of simple packets of information using optical camera communication (OCC) for the beacon identification. This work aims to explore and propose new techniques for camera-based visible light positioning systems. More specifically, the objective is to explore new OCC techniques suitable for such applications, increasing the robustness and number of identifiable beacons, and new localization algorithms for improved accuracy and timely position estimation, extending the existing techniques to larger scenarios.*

DL-based Channel Estimation for the 6G Physical Layer

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Abstract. *In the last few years, some deep learning algorithms have been successfully applied to the network processing functions, such as channel modeling and identification, encoding and decoding, channel estimation, equalization, and modulation recognition. One possibility to improve the network performance is the use of deep learning-based algorithms in the channel estimation processing function. More recently, some derivations of the deep learning algorithms have been introduced in the physical layer functions due to their characteristics to significantly enhance the feature extraction and structure flexibility by estimating the channel and hardware impairments compared with conventional machine learning algorithms. In particular, the convolutional neural networks have been introduced in the channel estimation after the success in the image processing tasks namely in nonlinear denoising and recognition tasks.*

Thus, the main goal of this Ph.D work plan is to estimate the complex and nonlinear issues of the hardware and channel imposed by the complex scenarios in the next generation of communication systems, by the use of convolutional neural networks-based algorithms in physical layer processing functions. Furthermore, the hardware implementation of some algorithms for the channel estimation processing functions will be also explored with the filed-programmable gate array.

Smart Antennas for the Future Low-Earth Orbit Satellite Constellations

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Abstract. *Half of the world's population is not online and empowered by many space industries there is an on going distribution of Low-Earth Orbit (LEO) satellites which will allow to reach remote areas with less economical power. One of the key elements in this future communication systems is the antenna element and thus the main goal is to develop an adaptive antenna structure, suitable to for tracking satellites and aligning its beam with the most favorable. Meanwhile the antenna prototype will be integrated efficiently with the compact RF frontend, lowering production costs and easing mass production.*

Improving the Thermal Management of Power LED Arrays with Diamond

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Abstract. *High operating temperatures have a negative impact on the performance and efficiency of power light emitting diodes (LEDs). Due to the direct contact between the LED die and the carrier, the thermal conductivity (?) of the carrier plays a key role in the ex-traction of heat away from the junction, and some manufacturers use high-? materials, such as aluminium nitride, as die carrier. The board also impacts the transport of heat to the ambient and metal core printed circuit boards (MCPCBs) are the standard choice for power applications. Artificial diamond has also been gaining momentum for demanding heat management applications. To evaluate the impact of integrating diamond plates with power LEDs, the temperature profile of two 3?3 arrays of Cree white XLamp XB-D LEDs with AlN/diamond carriers mounted on MCPCB/diamond boards was obtained with Ansys for different current levels. The impact of the junction temperature on the LEDs? lifetime was evaluated for each carrier/board combination based on the datasheet of the devices. The results provide additional knowledge regarding the potential impact of diamond on the reliability of power LED arrays.*

Beamforming Optimization for ISAC Paradigm

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Abstract. *The use of wireless communication radio signals for environmental awareness has recently become a timely research subject, known as integrated sensing and communication. We present the general scenario in which our research grounds and the previous results are highlighted. Then, the ongoing work on beamforming optimization for an ISAC scenario serving several communication users and sensing the environment is briefly overviewed. We finalize by reviewing the current impact of the research in terms of journal and conference publications.*

Object tracking using adapted optical flow

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Abstract. *O objetivo deste trabalho consiste em desenvolver um algoritmo capaz de rastrear (e detectar) objetos combinando as técnicas de fluxo óptico adaptada e árvores aleatórias. A adaptação do fluxo óptico consistiu em expressá-lo em termos de aceleração e curvatura gaussiana da de uma superfície de imagem mínima. A utilização das árvores aleatórias, servirá como classificadores de características, selecionando elementos estritamente importantes de imagens. A combinação destas técnicas detectara de forma ótima os elementos necessários para rastreá-los. Os resultados obtidos foram comparados com 04 outros algoritmos de rastreamento clássicos de fluxo óptico. Eles se mostraram bem superiores em realçai ao a 02 e ligeiramente aos restantes. Espera-se como resultados futuros que a aplicação possa ser utilizada em estruturas de rastreamento e detecção mais robustas, como redes neuronais, atribuindo a elas ainda mais precisão e aumentado suas velocidades, nessas tarefas.*

Sustainable Powering Solutions for Flexible Implanted Medical Devices

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Abstract. *Miniaturized flexible electronics have propelled a wave of technological discoveries in implantable medical devices (IMDs). Since the first battery-powered pacemaker was successfully implanted in 1958, significant strides have been taken to improve the well-being, health, and livelihood of people born with medical complications or suffering from crippling accidents, critical illness, or chronic disease. Nevertheless, the best commercially available IMDs still run on batteries that are bound to be surgically explanted multiple times during the patient's lifetime. This is largely due to energy harvesting and generation strategies lagging behind the thrust of nano-flexo devices. This is the case possibly because the current IMDs are not integrated into the human body. Instead, rigid metal casings still encapsulate harmful chemicals of batteries, and extension lead wires traverse under the patient skin from power supply units to the diseased organ. This proposal aims to focus on developing and enabling biocompatible, flexible, and sustainable implantable power generators to meet the energy requirement of IMDs. The power generation could be based on harvesting ambient vibrations or harnessing beamed energy. The proposed approach focuses on integrating the power generators within the human body by using biomimetic materials and structures. The vision of this project is to push the boundaries beyond rigid materials and toward tissue mimetic materials and advance research in material science, nanofabrication, and biomedicine technologies for implantable power generators.*

Physical engineering

Optical Fiber Sensors for Structural Health Monitoring

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Abstract. *The Structural Health Monitoring (SHM) emerged in response to the need for safety, security, lower life cycle costs, and post disaster condition surveys, and involves the observation and analysis of the behaviour of the structural systems. Early detection of damage and rigorous assessment of structural safety require monitoring systems, and the obtained data can be used to calibrate numerical models of structural analysis and assess their integrity. To prevent the collapse of civil structures and consequent human, material and economic loss, the implementation of monitoring systems had become a necessary tool for the current society. Recent advances in optical fiber sensing technologies have fostered the development of innovative solutions for SHM, due to the compelling advantages of these sensors over conventional electrical sensors. In addition, optical fibers have the capability to act simultaneously as a sensing and communication medium which enable the use of the already implemented optical fiber network to transmit data and their easy integration in complex sensing configurations in remote and harsh environments. In this work we aim to develop and test new low-cost optical fiber sensor prototypes, using Fiber Bragg Gratings as the main sensing optical device, to be implemented in SHM for structural and material analysis. After testing, evaluating and validating their performance, the sensors will be ready to integrate into existing structures and materials, where the conditions will be examined by monitoring specific parameters and the obtained data can then be used for investigation purposes, behaviour analysis and structural integrity evaluation.*

Fibre optics sensors for e-Health applications

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Abstract. *This presentation is about my Ph.D. work. This work focuses on the development of equipments for e-Health monitoring with fiber-optic sensors (with silica and plastic fibers), as well as the implementation of a data transmission, processing, and storage system. The work intends to develop sensors to monitor pressure and shear to prevent ulcer pressures; sensors to monitor heart and respiratory rate to supervise the health status of users; and sensors to monitor the posture of desk chairs users to reduce pathologies associated with poor posture in the workplace.*

Customization of dental implants coated with multifunctional bioglasses

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Abstract. *The use of dental implants is increasing due to the limitations of removable prosthetics and the need for alternative devices that consider aesthetics. Moreover, dental implants are considered as the only restorative technique that preserves and stimulates natural bone. It is expected that the dental-implant market expand at an annual growth rate of 11.0% between 2021 and 2028. However, even with the excellent results that dental implants deliver, mechanical, technical, and biological complications can still occur. This work focuses on the biological level, where early failure and late failure can arise. Early implant failure can be associated with host factors such as systemic disease; implant design related factors; surgical trauma related factors. Late failure is typically due to infections, such as peri-implantitis and improper design that is evident with force cycles applied over time.*

Peri-implantitis is considered the most challenging biological difficulty in implantology, as the disease can progress and result in implant loss. It affects 13% of implants and 19% of patients and its incidence tends to increase from 0.4 to 43.9% within 3-5 years. Thus, prevention of the disease is crucial in daily clinical practice.

It has been reported that the use of bioglass as an implant coating can stimulate tissue integration and accelerate implant regeneration. In addition to these properties, antibacterial activity and osseointegration can be promoted by the insertion of several ions such as cerium, zinc, strontium and magnesium.

*In this work, results on cerium-containing bioglass synthesized by melt-quenching will be demonstrated. At the biological level, cytotoxicity, bioactivity and antibacterial activity assays were performed. All concentrations are non-toxic at 12.5 mg/ml and the samples with 1 and 2% mol cerium show more antibacterial activity than the base bioglass for *E.coli* and *S. mutans*. The positive biological results show that this biomaterial is promising for application in implantology.*

Multi-core fiber devices for high capacity optical networks

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Abstract. *Spatial Division Multiplexing has been proposed to deal with the ever increasing demand for data. This technique can be implemented with weakly-coupled multi-core fibers (MCFs). As any other transmission system, the MCF ones will rely on the availability of certain devices such as optical amplifiers and ROADMs (Reconfigurable Optical Add/Drop Multiplexer) architectures. Thus, this work is focused on the development of MCF devices to be integrated in optical networks. This year, an experimental set up of a single-mode fiber (SMF) to a single-mode fiber coupler based on long-period gratings was developed. The coupler showed promising results, with a reduced penalty in the coupled signal at certain wavelengths. The next step is to replace one of the SMFs for an MCF, to develop an SMF to MCF coupler for MCF systems.*

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CsH₂PO₄ composites with high proton conductivity for intermediate temperatures fuel cells

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Abstract. *The ever-present need for reducing the greenhouse gases emission encourages the research of alternative energy sources. Fuel cells with highly efficient catalysts and electrolytes are one of the most promising hydrogen-based technological solutions. Nowadays, proton-conducting Polymer Electrolyte Membrane Fuel Cells are used for temperatures below 100 °C and Solid Oxide Fuel Cells between 800-1000 °C. Intermediate Temperature Fuel Cells (ITFCs) remain under improvement, since new capable electrolytes between 200-500 °C are still needed. This class of fuel cells has potential to overcome some of the challenges found in fuel cells nowadays.*

Proton-conductive materials such as CsH₂PO₄, SnP₂O₇ and its doped materials have been reported as promising materials for ITFCs. However, since they have low mechanical strength and low thermal stability, usually a matrix material is mixed with the conductive phase to form composite electrolytes. The present work wishes to extend the existing study regarding composite materials for ITFCs.

Novel technologies for Optical Fiber Distributed Sensors systems and applications.

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Abstract. *Distributed optical fiber sensor systems (DFSs) are intrinsic fiber optic sensors, in which all the fiber length is used as sensing element. DFSs have the advantage of providing measurements continuously over distances that can extend to hundreds of kilometers with only one interrogation system. These systems have several applications including structure monitoring of tunnels, oil or gas pipelines and power cables, leakage or fire detection and are expected to be one of the core technologies to collect a vast amount of data in what regards the smart cities concept.*

The use of installed standard singlemode fiber based telecommunication networks as sensor systems together with the data transmission can have great interest. Along this work, a Raman based distributed temperature sensor (RDTS) system is analyzed by theoretical modeling considering a pump source with a wavelength chosen outside of the telecommunications? transmission windows, i.e., 1064 nm. Furthermore, the work will focus on the development and optimization of the resolutions (measurements and distance) and sensing distance of the systems and reduce their cost, considering an application in forest wildfire detection.

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Novel Light management Concepts in ultra-thin CIGS solar cells

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Abstract. *Cu(In,Ga)Se₂ (CIGS) is currently at the forefront of inorganic thin film technology, as it presents the highest light to power conversion efficiency value of 23.35 %. However, the current state-of-art cells are far from the 26.7 % record for monocrystalline silicon (mono-Si), with the latter dominating the Photovoltaics (PV) market. A pathway for the CIGS market expansion consists of a reduction in the production costs and a performance increase. An ultra-thin approach, through absorbers with thickness lower than 1 μm, satisfies the low-cost requirement, although it comes with a decrease in the conversion efficiency value. Using the Shockley-Queisser (SQ) model as a performance evaluation figure of the aforementioned technologies, the mono-Si has already reached 97 % of the short circuit current density (Jsc) maximum value predicted by the SQ model, whereas thin film CIGS only achieved 89 %. Furthermore, the ultra-thin CIGS champion cell performs only at 70 % of its Jsc SQ limit value. Hence, with the aim of increasing the conversion efficiency value, the CIGS market expansion can benefit from the development and optimization of light management strategies. Therefore, in this work, novel light management strategies that may effectively be coupled to a CIGS solar cell and promote a conversion efficiency increase will be presented. The developed architectures were based on novel concepts ranging from, a moth-eye architecture, fabricated through an industry-friendly nano-imprint lithography procedure, to the integration of plasmonic nanoparticles, to promote an optical path length enhancement in the CIGS layer.*

Novel Rear Architectures for Bifacial Thin-film CIGS Solar Cells

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Abstract. *With the current increased rates for high energy prices from sources such as natural gas and oil, and the current geopolitics affecting the energy supply, mainly those from non-renewable and pollutant fossil fuels, it became evident the urgency for a clean and sustainable energy supply. Specifically, the Europe needs to address the transition from fossil fuels to, preferably Europe-made, clean and renewable energies.*

One of the most promising renewable source with high technology implementation rate is the solar energy. With already several decades of development the respective solar modules reduce its price per Watt to competitive prices. However, to compete with the traditional non-renewable sources such as the oil, the modules fabrication costs per energy they produce need to be further pushed down. Bifacial solar cells and modules greatly increase the energy production while potentially maintaining the same fabrication costs. Such devices absorb the light from all around, i.e. both from the front and rear contacts, whereas conventional devices only absorb light from the front contact. By bridging the bifacial concept with thin-film technology, such as Cu(In,Ga)Se₂ (CIGS) the promise for a reduced price per Watt is magnified. However, we face challenges in obtaining similar performance with solar cells using the bifacial concept and the conventional ones due to the replacement of the opaque rear contact. Here we intend to study different materials as the transparent rear contact in CIGS and propose novel architectures. At the same time, SCAPS electrical simulations provide valuable insight into the different rear contact materials and the possible impact of novel architectures.

Computer engineering

Decentralized Security for Cooperative Maneuvers

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Abstract. *Vehicle-to-everything (V2X) communication has been a key technology enabler in the field of cooperative mobility and maneuvering. However, like many other technologies, it carries new security and privacy concerns. The ability to make safe decisions in a decentralized real-time scenario, such as when driving, heavily depends on the trust and coordination between the several vehicles on the road. A driver, or, in a more broad sense, an autonomous vehicle, should be able to take into account all environmental information collected by its sensors and reach a consensus with its neighboring vehicles on which shall be the best course of action to perform a certain maneuver. Adding to this, maneuvers may fail and result in accidents. It is in this case that the data collected by the local vehicles and used to build the consensus should be saved for posterior analysis. This presentation serves as a concise doctoral thesis state of progress and its current efforts to tackle the mentioned issues.*

Data-Centric Artificial Intelligence In The Context Of Computer Vision

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Abstract. *Deep Learning algorithms are evolving rapidly in every front, including in the Computer Vision field. And the more complex those algorithms are, the more data hungry they become. For that reason, data-centric artificial intelligence (AI) practices are becoming the primary focus of the Deep Learning process. In Computer Vision, data comes in the form of images and videos. However, depending on the domain, these datasets can be small, biased, unlabeled, or poorly labeled, and inadequate. This is especially true in Computer Vision since it requires powerful infrastructures and human resources to collect, store, and label data. Consequently, researching how we should tackle data collection, data quality, data generation, and even data pre-processing is of utmost importance in this field. In this work, we explore three different domains within Computer Vision, proposing a use case of data-centric AI for each: Facial Expression Recognition (FER), Dirt Detection, and Archaeology.*

MEMORIA: A Memory Enhancement and Moment RetrIeval Application

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Abstract. *Over the past decade, the wide availability and small size of different types of sensors, together with the decrease in pricing, have allowed the acquisition of a substantial amount of data about a person's life in real time.*

These sensors can be incorporated into personal electronic devices available at a reasonable cost, such as smartphones and small wearable devices. They allow the acquisition of images, audio, location, physical activity, and physiological signals among other data. With these data, usually denoted as lifelog data, we can then analyze and understand personal experiences and behaviors. This process is called lifelogging.

This thesis explores several open challenges in the research area of lifelogging, an interdisciplinary research topic. The main goal of this thesis is the development of a lifelogging platform prototype, called MEMORIA, A Memory Enhancement and Moment RetrIeval Application, capable of helping people in retrieving memories from their recorded experiences and consequently improving their quality of life.

One of the potential applications that will be explored focus on supporting people with memory problems, such as people with dementia, through the visualization of lifelog data and contextual data extracted from these personal lifelogs.

The several contributions proposed in this thesis include creating solutions for the pre-processing of lifelogs, the extraction of relevant information from these lifelogs, the temporal events segmentation to improve the search and retrieval of the lifelogs and the user interface for visualization and interaction of the lifelogger with the platform.

The final MEMORIA prototype will provide an open source utilitarian lifelogging platform to support people in retrieving their memories and enjoying a more qualitative life.

Contributions to simplify integration of nonverbal interaction in multimodal interactive systems...

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Abstract. *Communication is part of our everyday life. While speech is our most natural form of communication, non-verbal aspects also play a pivotal role in complementing or reinforcing communication. It is this diversity of communication channels that makes human-human communication so efficient, natural, and adaptive in a wide variety of contexts.*

In our communication with machines, research has progressed in harnessing multimodality to foster adaptiveness, but we are still far from the sought efficiency. In fact, regarding non-verbal components, the community has yet to consider them to their full extent, with efforts mostly concentrated on gestures, limited sets of non-verbal cues, and not much exploration of the verbal-nonverbal synergies. This results from the inherent complexity of the topic and from the challenges involved in integrating and reusing the different technologies in interaction design and development for different scenarios.

In this context, this proposal aims to contribute to a more advanced consideration of verbal and nonverbal components in human-machine interaction by increasing their extent, availability, and easiness of development and integration. To this end, it proposes novel methods and architectures to support nonverbal cues in interaction, reducing the complexity towards a simple off-the-shelf use by developers, and fostering their consideration side-by-side with verbal interaction.

The work carried out, so far, has: (1) identified the major gaps in the current state-of-the-art, reaffirming the novelty and importance of the proposed vision and roadmap; (2) conceptualized a first version of the architectural aspects required to instantiate this vision; and (3) explored a first level of nonverbal cues obtained from speech and proxemics.

A jointly trained neural pipeline for biomedical Q&A

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Abstract. *In 2017, an IBM study [1] stated that "Over the last two years alone, 90% of the data in the world was generated?". A significant part of this trend is related to textual and other non-structured data. Recognition of the value of these data turned text analytics into a major area of research, where Deep Learning techniques have emerged, replacing previous information retrieval and extraction systems, often based on carefully engineered features or rules.*

This proposal aims to leverage Deep Learning to design an end-to-end system that: 1) builds a language model; 2) learns, from training examples, how to identify relevant documents and passages from large textual repositories; and 3) generates, based on the extracted passages and language model, a natural language answer for a given question. This pipeline presents, at least, three distinct and measurable system iterations, easing the validation and evaluation process during the research and development process.

At the time of writing, the developed model is already capable of retrieving the most relevant articles showing top-performing results in the BioASQ 8, 9b and 10b, Trec-Covid and TREC-PM international challenges. Additionally, some encouraging results were also achieved regarding the snippet retrieval task in the ongoing BioASQ 9b challenge.

Skill Generalization in Reinforcement Learning

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Abstract. *The goal of systems capable of generalising their knowledge is to learn how to handle complex new scenarios by selecting the relevant information obtained in previous experiences. Humans and other life forms, act on inherent assumptions concerning the nature of their current environment to predict the output of its actions when faced with new tasks. Generalization research focuses on finding methods able to adapt properly to new, previously unseen tasks based on data already collected. Advances in this research field can lead to the deployment of autonomous agents in the real world that can learn from humans or even other agents.*

Our approach for learning transferable behaviours is composed of three modules, operating in two separate timescales and it uses a hierarchical model with both discrete and continuous variables. This modular structure allows an independent training process for each stage. These stages are organized using a two-level temporal hierarchy. With this approach, we aimed to solve long-horizon sequential tasks with delayed rewards.

Methodologies for prediction and optimization of bivalves detoxification and purification processes

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Abstract. *Bivalve molluscs represent a highly important fishery resource in the national economy. According to fisheries statistics, the production/catch of bivalve molluscs in Portugal reached 6,353 tons in 2016, which translated into a total value of 243,141,000.00 (INE, 2018). However, the consumption of bivalve molluscs can pose a risk to public health, due to the fact that these filtering organisms can accumulate chemical or microbiological pollutants in the body.*

*In this sense, the legislation requires the classification of production areas and their regular monitoring, in order to ensure the health of the bivalves. The classification of these zones (A, B, C or D) is based on microbiological fecal contamination (content of *Escherichia coli* and presence or absence of *Salmonella sp.*) and content of toxic metals (namely mercury, lead and cadmium). The most alarming zones are those of class C and D: the marketing of bivalves produced or caught in zones C (not intended for the processing industry) necessarily requires the transfer of bivalves to zones A, a process that is not economically viable ; the harvesting of bivalves in zones D is prohibited by law.*

The general objective of this doctoral thesis is to develop methodologies to optimize detoxification and purification processes for bivalves, investigating in depth the presence of persistent and emerging microbiological and chemical contaminants, namely in class C and D areas.

It is intended to model a purification system and develop classifiers, through artificial intelligence techniques supported by the collection of parameters in real time, supported by the analysis of water quality. These will work as a prediction and alert mechanism, in order to guarantee that the bivalve molluscs supplied to the final consumer are safe from a microbiological and/or chemical point of view.

Using Machine Learning to optimize both a smart space network and services

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Abstract. *The network infrastructure built in the city of Aveiro enables the gathering of mobility data. This poses the possibility of learning and improving city mobility and researching new Deep Learning algorithms to understand, predict and optimize city mobility.*

Examples of this urban mobility study include, but are not limited to, the observation of patterns as a result of the commute of people, the profiling of vehicles, the detection of dangerous driving situations, traffic congestion analysis, etc.

Context mixed reality for situated visualization

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Abstract. *Augmented Reality (AR) has the ability to display additional information aligned with the real world and to support context-driven visualization techniques. Situated Visualization (SV), a method to represent data in a context, encompasses all the visualizations that change their appearance based on context, by considering the visualizations that are relevant to the physical context in which they are displayed. Therefore, AR is well suited for SV and presents high potential in many situations, as is the case of supporting decision-making. AR-based visualizations are commonly constrained to the users' single egocentric viewpoint, which reduces their ability to explore all the layers of available information. This limitation is particularly evident in situations that require overviews of all information inside and out of the user's field of view (FOV). This work proposes methods to extend the user's egocentric viewpoint based on multi-perspective renderings and transitional interfaces techniques. The main idea is to coherently present and augment, in the same user's display, dynamic and static feeds of several AR and Virtual Reality (VR) egocentric viewpoints, related to and relevant for the user's context.*

Big Spatial Data Integration and Enrichment with Provenance Control

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Abstract. *In the last few years, an increasing number of devices generated vast amounts of data, commonly called Big Data. This brought many opportunities - and challenges - in terms of knowledge discovery, as distributed and heterogeneous data may be combined and used to create high-quality models of events and phenomena. Current big data integration uses some kind of distributed query execution engine that does not really integrate data in terms of concepts and neither provides distribution transparency. There is no general model to be used. Also, integration workflows usually involve manual transformations and the loss of provenance information. In this research, I will investigate data integration, with a special focus on big spatial data. A generic model for data integration and enrichment will be developed to improve knowledge discovery capabilities while maintaining provenance information. I will also evaluate querying capabilities of existing languages and optimizers, and propose required improvements.*

Software-Defined Emergency Network for a Smart City

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Abstract. *The number of smart cities is increasing worldwide, with the number of people who live in cities rising dramatically in recent years. To support the deployment of systems solving smart city issues, several heterogeneous computational nodes are displaced, covering the largest possible area of such urban locations. Here, an emergency network can be deployed, granting proper paths for emergency-context message dissemination.*

Interpreting emergency classes and their requirements, this proposal will use a software-defined network to disseminate emergency content and address the integration of time-sensitive networking to the delivery of content with strict requirements of latency and jitter, in more emergency-prone areas of a city network.

This proposal also considers security issues in handling emergency messages throughout the network and considerations on the running nodes where procedures must run in the background without causing interferences to the task the node was designed to perform, when not at an emergency.

Mechanical engineering

Components manufacturing for medical applications - case studies

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Abstract. *The evolution of production processes, with emphasis on additive manufacturing methods, applied to the manufacture of devices for medical applications is constantly changing the paradigms of both design and manufacture with a significant impact at economic and social levels. The use of a hybrid production system in which an additive process is used in an initial phase to obtain the component, followed by a subtractive process to guarantee functionality, enables obtaining components of high geometric complexity with superior surface finish, higher geometric and dimensional precision on functional surfaces where those attributes are required.*

Aiming at realistic numerical simulations of sheet metal

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Abstract. *These days, digitalisation and virtualisation are essential for an industry's product quality, efficiency, and economic success. Product development and manufacturing are very dependent on numerical simulation tools. Yet, for a realistic numerical simulation, it is required the selection of an adequate constitutive model and the accurate identification of the inherent material parameters. Regarding the model calibration accuracy, heterogeneous mechanical tests that present a high diversity of strain states can outperform the classical approach. Besides, for the latter, it is necessary to perform a larger number of tests that results in a more time consuming and expensive procedure than the first. Most of the heterogeneous mechanical tests presented in the literature were developed by intuition and trial and error attempts. These strategies are limited to the knowledge and creativity of the author, so an optimised methodology can be useful to extract the full potential of the test configuration. In this work, a heterogeneous mechanical test was numerically designed using a shape optimisation approach of the interior notch. The non-conventional specimen's shape aims to maximise the strain heterogeneity of the test. The outer boundaries of the specimen are rectangular and, thus, can be tested in a standard tensile test machine under uniaxial loading conditions. This innovative test configuration reveals uniaxial tension and compression, pure shear and plane strain tension in the plastic regime. Also, a FEMU-based approach was used to identify the material parameters of the Swift hardening law, proving the adequacy of the test configuration for inverse identification methodologies.*

Towards virtual forming and AI: Implicit material modelling using AI techniques and big data generation

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Abstract. *Numerical simulation is vital for product development, reducing experiments between design iterations, delays and costs. However, accurate results require accurate constitutive laws. These laws consist on simplified assumptions and expressions with empirical parameters, calibrated experimentally, to ensure compatible observed/numerical mechanical responses. Physically complex models often require extensive experimental campaigns. Several calibration methodologies have been developed to improve model accuracy, nevertheless, performance is constrained by the explicit formulation. Machine Learning (ML) techniques, such as Artificial Neural Networks (ANNs) can potentially overcome these limitations. However, their use in the field was not fully explored and requires large amounts of data. This PhD project aims to develop accurate data-driven implicit material models using ML techniques, for the simulation of sheet metal forming processes. To train these models, big data concerning material behavior will be generated through the development of non-homogeneous strain field and complex strain paths tests using design optimization techniques.*

Acknowledgements

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On the inverse identification of hardening law parameters of sheet metal using a DIC-based synthetic image approach

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Abstract. *Today, numerical simulation tools are used in a wide range of manufacturing processes to reduce costs and time waste while also improving product quality. The accuracy of the finite element analysis (FEA) results is highly dependent on the constitutive model used and the calibration of its parameters. Modelling the plastic behaviour of materials during loading and determining the deformed geometry after the loading is released is critical in sheet metal forming technology. Modelling such nonlinear behaviour, however, requires complex constitutive models that consider the effects of hardening, softening, anisotropic yielding and strain rate dependence. The complex nature of the plastic behaviour of metal sheets has resulted in the development of numerous phenomenological constitutive models, such as different hardening laws and yield criteria. Nowadays, constitutive models offer increased mathematical formulation flexibility to better adjust to experimental observations. However, this comes at the cost of a larger set of parameters to calibrate, which requires an exhaustive experimental campaign. Classically, the experiments consist of simple uniaxial tests in which the state of stress and strain in the region of interest of the specimen is homogeneous and well known and may be derived from the measured load. The recent advancement of optical full-field measurement techniques, such as digital image correlation (DIC), has resulted in the development of novel experimental test configurations and inverse methods for characterising material plasticity. A heterogeneous specimen can be used in this case, and the full-field displacement and strain maps are measured using a full-field measurement technique and used to identify the material parameters. This approach can provide heterogeneous strain fields over the specimen's region of interest, allowing several stress-strain states to be evaluated, reducing the number of experimental tests required to accurately identify constitutive parameters. Classically, experimental DIC measurements and FEA results were directly compared. However, before doing this comparison, several inconsistencies must be addressed, including different coordinate systems, data locations, strain formulation, spatial resolutions, and data filtering.*

In this work, the Swift hardening law parameters of a DP600 steel were identified using a virtual tensile test on a heterogeneous dogbone specimen and the finite element model updating (FEMU) technique. The numerical displacement fields were used to generate synthetic images, which were then processed by DIC and used as reference. The results were then compared using two methodologies: (i) the classical FEMU technique, which directly compares DIC measurements and FEA results, and (ii) a FEMU-based approach which compares DIC-levelled FEA data with the reference. The results show that using DIC-levelled FEA data in the identification procedure improves the identification accuracy, due mainly to the accurate minimisation of the differences between the strain results.

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Characterization and functional properties of carbon nanotube reinforced thermoplastic composites via fused filament fabrication

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Abstract. *3D printed nanocomposites have attracted researchers and industry due to the combination of advanced materials with good physical properties and advanced manufacturing technology with significant potential for cost-saving and complex components building. Carbon nanotube is one of the most popular nano reinforcements for composites due to its guarantee of both strength and light-weighting. The aim of the present work is to study the reinforcement by carbon nanotube (CNT) for polylactic acid (PLA) composites, manufactured by fused filament fabrication (FFF).*

CNTs were firstly mixed with PLA by compounder and extruded into feedstock filaments by single screw extruder at 0.5 wt. %, 0.75 wt. % and 1.0 wt. % CNT loadings. The crystallization-melting behaviors and melt flow rate are investigated to research the printability of the PLA/CNT filament. Based on that, the effects of reinforcement content and filling design on mechanical properties (both rigidity and ductility properties) of 3D printed composites, are carefully analyzed by considering several layering configurations by tensile testing. The internal structure and behaviors of composites were morphologically characterized through scanning electric microscope and computed tomography. The deformation processes and failure mechanisms of laminated composites were also analyzed.

The results showed that the rigidity of 3D printed PLA/CNT composites was significantly reinforced without losing ductility with limited introduction of CNT. Specifically, the elastic modulus was increased by 34 % (0.5 wt. %), 43 % (0.75 wt. %), and 53 % (1.0 wt. %), while the ductility, presented as elongation at break was hardly affected. In addition, the effect of infill also affected the mechanical properties of 3D printed composites.

Based on the present study, experiment data support for modeling and simulation could be collected. Then, by means of recycling and remanufacturing carbon nanotube reinforced thermoplastic, the improvement of adhesion between carbon nanotube and polymer matrix, and the degradation of polymer matrix are going to be investigated. In addition, the effect of the surrounding environment including humidity and temperature on mechanical properties of 3D printed CNT/PLA composites are also studied. Overall data and results will be available for traceability and used for open dissemination.

Intelligent methodologies for digital manufacturing in machining

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Abstract. *Portugal and Europe's reindustrialization imply the integration of information and communication technologies in manufacturing (industry 4.0). This retrofitting will be crucial to overcome the crisis caused by the recent public health calamity and to create more resilient industries. Digital manufacturing is a reality in some production sectors, where digital systems are monitoring and controlling the processes and interacting with the operator. To control machining operations using digital data, preliminary efforts must be made, among them, to create reliable and effective predictive models and develop strategies to convert machining information into digital data (digitization). The finite element method (FEM) and artificial intelligence (AI) modelling are effective tools for predicting the machining response while digital image processing (DIP) has great potential for extracting quantitative data from the tribological outcomes. The digitization of the machining system will lead to the development of intelligent tools to support machining operations which will promote sustainable production patterns. Aware of the yet-unsolved technological challenges for digital transformation in machining, the PhD work plan aims to tackle three fronts: (1) digitization of the machining system, (2) development of predictive models (3) optimization using (2) and (3). The overall objective of the PhD work is to combine digital and intelligent tools (AI, FEM, DIP) to create routines (software-hardware solutions), that can be integrated into machining systems to assist the factories of the future and contribute with knowledge to consolidate the culture of digital machining. The PhD central question is how to effectively develop hybrid tools, to create robust predictive models to be put to service of a more sustainable production, where tools are used in their fullest tool-life, machined surfaces topographies are optimized considering the application, and cutting fluids are applied more efficiently by controlling the process conditions.*

Modelling, simulation and control of tankless gas water heaters: a hardware-in-the-loop approach

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Abstract. *There is a growing concern about the scarceness of natural resources and the emissions problematic. Water heating is a relevant part of a household's energy use, and tankless gas water heaters (TGWH) are widely used. There are design and engineering challenges to develop more efficient devices, with lower emissions of pollutant gases, reduced water waste, and providing comfort improvements from the user point of view.*

The overall purpose of this PhD project is to study and develop tools and methodologies to implement and evaluate advanced control strategies that improve TGWH environmental and comfort indices.

The PhD student will develop mathematical models of individual components, parametrized with experimental data. Based on these models, research on advanced predictive and adaptive control strategies will be carried out for embedded applications. A virtual-test-bench platform will be developed based on hardware-in-the-loop-simulation methodologies, for evaluation on different TGWH configurations and control strategies performances.

Using smart edge devices and Big Data analytics for predictive maintenance

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Abstract. *Predictive maintenance (PdM) strategies play an important role concerning the competitive strength of enterprises. There is no doubt that an effective PdM strategy contributes to a reduction of two key indicators: the costs with maintenance, and the unavailability of industrial assets. However, there are important challenges in this field, namely, PdM can be applied to many industrial use cases, which means that many systems may be employed. The literature proposes very different approaches to assess the health condition of industrial assets depending on the use case in analysis, and often the solutions proposed rely on known formulas that describe specific phenomena, such as fatigue or mechanical crack propagation, or depend on expert knowledge, making it specific rather than generalized. On the other hand, the exponential increasing volumes of data demands efficient architectures to analyze the data in real-time and provide valuable insights and suggestions as near as possible from the shop floor.*

The overall purpose of this PhD is the development of a generalized data-driven methodology to assess the health condition of industrial assets, through a decentralized solution based on smart edge devices. Until the moment, a prototype of a smart edge device has been validated. Furthermore, a statistical approach, the so-called generalized fault trees (GFT) has been developed and applied to three different industrial use cases, namely to smart press, and to friction welding tools at Bosch Thermotechnology and to an injection molding machine at OLI. In the future, the GFT model will be enriched with other techniques, namely anomaly detection, and it will be encompassed in a PdM platform, allowing the predictive models to be embedded in the smart edge devices.

Enabling closed-loop additive manufacturing through an on-demand feedstock material customization system

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Abstract. *The integration of end-of-life plastic products in circular flows of material largely contributes to the reduction of the negative environmental and health impacts plastic waste mismanagement causes nowadays. Besides, it allows for a more efficient use of the resources through the extraction of further value from the same initial materials. Moreover, namely in additive manufacturing, distributed recycling has been proposed as an important enabler of plastics reintroduction in the value chain throughout multiple lifecycles with thermomechanical reprocessing.*

This work aims to improve upon the current state of the art on distributed recycling with additive manufacturing by creating tools to predict the reprocessed plastics properties and applying strategies to recover them if the material is too degraded. To recover the properties in a controlled way, additives that can repair the polymeric molecular chains and process parameters adjustment are tested. With property predictability and an upgrading strategy, the choice to use the reprocessed plastic for applications with a well-defined properties requirements range becomes more appealing. Despite the work's specific context, the developed solutions are expected to be applicable to other thermomechanical processing strategies, at bigger scales, such as injection molding or extrusion (without subsequent additive manufacturing), further widening its potential impact and relevance.

Currently, the focus is on the development of machine learning models to predict material degradation. Data from literature has been collected to create a database and an Artificial Neural Network (ANN) -based classifier has been developed with an average accuracy of 76.7% and 76.1% F1-Score. The classifier can predict whether a given input plastic, in this case, polylactic acid (PLA), is degraded or not, according to the number of reprocessing cycles it has been subjected to and the material grade. This is done by defining a 5% tensile strength reduction threshold.

Future works include testing the prediction performance of other algorithms, training the current algorithm with experimental data obtained in-house, and integrating the prediction tool in a monitoring system, previously created. Works such as this one, highlight the relevance of open science, especially when trying to develop prediction algorithms with machine learning tools. These algorithms need to be trained on the best quality, most representative dataset possible, and the amount of available data has a big influence over the algorithms' quality. One of the ways this work is expected to contribute to open science is by aggregating and adding new experimental data to a comprehensive PLA reprocessing and properties degradation database. The other is to make the results available to as wide an audience as possible, either by publishing on open access journals, when possible, or through public communications and social media.

Development of predictive tools for controlling the polymers morphing behavior in 4D printing

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Abstract. *The integration of stimulus-responsive materials combined with the fused filament fabrication (FFF) technology opens the possibility of solving polymer processing issues, such as the production of complex geometries that can undergo programmed temporal changes in response to external stimuli, such as change in temperature. As the shape change depends on the raw material's microstructure along with the processing methods and parameters, several challenges still need to be explored, such as controlling the precision of shape change effect and its cyclic performance, before proper functional devices can start to be developed.*

This PhD aims to study the influence of extrusion/deposition processes and 3D printing strategies in the molecular structure of thermoplastic compounds. The success of this study will give rise to a new predictive tool that contribute to automatize decisions related to the enhanced FFF of structures with a shape-changing ability.

So far, the relationship between the microscopic properties of a polymeric filament associated with the deposition parameters during its processing and the repercussions on the morphing effect was established. Through a design of experiments (DoE), the influence of five deposition modeling parameters (printing temperature, bed temperature, printing speed, fan speed, and flow rate) on the degree of crystallinity was studied. The morphing effect was also explored with the hot programming process. The interaction between bed temperature and printing speed has revealed the most significant impact on crystallinity. The raw material showed the ability to memorize a shape and return to its original shape through an external thermal stimulus, a hot water bath.

Further experiments will address these issues of shape morphing capability to more complex geometries, targeting to define different 3D printing strategies at a macrostructure level.

Self-powered stimulating-sensing technology for multifunctional smart bone implants (SImplant)

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Abstract. *The global prevalence of osteoarthritis is estimated at 4%, being this condition the main reason to undergo a replacement procedure. Although arthroplasty is considered a successful surgery, the revision burden is still high, and implant failure can reach 12% and 6% after five and ten years, respectively.*

Currently, the decision to perform revision surgery is based on the results of imaging methods, which have low accuracy in detecting early loosening stages. Additionally, these methods do not allow continuous patient monitoring. Thus, they cannot establish high-performance osteoinduction and osteoconduction processes according to personalized requirements.

Researchers have already proposed various methods to detect bone loss stages, namely, acoustic, bioelectric, and magnetic induction methods. Although they comprise significant advances relative to imaging methodologies, they cannot effectively monitor different loosening stages.

The following problems still need to be addressed: (i) provide flexible integration of sensing systems inside the instrumented implants; (ii) provide an easy way to redesign the detection technologies for different geometries of implant surfaces; (iii) provide target-oriented monitoring of peri-implant regions; (iv) provide continuous monitoring of patients during their daily life.

Instrumented multifunctional implants hold the potential to monitor the bone-implant interface and deliver personalized stimulation to peri-implant tissues.

Research in the field of smart implants, based on a Master-Slave architecture, was conducted and successfully demonstrated the ability of cosurface capacitive networks to: (i) monitor loosening in a vast peri-implant region; (ii) control the monitoring operation using extracorporeal informatic systems; (iii) provide effective sensing in interfaces with hydroxyapatite-based layers; (iv) control the monitoring operation using extracorporeal informatic systems.

On the topology design of an innovative heterogeneous mechanical test for material mechanical characterization

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Abstract. *Sheet metal forming processes are widely used in industrial manufacturing, in automotive, aircraft industries, etc. In order to meet industry requirements concerning reduced costs, time, and material waste, these processes have been virtualized through the use of simulation software. However, an accurate reproduction of the material behavior is required to obtain realistic results from numerical simulations.*

The actual material characterization procedure involves an exhaustive mechanical testing task, due to the number of standard mechanical tests that have to be carried out. Each one of these tests provides a limited quantity of data due to the homogeneous stress/strain fields that are induced. This work aims at improving the efficiency of this procedure.

The design of new test configurations has already been addressed. Several test configurations have been proposed, presenting heterogeneous mechanical fields. An interesting quantity of material information can be retrieved from these. However, the use of trial-and-error approaches for their design may not be suitable. A design optimization procedure is a requirement for obtaining a mechanical test that provides a significant quality and quantity of information about the material. The nonlinear behavior of the material has to be taken into account to obtain realistic test configurations. There is not yet a systematic methodology for test design that takes into account these key points.

In this work, topology optimization is applied to the design of a heterogeneous mechanical test. The elastoplastic material behavior is taken into account. Innovative geometries are optimally obtained with heterogeneous mechanical fields, providing a valuable quantity of data about the material behavior.

The proposed work is a step towards a more accurate material characterization procedure and aims at making the virtualization of metal forming processes a reliable option in the future, leading to more efficient engineering development processes.

Acknowledgements

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Self-adaptive electromagnetic energy harvesting system

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Abstract. *Motion-driven electromagnetic energy harvesters are widely used to power both small-scale and large-scale devices as well as suitable to operate as self-powering technologies, allowing customizable upscaling and downscaling, ensuring low production and maintenance costs, and even able to integrate with hybrid solutions. Remote sensors and/or actuators, mobile devices, portable and wearable systems, and intracorporeal biomedical devices are some examples of using self-powering technologies for ever-increasing small-scale harvesters. Many relevant advances have been carried out in renewable energy systems regarding the scope of large-scale powering. Even so, they are not enough to overcome the limitations of intermittency of some renewable sources, such as wind and sun, and/or the significant time-varying mechanical excitations provided by wind and ocean energy, among other sources. If energy sources are intermittent, energy production costs are high, as complex grid management, expensive energy transduction mechanisms and energy storage systems are required.*

This work focuses on self-adaptability: so that their architectures can be automatically tuned to optimize the harvester length as a function of time-varying external power source dynamics driving the harvesters. This feature is of utmost importance as these electromagnetic harvesters exhibit highly nonlinear behaviors with resonant (excitation frequency matching the natural harvester resonance frequency) and hysteretic dynamics.

A model based on first principles was developed and experimentally validated. Self-adaptability was realized by changing the generator's length and natural frequency as a function of the mechanical excitation characteristics. We propose an instrumented electromagnetic generator for optimized self-adaptive performance. Instrumentation comprises: (i) an accelerometer to monitor the mechanical excitations driving the harvester; (ii) a stepper motor to change the harvester length by changing the distance between non-levitating magnets; (iii) a processing system with a microcontroller and conditioning circuitry to manage and control the entire system. The ability of the self-adapting generator to provide significant power gains were both theoretically and experimentally demonstrated. Although this generator exhibits a volume of 140.7 cm³, maximum open-circuit resonant voltage peak values up to 2500 V, short-circuit current peaks of 36.5 mA and average powers of 1.5 W (with instantaneous power peaks up to 6 W) were achieved for matching loads of 10-30 k Ω under translational excitations with displacement amplitudes of 3-10 mm and frequencies of 4-18 Hz. The maximum power output was achieved under different conditions of input amplitudes and frequencies for corresponding controlled optimal loads and distances between fixed magnets. A Monte Carlo method for different case studies, considering the power consumption of instrumentation, showed the ability of the self-adaptation mechanism to provide energy gains that can surpass 30%. These are very promising results that highlight the potential of self-adaptive energy harvesting technologies for opening new research directions towards the emerging of a new line of highly sophisticated autonomous generators.

Tailoring Heat Storage Materials for Smart Refrigeration Systems

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Abstract. Domestic refrigeration systems, namely for food preservation, largely contribute to 17% of the world's total energy use. Although its primary function is food safety, refrigeration systems have enormous potential as energy-storage devices which are required to fully develop the potential of renewable energy sources and the emergence of smart grids. Recent challenges in the cooling equipment manufacturing industry also include topics such as augmented autonomy and the source of the electrical energy used, tackled in particular by integrating phase change materials (PCMs), solar-powered compressors, and smart control algorithms. Furthermore, in refrigeration, accurate dynamic models are fundamental to predicting, among other things, the effect of new control algorithms on the enhancement of energy efficiency and reduction of operational costs. Thus, the PhD candidate's main goal is to provide a modeling approach capable of providing a quick response and periodically inform the controller of the decisions to make. Outcomes of this project include the development of model-based control systems and the experimental validation of the proposed methodology. Recent progress includes the study of the importance of the mushy zone parameter ($Amush$) to the Numerical CFD investigations on the phase change behavior of low-temperature thermal storage materials. On the other hand, experimental data on chest freezer prototypes' behavior (solar-powered with and without PCMs) and detailed thermophysical properties have been supporting the development of 0-D transient models. Further work is required for calibration of the lumped systems to simulate normative tests of autonomy and energy consumption of smarter refrigeration systems with tailored PCMs.

Coupling tool to assist design and engineering of mold temperature control systems by topology optimization and hybrid fabrication

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Abstract. *The injection molding (IM) process is one of the most widespread and economical methods used to produce high-quality plastic parts. Nevertheless, this manufacturing process, and the quality of the components, greatly depends on the IM tools. In recent years, the design freedom granted by additive manufacturing (AM) has gained interest to produce new and enhanced temperature control strategies in injection tools, which have already proven to decrease cycle time and achieve better part quality. There is, however, a lack of fundamental knowledge that will enable the optimal design of this system. Moreover, since new materials and technologies are continuously being sought and under consideration, it is vital to assess the structural integrity of the IM tool during its cyclic operation, to comply with the IM tooling industry standards. This PhD work program has been designed to tackle the above highlighted issues through the development of a numerical tool to assist the design of enhanced temperature control strategies, employing AM. The latter will be accomplished through advanced algorithms that will be trained by a detailed typical scenario database. The study here presented aims to establish the roots for the approach previously described, therefore a HDPE food container was selected to be produced by IM and a conformal cooling channel (CCC) typical temperature control system (TCS) was designed. The IM HDPE part study was carried out using Autodesk Moldflow Insight software via a Finite Element Method (FEM) transient in cycle analysis. To ensure proper process settings and guarantee minimum cycle time and part maximum quality a Design of Experiments (DOE) approach based upon the Taguchi method was undertaken. The DOE was employed with four distinct parameters ? injection temperature, mold temperature, packing profile (time and pressure). For each parameter two levels were identified (minimum and maximum value), resulting in a total amount of 8 analysis. The goal of this optimization being part improvement by minimizing two quality criteria ? differential volumetric shrinkage and deflection. Minimizing both quality criteria lead to a reduction in warpage, thereby fulfilling the geometric constrains of the food container. Once determined the optimal process settings and consequently reached the best part quality, it will be necessary, to complete the envisaged scenario concerning the TCS and the IM tool durability, to study the structural integrity of the mold. The latter will be accomplished by Ansys Workbench module, Ansys Mechanical, in future studies. The data resulting from the research developed complies with the transparency requirements of open science and will be used for general dissemination actions.*

A review study on metal powder materials and process parameter on LMD

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Abstract. *Laser additive manufacturing is typically a layer by layer process, which has attracted various industries due to its flexibility in manufacturing complex shape without dedicated tools. Further, it has been used for other applications as for repairing high cost parts. These techniques can be classified into different technologies, based on the equipment working principle and the materials that are used. In this manufacturing technologies, and based on the process requirements, various parameters play a key role and needs to be fully controlled in order to meet the industry?s requirement. This paper reviews the use of different metal powder material and process parameter in the Laser Metal Deposition (LMD) process. The metal powder manufacturing and characterizations processes are first described to better understand the process raw material. A roll of reported studies is then analyzed to systematize the possible working parameters range and feasible results.*

Intelligent sustainable plastic product design through machine learning and design for X

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Abstract. *Circularity is a topic of great interest nowadays. This is related to the fact that a broad variety of products are designed with a linear lifecycle perspective. The product starts as a concept, then it is translated into a project, which is materialized as a physical product. When it becomes obsolete, it turns into waste. Circularity addresses this problem by re-introducing the product into a new life cycle by means of recycling, reusing, remanufacturing, among other approaches that promote product sustainability. It is often challenging to realize this process because of the product physical properties that are the result of decisions made during its design and development. This happens because a product must often be conceptualized as circular during its earlier stages of development.*

These decisions are often driven by directives, namely Design for X (DfX), that take into consideration future stages of the product lifecycle, at the development stage. Nevertheless, it is difficult to relate these decisions with the behavior of the product, to better guarantee product circularity. For this, artificial intelligence (AI) has been showing promising results in many and varied fields of research. However, there seems to be a lack of research in areas related to product development and, primarily, plastic product development. And this is important since it has been stated that AI applied to product development can not only improve its sustainability, but also enhance its circularity. Thus, the main objective of this work is to apply a systematic approach in product development, with emphasis on plastics, so that it not only generates standardized data that can be treated, but also takes advantage of data generated during the life cycle of past and current products.

To accomplish this goal, this work aims at characterizing the plastic product lifecycle with representative data and standardize it so it can be used to describe many different plastic products. This will focus on information that links product development with product behavior and handling. The standardized data will allow for the representation of assorted products by comparable parameters. This information will be stored in a database which will serve as a product lifecycle management tool. Next, actual data needs to be acquired, inserted into the developed product lifecycle management system, and used to feed machine learning (ML) models. The latter will be used to find hidden patterns and relationships between product design, with a focus on DfX methodologies, and their implications during post-development lifecycle stages. The knowledge that this process will generate will be used during present plastic product design, as an initial approach, and then integrated in an ML based decision-support system, that will help engineers make more insightful decisions in designing a sustainable product.

Generative design to model metamaterial devices using reprocessed plastics

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Abstract. *High-performance plastics are continuously being sought in engineering sectors such as the automotive and aeronautics. Simultaneously, the unbridled consumption of plastic products has led to environmental, health and economic impacts. In the light of the above, it is mandatory to attain smart reintroduction of reprocessed plastics into the productive chain. This work plan aims to study and demonstrate that reprocessed polymers, in conjugation with high-performance ones, can achieve meta-materials performance to fulfil the product working requirements imposed by the automotive and aeronautics sectors. The latter will be achieved through generative design coupled with numerical tools to produce a model that will be further used during the additive manufacturing of reprocessed polymers, strategically combined with high-performance ones, in order to achieve a metamaterial device performance.*

Continuous processing of density graded and rigid thermoplastic bio-foams

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Abstract. *Thermoplastic foams have cemented a widespread use in modern society, as they provide lightweight structures with outstanding properties (e.g., cushioning and thermal isolation). Moreover, foamed materials contribute to decrease raw materials amount, thus rendering a decrease in materials cost production, alongside an equally decreased expense of resources. Notwithstanding, the high volume-to-weight ratio associated with this category of materials jeopardizes its recovery rate for recycling and poses serious environmental concerns, particularly for short to medium-life-cycle products. Hence, the use of biobased and biodegradable thermoplastics has been established as a possibility to develop a foamed material with a designated end-of-life disposal pathway. Furthermore, current research has been focused on the establishment of materials with property gradation to fulfill certain performance requirements. In the realm of thermoplastic foams, density gradients have demonstrated enhanced strength and energy absorption capacity without compromising their lightweight structure, thus allowing to produce a sustainability-aligned material to be employed in performance-oriented applications. However, few works have considered the production of density-graded foams (DGF) through continuous processes. In this scenario, the research objectives of the current PhD workplan are: (1) to develop a suitable foam-grade formulation based on plasticized potato starch and cellulose-derived fillers in order to attain a biodegradable material with properties as competitive as those of synthetic thermoplastics; (2) to establish a predictive tool to effectively control and optimize the foam morphology and its macroscopic properties based on both material properties and processing conditions; (3) to postulate a continuous manufacturing procedure for density graded thermoplastic foams, thus fostering functionality to this innovative material, while achieving a manufacturing cycle that can easily be integrated into a general thermoplastic processing facility. To accomplish these objectives a structured research methodology concerning the relevant tasks, expected outcomes, and contingency plans, was developed and chronologically distributed. Particularly, the expected outcome of the current PhD workplan is a thermoplastic bio-foam produced from an engineering perspective to perform in structural applications, thus allowing to broaden its application range to the segment of short to medium life-cycle products. Moreover, as this application segment has been tackled by governmental policies like the one that must avoid plastic-based materials, the development of a performance-oriented material with a designated end-of-life disposal pathway will contribute to accomplishing these goals, as well as envision a sustainability-aligned society.*

Adsorption heat pumps for space and domestic water heating

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Abstract. *Given their low environmental impact, adsorption heat pumps (AHPs) have gathered academic and industrial attention. AHPs can improve household's energy efficiency by extracting heat from free energy sources. Furthermore, AHPs work with zero global warming potential (GWP) substances and can be driven by waste heat and renewable energy sources. This work has developed an AHP system suitable for central and domestic water heating applications. Novel physical models have been developed and implemented, allowing the dynamic simulation and performance evaluation of a complete AHP system. Resorting to the results obtained by simulation, an AHP system was designed. The prototype of the best solution was built, which will be used to evaluate the AHP's performance and further validate the dynamic models. This study has as output a novel dynamic model capable of describing a complete AHP system, which was unavailable in the literature, being a powerful tool for better performance achievement on AHPs.*

Development of Embedded Maintenance Algorithms for Equipment Failure Forecast

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Abstract. *Maintenance policies play a significant role in assuring the sustainability of enterprises, from both a financial, as well as environmental standpoint. Industry's digitization created a new inflow of information, that when properly taken advantage of, can enable smarter approaches to maintenance. However, this also created a new sustainability issue, as managing larger and larger volumes of data is itself an immense task. Despite of predictive maintenance not being a new concept, current solutions are based on centralized architectures where the entire process is dependent on a single element, introducing single points of failure that jeopardize identification of possible critical failures. Therefore, predictive maintenance algorithms evermore require deployment in edge devices, increasing acquisition and pre-processing efficiency of the data that is used for anomaly detection and failure/degradation pattern identification. Moreover, current decentralized solutions are not capable of predicting a failure time window, eliciting a need for the creation of a hybrid solution, merging centralized and decentralized paradigms. This is the motivation of this doctoral program, leading to the development of intelligent embedded maintenance devices, which can be easily integrated in manufacturing facilities, capable of forecasting equipment failures, enabling the smart scheduling of maintenance times, and subsequent reduction and early prediction of manufacturing bottlenecks.*

Chemical engineering

Reversible aqueous biphasic systems as alternative separation platforms

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Abstract. *This PhD thesis aims to develop reversible aqueous biphasic systems (ABS) as alternative separation platforms for application in complex matrices. ABS are a water-based and biocompatible liquid-liquid separation strategy and present a low cost comparing with the traditional techniques used in the industry. The use of stimulus-responsive ABS simplifies the separation, allowing in a single-step the purification and concentration of the target (bio)molecule. Based on these advantages, novel reversible ABS were developed and characterized by the determination of the phase diagrams for the stimuli of temperature and pH, leading to the creation of simultaneous pH- and temperature-driven systems. The synthesis of magnetic ionic liquids (MILs) was performed for the development of magnetic responsive ABS.*

The action puzzle of the hydrotrophy mechanism

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Abstract. *Hydrotropes are amphiphilic organic substances that significantly increase the aqueous solubility of hydrophobic compounds. Since the concept was first proposed, in 1916 by Carl Neuberg, a variety of substances have been studied as hydrotropes, and different mechanisms of action have been proposed, but it is still not fully understood. After much speculation in the literature, the statistical thermodynamics-based cooperative model of hydrotrophy was recently proposed. During the four years of this thesis project, the main objective was to unravel the mechanism of action using simple hydrotropes, such as monoglycerol ethers and alkanediols.*

For that purpose, solubilities of hydrophobic compounds, proton nuclear magnetic resonance spectroscopy (1H-NMR), and the chemical environment probes, such as Kamlet-Taft solvatochromic parameter π^ and Py (pyrene) polarity scales were determined for the aqueous solutions of hydrotropes. These data were rationalized using the cooperative-hydrotrope and Setschenow models to clarify the molecular mechanisms and lead to the enhanced design of novel hydrotropes.*

The dataset obtained from monoglycerol ethers revealed that the magnitude of the solubility enhancement of a given solute correlates well with the apolarity of the hydrotrope and reaches a maximum when the apolar surface area of the hydrotrope and solute match. Henceforth we called this important parameter the apolar factor. Interestingly, for the two different families of alkanediols studied (1,2-alkanediols and 1,n-alkanediols), it was observed that hydrotrope self-aggregation is more prevalent in 1,n-alkanediols, which negatively impacts their performance as hydrotropes. As one of the final applications of the compounds studied, some of these biobased solvents have been integrated into the extraction process of phenolic compounds from juçara fruit, a by-product of the palm-heart industry. The results show that the hydrotropes under study have as much or greater extraction power than traditional solvents. In summary, the obtained results support the cooperative model of hydrotrophy and, from an application perspective, show that hydrotropes should be designed considering both their apolar volume and ability to self-aggregate in water.

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Novel strategies based on aqueous biphasic systems for the encapsulation of immunoglobulin G antibodies

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Abstract. *Biopharmaceuticals, such as immunoglobulin G (IgG), can be used in the treatment of several diseases. However, these antibodies easily lose stability and therapeutic efficiency, requiring adequate delivery strategies. Water-in-oil and solid-in-oil-in-water emulsions have been used for their encapsulation, requiring however volatile organic solvents that may compromise safety and stability. In this PhD a novel type of encapsulation technique is proposed, using aqueous biphasic systems (ABS) as water-in-water emulsions and using phase-forming components with gelling ability. Following the assurance of biopharmaceutical stability in ABS, further gellification occurs when temperature changes are applied to directly manufacture gellified particles. An emulsification method has been developed for the encapsulation of a model drug in a gelatin-based ABS, followed by improvements in particle size and homogeneity by the application of an emulsification module. Protein encapsulation, drug release profiles in simulated gastric fluids and stability have been determined and will be presented. Further assays will be carried out using different biopolymers and microfluidics.*

Integrated recovery processes for high-value bioactive compounds from agroforest by-products using alternative solvents

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Abstract. *A circular economy relies on the value of resources, such as raw materials and waste, being maximized. Since biomass is highly significant in terms of high value bioactive compounds (HVBCs), this work plan aims to valorise industrial byproducts such as orange peels and olive pomace and leaves, through the isolation of added value phenolic compounds using sustainable extraction processes. For this purpose, novel biobased alternative solvents (ionic liquids and deep eutectic solvents) derived from natural sources, able to boost the solubility of phenolic compounds (naringin, rutin, hydroxytyrosol, oleuropein) by several orders of magnitude. Experimental design was applied to optimize extraction conditions. Under the assessed optimal conditions, the proposed process resulted in the efficient and selective extraction platforms, allowing the solvent reuse, when possible. The biological activity of the extracts combined with deep eutectic solvents will be investigated. The developed processes are a competitive alternative to conventional processes comprising volatile solvents.*

Non-volatile solvents as a promising strategy to improve indoor air quality

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Abstract. *According to the World Health Organization, access to clean air is considered an essential human right. However, air pollution is a serious threat to human health, being responsible for around 7 million deaths per year. This mortality is associated with several pollutants with both ambient and household emissions, such as gases, particulate matter, and volatile organic compounds (VOCs). As poor air quality is responsible for various diseases, improving indoor air quality (IAQ) must be a priority. Despite the existing guidelines to guarantee IAQ, other strategies should be employed whenever possible, including the reduction of pollutants at their source, air ventilation, and, if necessary, indoor air treatment. Although several technologies can be considered for indoor air treatment, these possess some disadvantages such as high energy consumption, waste generation and harmful by-products production. Therefore, new indoor air technologies are required to overcome these limitations and non-volatile solvents (NVS) appear as a promising alternative. Due to their unique thermophysical properties and adjustability of anion-cation/compound combinations, ionic liquids (ILs) and eutectic solvents (ES) are promising NVS for gas and VOCs capture. Despite all these greener compounds? properties and potential for gas/VOCs separation, transport properties limitations have hampered the development of separation units and their use on target applications. Thus, to develop a technical and economically viable process for gas/VOCs capture, the pursuit on improving solubility, viscosity, and heat capacity must be addressed from an engineering perspective. Aiming at enhancing absorption and desorption processes, the use of a solid phase to immobilize NVS can be considered. Membrane gas absorption stands as a mature technology where high specific surface area, independent controllable gas and liquid flow rates, compact and energy efficient separation units, and a linear scale-up design allows to envision its use for gas and gas/VOCs capture. The use of NVS as absorbents with membrane technology improves the separation selectivity and the mass transfer driving force, allowing high membrane fluxes and low gas outlet concentration. This highlights the potential of the technology to take advantage of green solvents and, ultimately, stand as a technology with high potential for IAQ.*

Acidic aqueous biphasic systems and ionic liquids: problem solvers for metal extraction

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Abstract. *The higher demand for raw resources is leading to supply issues, affording a metal scarcity problem. Managing scarcity can be achieved by resorting to secondary metal sources such as waste of electrical and electronic equipment (WEEE), industrial effluents and acid mine drainage. Extraction of metals from these resources may result in a complex multi-elemental metal solution. Ionic liquids (ILs) are designer solvents proficient for metal extraction. They can be paired with liquid-liquid extraction systems for metal separation. Acidic aqueous biphasic systems (AcABS) are alternative liquid-liquid extraction systems with two immiscible phases mainly composed of water. Unlike conventional aqueous biphasic systems, in the AcABS the inorganic salt is substituted by an acid. Nevertheless, the use of IL-based AcABS for metals extraction is recent and the mechanism of this process is not yet fully clear. To address the gaps in this field, we propose AcABS based on tributyltetradecyl-based ILs for metal recovery (Cu(II), Co(II), Ni(II), Mn(II) and Ce(IV)) from multi-elemental solutions. The influence of metal concentration, IL anion, acid, and its concentration were taken into consideration. The acid had a key role in metal distribution. The hydration sphere of the metal complex and the complexing anion/water ratio were linked to the extraction efficiency of metals. Adjusting parameters such as temperature, ionic strength and acid concentration enables to fine-tune the selectivity of AcABS.*

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Enzymatic Dopamine Polymerization in Aqueous Biphasic Systems

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Abstract. *Laccase, a multicopper oxidase and environmentally friendly biocatalyst, has attracted worldwide attention due to its wide range of applications in biotechnology, including the synthesis of polymers [1]. Among them, polydopamine (PDA) is an added-value biopolymer produced from dopamine polymerization, used in the modification and functionalization of surfaces with biomedical applications [2]. In contrast to the conventional method of dopamine polymerization, which is chemical-based, time-consuming and produces PDA films with poor stability, the production of PDA using laccase improves the efficiency and rate of the process, fulfilling some green chemistry principles [3]. However, on an industrial scale, it is relevant to develop novel methods to allow the biocatalyst recovery and reuse. In this field, aqueous biphasic systems (ABS), which are liquid-liquid systems mainly composed of water, appear as a promising alternative since they provide a mild and biocompatible environment for biocatalysts [4].*

This work aims at the optimization of several parameters for the enzymatic production of PDA. It was demonstrated that the enzymatic polymerization of dopamine is a more efficient process when compared with the non-enzymatic method. At the optimized conditions, the development of an integrated and sustainable platform to efficiently produce PDA using laccase and simultaneously separate this target product and the enzyme through the use of designed ABS is proposed. Several ABS composed of polymers, salts and ionic liquids were investigated, with the most promising ABS allowing their use as an integrated platform for PDA production and recovery and laccase reuse.

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New sustainable approaches for eco-recycling of polyesters wastes into novel (bio)degradable polyesters

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Abstract. *With the rise of bio-based polymers? research and production, the concern about their fate after usage continues as some of them also tend to be persistent in the environment. Bio-based poly (ethylene 2,5-furandicarboxylate) (PEF) is widely known to be a viable replacement for conventionally used poly (ethylene terephthalate) (PET). Despite its enormous potential and expected global production, its end-of-life (EoL) options are still overlooked. In this work, we report the design of several Deep Eutectic Solvent (DES), namely an urea : zinc acetate (U : ZnAc₂) system, for a continuous, mild, and close-loop recycling approach from PEF into rPEF.*

First, to depolymerize PEF we tested several DES being the U : ZnAc₂ the most efficient, afterwards we used this U : ZnAc₂ (4 : 1 molar ratio) as reaction media and catalyst and mild reaction conditions for PEF glycolysis. Subsequently, the repolymerization was carried out successfully without additional catalysts or purification steps in a novel one-pot approach, yielding again PEF (rPEF), confirmed by ¹H and ¹³C NMR, with a 69 % yield. When a co-catalyst was added, titanium(IV) tert-butoxide (TBT), a maximum yield of 91 % was reached. Additionally, the main intermediate product was confirmed to be bis(hydroxyethyl)-2,5-furandicarboxylate (BHEFDC).

The purposed recycling approach confirms, for the first time, the potential for DESs to catalyze PEF's de-/re-polymerization in a continuous way, as an efficient greener option to chemically recycle persistent PEF wastes (and beyond), promoting a more circular approach for EoL. We are now studying this novel circular approach applied to PET.

Improved analysis of breast cancer biomarkers resorting to ionic-liquid-based aqueous biphasic systems and microfluidic devices

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Abstract. *Serum protein biomarkers analysis can support the detection and management of breast cancer. However, technical difficulties related with the low concentration and lability of biomarkers commonly leads to non-reliable results. Accordingly, the analysis of biomarkers involves sample pretreatment and detection resorting to costly and time-consuming resources/protocols. The development of reliable, cost-effective, and user-friendly point-of-care (POC) devices is thus urgent, for which the microfluidic technology holds potential; however, sample pretreatment miniaturization remains challenging. This PhD working plan aims to develop efficient microfluidic POC devices for breast cancer detection by integrating sample pretreatment and biodetection. Being designer solvents, ionic liquids (ILs) will be studied in aqueous biphasic systems (ABS) to develop high-performance sample pretreatment techniques. Given the lack of reports on the integration of IL-ABS within microfluidic devices, it is expected to meet unmet analytical needs at the POC, while making breast cancer detection more expedite and accessible to a widespread population.*

Bioactive protein-rich films obtained from poultry-processing industry waste using bio-based ionic liquids

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Abstract. *The poultry-processing industry generates large quantities of waste rich in proteins, such keratin present in chicken feathers, that are currently disposed in landfilling or incinerated. Therefore, and while considering the Biorefinery and Circular Economy concepts, the recovery of this protein and its application, using ionic liquids (ILs) as alternative solvents is a relevant topic of research. Tailored and low-cost bio-based ILs will be synthesized and characterized to identify the most relevant solvents. Selected ILs will be applied to recover the keratin from industrial waste. These solutions rich in proteins will be applied to produce novel films and scaffolds while allowing IL recovery and reuse. Foreseeing biomedical applications, biodegradability, cytotoxicity, antioxidant, immunocompatibility and impact on cell phenotype and proliferation assays of the prepared materials will be performed.*

Unlocking the hydrotropy potential of alternative solvents for the extraction of target compounds

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Abstract. *Improving water solubility is the most challenging aspect for various new chemical entities. Hydrotropic extraction is emerging as a promising alternative for the recovery of bioactive compounds from organic matrices and the design of novel sustainable extraction processes since it is based on aqueous solutions. Hydrotropy is a method to improve the solubility of hydrophobic molecules in an aqueous medium. We propose to study the mechanism of action of novel hydrotropes based on ionic liquids, deep eutectic solvents and bio-based solvents, to enhance the solubility of target compounds. For that purpose, comprehensive experimental solubility curve measurements will be used as inputs in statistical thermodynamic models to rationalize the still debated molecular mechanism of hydrotropy, and lead to the enhanced design of novel hydrotropes. The molecular level mechanisms of the hydrotropic capacity of the solvents (IL, DES, bio-based) will be also proposed and evaluated based on experimental evidence obtained from spectroscopic techniques. To assess the presence of hydrotrope-solute aggregates, as well as to determine their size, solutions composed of hydrotrope, water and solute will be analyzed by dynamic light scattering (DLS) using a Malvern Zetasizer Nano-ZS from Malvern Instruments. RAMAN spectroscopy will be used to provide detailed information on the composition and structure of the molecules under study. The first experiment critically compares the effect of aqueous solutions of IL and DES to increase the solubility of target compounds (gallic acid, benzoic acid, vanillin, tryptophan and syringic acid). In the second part, the bio-based solvent Cyrene is proposed as a hydrotrope to increase the solubility of phenolic acids (benzoic and syringic acid). The best class of hydrotropes identified will be applied to the extraction of phenolic compounds from natural matrixes.*

Purification of therapeutic proteins using hybrid processes involving ionic liquids

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Abstract. *Over the last decades, biopharmaceuticals have been gaining attention due to their multiple advantages over traditional pharmaceuticals products, such as higher specificity with fewer side effects. Despite their ability to treat several pathologies that currently do not have efficient treatments, their accessibility is lower than traditional pharma products due to their complex manufacturing. The manufacturing process of biopharmaceuticals, which can be divided in the upstream and downstream stage requires the improvement of both processes for a successful biomolecule production [1]. In this sense during the development of this work Komagataella Pastoris, considered a GRAS microorganism, was employed as a host for the expression of IFN γ -2b. Considering that the recombinant protein was being secreted into the media, to increase the protein concentration, low amount of Pluronic and polysorbates were added to the media. Their addition leads to protein stabilization and thus, upstream stage optimization. Afterwards and for downstream optimization, the expressed protein was recovered using aqueous biphasic systems (ABS) using an integrated approach with ABS composed of Pluronic-salts, and Pluronic-ionic liquids. Using this approach, we were able to concentrate and pre-purify the recombinant protein in a more cost effective and sustainable strategy.*

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Development of renewable-based adhesives and surface treatments to produce cork stoppers

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Abstract. *In last decades, the cork stoppers sector has devoted several efforts to replace some conventional materials, such as binders and coatings, with renewable alternatives as a solution to the increase demand for fully sustainable products. In this scenario, the objective of this PhD project is to develop renewable-based adhesives and surface treatments for the production of agglomerated cork stoppers. During the first year of this PhD project, functionalized vegetable oils were investigated as components of photopolymerizable formulations for application as surface treatments of the agglomerated cork stoppers. Several formulations were prepared, and the most promising ones were preliminary tested to surface treat cork stoppers at a pilot scale. The results obtained thus far will be presented and briefly discussed.*

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Modulating the biodegradability of 3D printing filaments using food byproducts

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Abstract. *Tomato industry generates large amounts of organic byproducts, such as tomato pomace and immature/mature fruits, which are being discarded, representing an economic and environmental concern. On the other hand, fused deposition modelling, an additive manufacturing technology, has been used to develop 3D thermoplastic materials while minimizing plastic waste. Within this framework, this PhD aims to create new scientific knowledge on the development of functional, biodegradable, and 3D printable polypropylene (PP)-based filaments, via incorporation of tomato byproducts. As case study, non-invasive functional biomedical devices will be the target. To achieve these aims, a methodology was established, being the chemical characterization of tomato byproducts and the development of PP/tomato byproducts-based formulations ongoing tasks. In the present work, the feasibility of using tomato pomace in PP-based formulations was evaluated.*

Tomato pomace conferred a reddish coloration to PP-based materials, whose intensity was directly related to the tomato pomace amount added. It also increased the melt flow index (MFI) of PP-based formulations from ca. 4 g/10 min to 5 g/10 min (180 °C, 2.16 kg), maintaining their melting temperature (ca. 168 °C). When different particle size distributions (163 µm, 90 µm] and [90 µm, 150 µm]) were used, tomato pomace neither changed the MFI values nor the melting temperature of PP-based materials. Therefore, tomato pomace revealed to be a renewable dye that imparts fluidity to PP-based materials, which opens the opportunity to meet the requirements of circular economy by integrating the tomato cropping/processing and plastic industries.

Thermochemical valorization of plastic waste

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Abstract. *Since plastic discovery, more than 9 billion tones of plastics have been produced. Consumer environmental awareness has driven the plastics industry to collect and recycle plastics. In Europe, more than 29 million tones of plastic waste were collected in 2020 with over one third being sent to recycling facilities, 40 % for energy recovery, and 23 % sent to landfill. A significant part is lost in the environment [1].*

Plastic packaging is the plastic waste category which raises more concern given its abundance in municipal solid waste and the low lifetime use. The food multilayer plastic packaging category is particularly worrisome because conventional mechanical recycling technologies can not recycle these residues. Other approaches have been proposed in the literature, such as selective dissolution-precipitation techniques, delamination, pyrolysis, and compatibilization [2].

The present work addresses the selective dissolution and precipitation as a strategy for the valorization of polymer-based multilayer packaging to recover good quality polymers. The developed process and chemical characterization of the starting material and of the recovered polymers are presented.

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Challenges and opportunities facing the flexible foams industry

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Abstract. *Polyurethane foams (PUF) have had a rapid development and growth over the years, and flexible polyurethane foam (PUF-F) is one of the most popular. PUF-F has numerous applications that play vital roles in various areas. However, the production of PUF-F so far is dependent on fossil raw materials, namely isocyanates and polyols. The global PU market is projected to grow, of the decline registered in 2020 due to the global impact of COVID-19. Climate action is at the central point of the European Green Deal, which aims at reducing greenhouse gas (GHG) emissions and decouple economic growth from resource use. In line with that the use of renewable polyols is already a reality in the PUF industry, namely vegetable oils, recycled polyols, and CO₂-based polyols but it only contributes in part to the total polyol used in some formulations in various industrial-scale applications. Even though there are others potential fossil counterpart to produce PUF as lignin or alternative synthetic routes of PUF via Non-Isocyanate Polyurethane (NIPU) they have several limitations compared to conventional synthesis are not yet available at industrial market scale. Furthermore, only few life cycle assessment (LCA) studies exist for PUF and comparison of the results of different LCA studies is only possible if the methodological choices, assumptions, and context of each study are equivalent.*

This study results from a systematic literature analyses regarding LCA studies on PUF considering the use of fossil and renewable resources. More specifically, the aim of this review was to assemble LCA studies of PUF, to analyse the methodological choices adopted in articles and environmental product declarations and the singularities of these choices. Moreover, the global warming results presented in the publications are compared and discussed.

The next step of the project is to apply LCA to the conventional process and to the most sustainable solutions reported in the literature in order to establish a set of sustainable solutions, to improve the resource efficiency of PUF-F manufacturing, targeting the sustainability of PUF- F industry.

Valorisation of value-added molecules from marine biomass

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Abstract. *The development of effective marine technologies to ensure the sustainable use of these resources is essential. A biorefinery based on marine biomass can represent a more sustainable alternative to petroleum-derived goods, while providing a range of new molecule with interesting biological activities.*

An example of this is Haloarchaea, an interesting class of halophilic microorganisms. Amongst these, Haloferax mediterranei ATCC 33500 is a highly promising candidate to produce bacterioruberin owing to its rapid growth and ability to consume a variety of carbon sources. Bacterioruberin is an uncommon C50 carotenoid which exhibits a higher antioxidant, thus having great biotechnological interest.

We will focus on the the valorization of Haloferax mediterranei ATCC 33500 for the recovery of bacterioruberin and its separation and purification from the remaining cell components using bio-derived eutectic solvents. This is a representative example for the rationale guiding the works performed throughout this thesis on the development of biorefinery approaches.

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Pretreatment of human serum using ionic-liquid-based three-phase partition systems to improve the analysis of prostate cancer biomarkers

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Abstract. *Cancer is not a new problem, however, it is still a major health concern. Only in 2020, an estimated 19.3 million new cases were diagnosed, of those 7.3% were only prostate cancer (PCa), the second most mortal among men. An early cancer diagnosis is considered the best approach, aiming to decrease cancer-associated death and morbidity. Cancer biomarkers can be a ?light in the dark? when concerning cancer prediagnosis since they can provide valuable information about the patients' condition and help deliver better treatment. When considering PCa, prostate specific antigen (PSA) is a small protein (30-34 KDa) found in human serum associated with this condition and one of the few cancer biomarkers accepted by the FDA and currently used in clinical practice. However, its quantification becomes harder due to the higher concentration of immunoglobulins (Ig) and human serum albumin (HSA) within the human serum. Thus, pretreating human serum is of higher importance, aiming to deplete the higher abundance proteins while keeping the desired cancer biomarkers, simplifying its quantification, and avoiding false positives. In this work, several three phase partitioning systems (TPP) based on aqueous biphasic systems (ABS) were tested as an alternative serum pretreatment in human serum and human serum spiked with PSA, aiming Igs and HSA depletion and PSA concentration in a single step. To this end, novel TPP-ABS composed of homopolymers or ionic liquids and a phosphate buffer and homopolymers, phosphate buffer with ionic liquids as adjuvants had their performance evaluated according to HSA and IgG depletion, resulting in efficiencies above 80% for both proteins. Here we identified four promising systems, registering higher depletion percentages for both referred proteins, that were further used for PSA extraction from spiked human serum. From the ELISA assay data, it is possible to notice a preferential partition of PSA for the top phase in all chosen systems ? around 90% - allowing its quantification in a complex matrix. Despite the need for additional optimization and the consequent testing using prostate cancer patients' serum samples, the developed TPP systems showed promising results and are expected to contribute toward a more accurate and precise quantification of PSA with a further benefit in prostate cancer pre-diagnosis.*

Natural Deep Eutectic Solvents as efficient media for the fractionation and valorization of bleached kraft pulps hemicelluloses and cellulose in Biorefinery processes

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Abstract. *Natural Deep Eutectic Solvents as efficient media for the fractionation and valorization of bleached kraft pulps hemicelluloses and cellulose in Biorefinery processes*

The growth of the world population as well as the depletion of fossil resources, pollution, and climate crisis, has led the scientific community to be more focused on the development of sustainable processes and products, to help the world transit from a current fossil resources-based economy to a bioeconomy.

Deep Eutectic Solvents (DES) are a new class of low-cost bio-based solvents, that can be that can be customized to have the physicochemical properties to a particular type of chemistry, have low vapor pressures and are nonflammable. Due to these features, DES have been regarded as one of the most promising types of solvents for biomass fractionation and valorization towards a bioeconomy.

Lignocellulosic biomass is the most abundant and renewable source of energy and materials on Earth. This feedstock is considered a key material for the transition into a sustainable bioeconomy since it is capable of fulfill the current fossil resources-based economy by producing less pollution and more biodegradable products.

In this regard, the developed PhD work focused on the extraction of hemicelluloses from bleached kraft pulp and their valorization into the preparation of bioactive food packaging films. In this period, we have been focused on the production of bioactive food packaging films using extracted xylans. The properties of the ensuing materials were accessed and compared to non-renewable alternatives.

Purification of p53-minicircle DNA biopharmaceutical using integrated processes based on aqueous biphasic systems and supported ionic liquids

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Abstract. *This work plan aims the development of integrated and cost-effective platforms to purify the p53-minicircle DNA(mcDNA) biopharmaceutical used in the genetic therapy of cancer. Despite its therapeutic relevance, current clarification and purification steps are complex, resulting in high-cost biopharmaceuticals. In order to surpass these shortcomings, ionic-liquid-based aqueous biphasic systems (IL-based ABS) will be investigated in the clarification step, whereas functionalized chromatographic supports comprising ionic liquids (ILs) as alternative ligands will be investigated to perform the purification of p53-mcDNA. To this end, this PhD work plan encompasses the production of p53-mcDNA through recombinant technology, the preparation and characterization of novel IL-based ABS and materials modified with ILs, and studies on their application to clarify and purify the target biopharmaceutical from Escherichia coli lysates. After optimizing both operation units, their integration and regeneration potential will be attempted. Finally, in vitro studies will be performed to assess the purified p53-mcDNA therapeutic potential.*

Cultural studies

Afrofuturism and resistance cultures in Brazilian comics

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Abstract. *The research investigates, through a specific focus on the Afrofuturism phenomenon, Comics that discuss what being black represents in Brazil. It proposes to map the publications released between 2011 and 2021, to distinguish Afrofuturist characteristics and understand how they dialogue with postcolonial and decolonial discourses. The Brazilian experience in discussions about blackness, adds to the contribution of comics as a language to register the presence of Afrofuturism as indicative of the emergence of decolonial expressions, in contrast with the hegemonic thought. In view of the extensive anglophone academic production on this theme, we intend to contribute with research in Portuguese language and with a focus on the Brazilian reality, indicating a methodological approach aligned with Cultural, Post-Colonial and Decolonial Studies.*

On Written-Body: A Cartography of the Flows of Desire from the Narratives of Elderly Writers

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Abstract. *Although the last years, it is emerging in Portugal elderly people who write and publish their first works ? works of poems, autobiographies, and others. Besides this, the writing practice is related to flows of desire of the one who writes, and this practice is permeated by tensions of the culture. Thus, this research aims to make a cartography of the fluxes of desire in writing practice, from narratives of elderly writers in Portugal. In methodological terms, this research presents a qualitative approach, and it has been developed narrative interviews with elderly writers. About the selection of sample, it has been used the ?snowball? technique. And to help us in analysis, it will be used the Content Analysis (Bardin, 2008). We believe that this research will produce contributes to our understanding about old age in Portugal, the flows of desire in old age and their relationship with tensions present in Portuguese culture. For example: being older and its stigmas, gender performances, race, and others.*

European Cultural Identity: an unattainable utopia?

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Abstract. *European integration and, in particular, its cultural dimension has represented a topic of multiple discussions, interpretations and positions in the recent past, with a strong impact on European citizens, in particular on organizations in the cultural and creative sector. The institutional objective of building a European cultural identity seems to be a utopia, given the obstacles, problems, advances and setbacks of recent decades. But are we really facing an unattainable utopia?*

The ongoing research work focuses on this central issue, based on literature and documents review, observing in a concrete way the work of European cultural and creative organizations and envisioning potential contributions of the European Union (EU) strategy for the transformation that is intended to dynamize, by political will. Key aspects of the European values and policies as well as the different concepts and perceptions of identity are being analyzed observing some controversies such as nationalism, tribalization, globalization or identity politics.

The dimension of transnational work and European cultural cooperation projects is considered as a central element of the research, analyzing the behavior, motivations, desires and perspectives of organizations in the field of performing arts. Facing proximity to the professional environment, which facilitates access to different experiences in European geography, it is intended to carry out a comprehensive study with an international dimension, based on inquiries, interviews and informal discussions, understanding through professional mobility and European cultural cooperation the current impacts on the performing arts sector and how professionals view the European dimension in their work. Will we be facing an effective desire for the internationalization of cultural organizations or, on the contrary, will we observe a mere response to the need to finance their projects?

Ultimately, it is intended to analyze and discuss the data obtained, understanding whether the entities of the European cultural sector are or could be active vectors in the process of building the European cultural identity. Observing the dynamic context and complexity of the processes under analysis, the proposed methodology also considers the perspective of continuous self-criticism, including potential "new" elements in transnational processes and professional mobility: which may represent in the future additional obstacles to the construction of the European cultural identity.

«Pelle» e «Adú» ou a resistência de viver – um olhar apocalíptico deleuziano aos conteúdos fílmicos de «Pelle o conquistador» de Bille August e Adú de Salvador Calvo»

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Abstract. *Partindo de uma dimensão crítica do pensamento de Gilles Deleuze, pretende-se efectuar uma análise qualitativa pós-crítica e pós-estruturalista aos conteúdos fílmicos de «Pelle o conquistador» de Bille August e Adú de Salvador Calvo», enquanto potência criadora, enquanto criação do impensável, capaz de quebrar a violência do consenso, capaz da ?modificação da língua? num processo apocalíptico cíclico de (des)construção e reconstrução da ?não-verdade?, assumida no sentido nietzschiano, tida como a racionalização axiomática do mundo, numa metaforizada da realidade, construída sobre uma convenção linguística que aproxima cada uma das coisas a uma realidade representada e convencionada.*

We want to make a post-critical and post-structuralist analysis to the films «Pelle the Conquer» by Bille August and «Adú» by Salvador Calvo, as creative power, as creation of the unthinkable, able to break the violence of the consensus, able to ?modify the language? in an apocalyptic cycle of deconstruction and reconstruction of the ?no-true?, assumed by the Nietzsche as the axiomatic rationalization of the world, in a metaphorized reality, build under the linguistic convention, approaching each thing to a represented and conventional reality. This approach will be made by the critical dimension of the Gilles Deleuze?s thought.

EVENTICIDADES - CLASSIFICAÇÃO DE FATORES IDENTITÁRIOS

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Abstract. *Este capítulo trata da coleta dos fatores identitários do concelho de Aveiro e do desenvolvimento do instrumento de pesquisa. O que seria uma construção direta, baseada em referências, tornou-se também uma investigação inédita sobre a identificação e classificação de fatores identitários de comunidades e territórios, partindo das semelhanças e diferenças encontradas entre as definições de patrimônio, imagem e identidade e resultando em um check-list (lista de controle) para futuros investigadores.*

Abstract

This chapter deals with the collection of identity factors of the municipality of Aveiro and the development of the research instrument. What would be a direct construction, based on references, has also become an unprecedented investigation on the identification and classification of identity factors of communities and territories, starting from the similarities and differences found between the definitions of heritage, image and identity and resulting in a checklist for future investigators.

Mulheres na Roda de Choro : Um estudo luso-brasileiro

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Abstract. *O presente trabalho é um estudo exploratório, parte da pesquisa de doutorado em processo de realização, que investiga de que forma se articula a participação das mulheres nas rodas de choro no Brasil e em Portugal. Dentre as questões investigadas na tese, procuramos cartografar, do ponto de vista da interseccionalidade, quem são/foram essas mulheres. Seguindo uma abordagem qualitativa (Minayo et al., 2009), pretendemos utilizar como procedimentos metodológicos observação participante, análise de registros de imagens (fotos e vídeos) e entrevistas em profundidade (histórias de vida) com as participantes que tocam em rodas de choro. Conseguimos apurar até o presente momento da pesquisa que apesar de uma expressiva participação feminina na música da Belle Époque carioca (Vermes, 2011), período em que surgiu o Choro, as mulheres em geral tocavam para o entretenimento de suas famílias. Do ponto de vista profissional, também encontramos neste período, mulheres viúvas e imigrantes que precisavam de uma fonte de renda e conseguiam trabalhar ensinando música. Em sua grande maioria eram pianistas, instrumento musical que para além de encobrir parcialmente o corpo de quem o toca, não é portátil. Em outras palavras, para estas mulheres o prazer de tocar e se divertir estava sempre restrito a um ambiente sutilmente controlado e bem delimitado, como salas domésticas por exemplo. Especificamente nas rodas de choro que consideramos um espaço de lazer para os músicos, não encontramos relatos histórico sobre a presença de mulheres tocando e ainda hoje, a participação de mulheres nas rodas ainda é rara. Para além do conceito de gênero (Butler, 2004) outro conceito que entra em cena na pesquisa é o de lazer (Gomes, 2014), uma vez que escolhemos a perspectiva de Roda de Choro como um espaço de lazer para os músicos. Para próxima etapa do estudo aprofundaremos os estudos sobre as mulheres na música em Portugal.*

Cartographies of the feminine care of the self: decolonial practices

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Abstract. *This is a qualitative research, of cartographic type, to be carried out with women who maintain ties with UNILAB ? University of International Integration of Afro-Brazilian Lusophony, located in Ceará state, Brazil. Based on Michel Foucault's notion of care of the self and concepts proposed by authors of gender decolonial theory in order to explore the (de)colonialities around the practices of care of the self. We already made ten in-depth interviews (seven with students and 3 with employees of the institution and also invited the students to the Photovoices. Data collection is being done remotely, using virtual interaction platforms.*

Gone with the Wind-Research about Jianghu Dage subculture in China

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Abstract. *In the context of China's reform and opening up, various social groups have emerged in, forming a variety of sub-cultures. Over time, the diversity of these subcultures is enough to surprise scholars who have long observed Chinese society, which also provides a rich soil for cultural research. This project, focuses on a group of 'Jianghu Dage' that is prevalent in counties in China. Most of them were born in civilian families in rural or county areas in the 1960s and 1970s. They did not have the opportunity to receive higher education, nor did they have a chance to get a job in a state institution or enterprise and become a worker. However, they started from nothing but took advantage of the historical opportunity of reform and opening up to establish their own business in the cracks between the state and foreign-funded enterprises and local large-scale enterprises, and accumulated wealth above the average level of society. Their personal assets are often as high as millions to tens of millions of U.S. dollars, and their annual income is generally more than 300,000 U.S. dollars. Of course, they often use extraordinary means to accumulate wealth, such as violence, buying and selling, operating profiteering industries, buying and operating the original state-owned enterprises, undertaking government market-oriented projects, and so on. Back then, sometimes they would engage in restrained fighting which would not cause serious casualties, and the winner would obtain the right to operate a certain industry; sometimes they would use language violence to threaten to harm the children of government officials in order to obtain the convenience of operating a certain industry. These actions of them are on the verge of illegality, and generally do not constitute a crime according to Chinese law. Jianghu Dage are a group full of contradictions, and their enviable wealth is even higher than that of elite white-collar workers working in well-known international companies. And because they have some degree of control of violence, they can often be respected or awed by ordinary people in the county. But their identities are not recognized by the mainstream culture dominated by government officials, and are considered to be 'marginal people' in society. They are all merchants or business managers to some extent, but they are full of disdain for the capitalist employment relationship, because they are influenced by the spirit of 'chivalry' in traditional Chinese culture. They and their fellows are called brothers (Dage and Xiaodi). They have a rebellious spirit and like to live freely, and they are very disgusted by the interference of the state and the government on individuals, but sometimes they have to form a close cooperative relationship with the government and government officials in order to seek money-making opportunities. Jianghu Dage have a relatively closed communication circle, which forms a unique language, personality, aesthetics and values. The focus of this research is to examine the unique subculture rooted in the vast regions of China.*

Estudo de Soft Power Chinês da China Contemporânea

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Abstract. *No início dos anos 90, com a introdução da teoria de soft power de Joseph Nye na China, atraiu-se a atenção dos peritos e académicos internos. Desde 2007, quando o governo chinês incluiu soft power no seu relatório governamental, os escritos chineses que abordaram este assunto tornaram-se conspicuamente abrangentes e sofisticados. Por um lado, a discussão dominante de soft power chinês pelos intelectuais e decisores políticos chineses baseiam-se em grande medida no quadro conceptual proposto por Nye, mas não se limita ao seu âmbito específico. O recurso mais valioso do soft power chinês é considerado a cultura tradicional chinesa. Por outro lado, desde o início do século XXI, a comunidade internacional tem mantido um interesse especial e contínuo na promoção do soft power chinês. Globalmente, existe uma suspeita internacional sobre as verdadeiras intenções da promoção do soft power da China, que é vista como uma parte importante da ascensão da China e destinada a eliminar a influência dos países ocidentais. No entanto, os valores e cultura tradicional chinesa, em cuja essência está o conceito de harmonia, são a base da atração cultural chinesa. Com esses valores, esta forma de soft power chinês poderá contribuir para um ambiente global mais pacífico. Atualmente, os estudos que abordam os aspetos culturais de soft power chinês ou a identidade cultural e nacional no processo de construção de soft power chinês ainda são escassos e por investigar. Neste contexto, o presente trabalho centra-se nos documentos oficiais endossados pelos líderes chineses e artigos nas prominentes revistas chinesas, pretende introduzir as características do soft power no discurso chinês e as principais abordagens propostas para a promoção do soft power chinês. Com base disso, o trabalho tenciona ainda analisar a questão da representação da identidade cultural no soft power chinês e como é recebida pelos chineses (internamente) e pelos não chineses (externamente).*

Tendências da Globalização na Indústria Transnacional de Produção de Ídolos: Identidade e Cultura no Caso Chinês

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Abstract. *A investigação pretende analisar a indústria de Ídolos enquanto fenómeno atual em franco crescimento no Leste Asiático, abrangendo países como o Japão, a Coreia do Sul e a China. Este fenómeno tem produzido uma adesão repentina de vários estratos da sociedade chinesa às plataformas digitais, de forma a poderem seguir as suas preferências, manifestar os seus gostos para a comunidade, votar nos desempenhos artísticos dos produtos de uma indústria. Esta investigação pretende compreender os seguintes pontos: 1. Como é que as redes sociais potencializam esta indústria de produção de ídolos e como é que as empresas se adaptam às tendências dos seus seguidores. 2. De que forma é que a indústria evolui dentro da própria China e se adaptou à mudança das tendências dos seus aficionados, analisando o processo da globalização da indústria dos ídolos. 3. Por que razão os jovens chineses são assim tão atraídos pelos ídolos e porque é que muitos deles queriam entrar nesta área para serem ídolos eles mesmos. 4. A função do governo neste caso; por um lado o governo está a aproveitar os benefícios económicos que a indústria dos ídolos traz, e, por outro lado necessita de controlar a influência desencadeada desta indústria sobre os jovens. Para realizar estes objetivos, procederemos à recolha de dados quantitativos sobre as indústrias produtoras, e à realização de inquéritos junto dos jovens para perceber a atitude dos chineses. Os desafios encontrados são: 1. Muitas fontes bibliográficas vêm da língua coreana e japonesa, duas línguas que não domino. 2. A indústria dos ídolos ainda está numa fase instável, e existem cada vez mais políticas novas do governo que estão a limitar o seu desenvolvimento. Portanto, o resultado da investigação provavelmente vai ser influenciado por essas mudanças sociais e governamentais.*

CULTURA DO CONSUMO E INCLUSÃO/EXCLUSÃO SOCIAL: Uma análise a partir das práticas do consumo de cerveja em Luanda

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Abstract. *O presente estudo, no âmbito dos estudos culturais, busca desenvolver uma reflexão em torno da cultura do consumo de cerveja. Com a identificação, descrição e interpretação deste fenómeno em jovens da cidade de Luanda, julga-se oportuno compreender a relação entre essas práticas do consumo de cerveja e os processos e ou momentos de inclusão e ou exclusão social em jovens. Optou-se por realizar a pesquisa em alguns dos principais locais de venda e consumo de bebidas alcoólicas, principalmente de cerveja: bares; restaurantes; cantinas, roulottes em zonas urbanas e peri-urbana na cidade de Luanda, uma vez que a mesma reúne os pressupostos materiais, ideológicos, culturais, humanos, de práticas sociais próprias de sociedades do consumo. Segundo Weber, 1968 apud Inglês (2016), o processo de agir e atribuir significados às próprias ações e às ações dos outros, não só cria uma regularidade, como também, constitui o núcleo das reações sociais, e é a partir destas regularidades que se pode falar de constituição de grupos, família, sociedade. Não é por acaso que (Friedman, 1982) afirmará que o consumo tenha se tornado numa categoria-chave da modernidade, e através dele, são acionados mecanismos de constituição e expressão de identidades. Durante longos períodos (Fontenelle, 2000), as pesquisas no campo da cultura do consumo foram desenvolvidas dentro de campos específicos e teorias da economia, gestão, marketing. Entretanto, áreas como a sociologia, psicologia, antropologia, comunicação, estudos culturais, vê-se ao nível da literatura mais recente, têm apresentado perspectivas diferentes em relação ao estudo da cultura, práticas e hábitos do consumo, em geral, voltadas ao campo da subjectividade, dos símbolos, significados, significância e do seu impacto nas relações sociais, bem como na constituição e organização das sociedades. Fontenelle (2000) propõe dois principais eixos teóricos para o estudo da cultura do consumo: a) teoria do capitalismo; b) teoria das paixões. Por sua vez, Featherstone (1995) propõe três diferentes perspectivas: a) produção do consumo; b) modos de consumo; c) prazeres emocionais do consumo. É sobre estas últimas três perspectivas teóricas, aglutinadas em uma única, designada, modos de consumo (práticas, dos símbolos e das emoções do consumo) que desenvolveremos a base teórica desta tese. Propõe-se pela realização de um estudo de abordagem descritiva e explicativa, de natureza aplicada. Para recolha dos dados optou-se pela observação directa e a participativa com recurso ao diário, entrevista semi-estruturada, focus grupos e o levantamento bibliográfico.*

Palavras-chaves: Cultura do consumo; Luanda; Paixões; Símbolos; Cerveja; Luanda.

Quem é Quem? - o processo.

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Abstract. *?Quem é Quem?? É um estudo sobre a identidade/ processos de subjetivação de uma personagem. Sendo que a mesma será o espelho de uma identidade coletiva, no caso, uma jovem (20-30 anos) mulher.*

Performative Cartographies of Capoeira Angola in Porto

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Abstract. *This work is a Qualitative Research, that cross studies Coloniality, Body and Performance in the field of Cultural Studies. We look at the possible meanings attributed to the practice of Capoeira Angola in the context of ?Cortiço do Abelha? in the city of Porto, Portugal, where we discuss, specifically, how this Afro-Brazilian body practice (game/dance/fight) disarticulates/articulates the relations of the Coloniality of Power.*

Pursuing Wellness: Bypassing, Escaping and Transforming the Marketplace

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Abstract. *Along with globalization processes, the interest and participation in health and wellness activities increased. In the marketing and popular well-being literature, wellness practices have been held up as a synthesis of proper, desirable, and appropriate actions within a system of norms, values, and beliefs that govern societies. In line with neoliberal ideals, global wellness culture assumes the individual as autonomous, potent, strong-willed, and relentlessly striving to improve himself/herself. A consequential theoretical and social issue is the preferred readings such ideological models carry, often exclude and relegate individuals' structural and contextual conditions to a secondary role. Agentic acts of consumption are subject to cultural and social influences in ways people do not readily recognize. Grounded in past work on Consumer Culture Theory, this thesis aims to understand how consumers rework global wellness practices and meanings to fit into their contexts. By exploring distinct contexts of consumption and individuals' worldviews, we examine different forms of consumer resistance and performative orientations. We conclude that global marketplace discourses can impose norms, prescribe specific behaviors, and convey ideologies often contested by local contexts. Resistance can be transformative, assemble changes in marketplace discourses, practices, and power relationships.*

Process of cultural identification with Portugal: a case study based on the Chengdu Institute of the Sichuan University of International Studies

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Abstract. *The research project has as general objective to study the process of cultural identification with Portugal during the learning of Portuguese as a Foreign Language in Chinese universities. The main research methods are: bibliographic research, fieldwork (focusing on the study of Portuguese in Chinese universities and on the perceptions of Chinese students studying Portuguese), and quantitative and qualitative analysis of the collected data. Currently, the project is progressing simultaneously with the literature review and fieldwork. During this period, I published an article in a Chinese journal which concluded that the motivation of the participants to learn Portuguese in this case was mainly instrumental. This laid a background foundation for my subsequent research into the process of cultural identification in foreign language learning. It is expected that this project research will explore multiple ways of reconstructing the cultural identity of foreign language learners and contribute to research on cross-cultural identity in the context of globalization.*

Activismo feminista digital em Moçambique: conquistas, desafios e perspectivas.

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Abstract. *O presente trabalho é uma tese que resulta de investigação sobre o activismo feminista digital em Moçambique, abordando as principais conquistas, desafios e perspectivas. A sua essência é compreender o processo de apropriação das plataformas digitais, pelo movimento feminista, no âmbito do seu activismo em Moçambique. Para o alcance do objectivo definido, tendo em vista a natureza do tema, optamos por metodologia de cariz qualitativo, realizando pesquisa etnográfica virtual ou, simplesmente, a netnografia. Os resultados preliminares mostram a existência de aspectos paradoxais: por um lado, as organizações feministas em Moçambique apropriam-se das plataformas digitais no seu activismo e o Facebook é uma rede social que possibilita a quebra de barreiras geográficas, dando feedback permanente aos membros das organizações activistas e a sua articulação com a sociedade; por outro, a mesma rede social é utilizada para acções de censura ou contra feministas, tornando-se enorme desafio para o respectivo activismo em Moçambique.*

Repression and (Neo)Orientalism: Portuguese Fiction and Travel Writing about China from the late 19th century to the early 21st century

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Abstract. *The current research is focused on a specific period of Portuguese literary production (late 19th century ? early 21st century) about a distant country with unfamiliar cultures, languages, rules of conduct and moral values. The travel writing of the earlier period was characterized by phallogocentric productions, mainly by governmental officials, members of the colonial army or individuals from the metropolitan elite. Their lenses often mirrored racial categorizations of people as a way of explaining the superiority/inferiority of one group over the other, the supposedly irreconcilable relation between artificial entities such as ?The West? and ?Yellow Asia?, articulating long-lasting phobias, but also lustful pleasures only accessible to men of their own class in a fractured, colonized world which included a weakened Manchu Dynasty that had suffered devastating wars at the hands of an alliance of Imperial superpowers, forced to sign unequal treaties. The encounters of these authors with the Chinese, if any, were very limited, most of the time visual and silent, part of sporadic events, since they preferred to socialize with ?their own kind?. These writers functioned as mediators of other worlds and they published books for a domestic audience who could fill the gaps in their imagination with respect to places that they would most likely never have the chance to see for themselves. Consequently, represented-China, constructed through the subjective experiences of a small number of men, worked as a complement to fiction, whose writers acritically accepted written text as a direct version of ?reality?.*

*Currently, this research is involved in the analysis of another paradigm: Eça de Queiroz did not go to China. However, he held a consular position in Havana, the heart of the brutal and repressive Spanish colonialism (Cuba?s Ten Years? War still in progress) where he witnessed slavery disguised as ?contracted labor? after the abolitionist movement. For this purpose, Chinese ?Coolies? were easier to procure and cheaper than black slaves. Even so, Eça was a supporter of Spanish Colonialism on the island, disregarded the insurgency that appealed to many Chinese laborers and did not familiarize himself with the Chinese community. Nonetheless, he was confident enough to write *O Mandarim* and this fiction is still widely praised in Portugal. 1) To what extent is *O Mandarim* any different from other fictions about China written in that period? 2) If this partial contact with some Chinese was not enough to change the Eurocentric, stereotypical image of China, what is the reason behind the insertion of this type of fiction in today?s National Reading Plan presented to 9th grade Portuguese students? 3) Why is critique of Eça on this issue brushed aside when elaborating recent forewords, biographies or surveys of his writing or Portuguese literature? Is it possible to engage with criticism instead of erecting a barrier of unbreachable respect with respect to certain cultural icons?*

Literary studies

The road novel in Portuguese literature: Genre and genealogy, modernity and mobility

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Abstract. *The main goal of my thesis is to assess if there really is a road novel subgenre in Portuguese literature. I look at that subgenre as the literary manifestation of a narrative and transmedia genre - the road narrative -, which has a more recognizable presence in film. Even though the road narrative, in many of its media forms, has been studied in some foreign cultures (the USA, Latin America, Germany and Spain, for instance), it has not yet been thoroughly investigated in Portuguese literature. After taking some time to define what can be called a road novel, I will propose a reading of six Portuguese works within that (sub)genre-framework, attempting to show the advantages of such an exercise. Then, I hope to show how some Portuguese novels are already subverting the road novel paradigm, giving rise to a particular counter-(sub)genre, called the counter-road novel (a designation which I take from recent investigations on the road movie).*

Notebooks, deviations and places in transformation: hybridism and multimodality in Ana Pessoa's young adult narrative

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Abstract. *Based on the analysis of Ana Pessoa's work, published in the Dois Passos e um Salto collection, by Planeta Tangerina, this study, supported by FCT (UI/BD/151283/2021), will reflect on the dialogical and exponential relationship between young adults literature and hybridism and multimodality concepts. Being necessary to identify the technical-formal marks in which such concepts are presented, it will be equally relevant to analyse the literary ways through which many contemporary young adults books elude formulas. Thus, this study aims, for instance, to reflect about the exploration of diaristic and epistolary procedures, about the subjective and creative construction of memory, about the search for a voice, visible in notebooks where a teenager writes, draws, experiments and erases. Besides that, these young adults narratives, like picturebooks, are also characterized by the expansive contamination allowed by the use of verbal, visual and graphic design languages, which will also be analysed.*

Physics MAP-fis

Upconverting material as an all-photonic platform for molecular logic

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Abstract. *The increasing demand for computing power and downscaling is reaching the limits of incompatibility with the lithographic methods limitations, precluding further the shrinkage of the electronic components using state-of-the-art top-down approaches. The future paradigm of computing requires logic elements constituted of nanomaterials with a rational design that can be obtained by employing bottom-up nanotechnology. In early 90's, the pioneering works of Prasanna da Silva et al. inspired a first general and practical approach to information processing and computing based on molecules able to perform logic operations. Since then, the research field grows studying systems based on organic molecules and exploiting chemical inputs.*

Despite recognizing that nowadays trivalent lanthanide ions (Ln^{3+}) can improve the state-of-the-art of Molecular logic devices, only a few works have been reported so far, and most of them respond to chemical inputs, operating in wet conditions. Nevertheless, physical inputs have several advantages as input-output homogeneity, reconfiguration, integration, remote control, and dry conditions, allowing the system to perform computing cycles of diverse logic operations.

Recognizing the potential of molecular logical devices based on Ln^{3+} ions emission, the goal of this project is to develop molecular logic devices exploiting the optical properties of Ln^{3+} ions as active computing centres. This work will explore several possibilities focused on physical stimuli (in particular pulsed excitation source) that will permit the systems to perform different binary arithmetic operations and even more complex logic operations including the possibility of sequential logic operations.

C60 Fullerite Clathrate Structure

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Abstract. *Recently we have proposed a 3D polymerized structure of C60 which is clathrate like. To construct these structure molecules are bonded via a new bond, the double 5/5 2+3 cycloaddition, to all their 12 face centered cubic nearest neighbors. This new bonding generates new C60 cages on the octahedral sites, equal to the original C60 molecules. On the tetrahedral sites distorted sodalite-like cages appears as a bonding consequence.*

We have computed the electronic structure of the new C60 fullerite clathrate. It shows semiconductive behavior having a huge density of states peak ~0.7 eV above the Fermi level. This huge DOS peak may be exploited to achieve High superconductivity temperatures if appropriate doping is adopted.

Novel and high-sensitive primary and self-referencing thermometers based on the excitation spectra of lanthanide ions

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Abstract. *Remote sensing through ratiometric luminescence thermometry based on trivalent lanthanide ions (Ln(III)) has lately become a promising technique due to its numerous applications. Most available Ln(III)-based luminescent thermometers require a calibration process with a reference thermal probe (secondary thermometers) and recurrent calibrations are mandatory, particularly when the thermometers are used in different media. This is sometimes impractical and a medium-independent calibration relation is postulated, which is potentially inaccurate. Thus, the determination of the temperature based on well-grounded physical principles by primary thermometers is the only way to overcome these challenges. Despite being considered one of the most important developments in luminescence thermometry, primary luminescent thermometers are scarce. We proposed, implemented, and validated primary thermometers requiring calibration at one known temperature (primary-T), which are also self-referencing, employing ratiometric data from the excitation spectrum of Ln(III). By combining with the emission spectrum, thermometers not requiring calibration (primary-S) were devised. A Eu(III)-b-diketonate complex was used as a proof-of-concept, but the approach is universal and other Ln(III)-based materials can be explored. Because many thermometric parameters are employed for temperature prediction an unprecedented very high accuracy of 0.2% in the physiological range is obtained.*

Using upconverting nanoparticles to unveil the anomalies of liquid water

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Abstract. *Although it is the most used solvent, water is the least understood liquid. This is due to its particular molecular structure, which allows the hydrogen bonds to take place. Once the fluctuations in the extensiveness of the hydrogen-bonding network are the key to deciphering the anomalous behavior of water, this research aims to use the Brownian motion of upconverting nanoparticles for identifying distinct organizations of hydrogen bonds in liquid water at ambient conditions. This allows for understanding the structure of the organization of the molecules in the vicinity of the nanoparticles due to the particle-particle and particle-water interactions.*

Atmospheric rivers in the Arctic: historical and future climatology

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Abstract. *Atmospheric rivers are identified as anomalous moisture and heat transport events confined to long, narrow, and transient corridors, that can cause heavy precipitation and warm. With the expected continuous increase of moisture fluxes and air temperature in the future climate, atmospheric rivers are likely to significantly affect the Arctic mass and energy budget, also due to a shift towards more recurrent rainfall.*

This PhD started with the analysis of case studies of atmospheric rivers reaching the Arctic during a measurement campaign (2017). After, this work was extended to a 42-year climatology (1980-2021) based on reanalysis, which included the analysis of changes in the variables used to identify atmospheric rivers and their impacts, the creation of an atmospheric river database and their relation with changes in precipitation and air temperature. Currently, the same methodology is being applied to analyze the changes of atmospheric rivers and associated impacts in the future (2081-2100) based on CMIP6 climate model outputs, when compared with a historical period (1995-2014).

Er³⁺ emission: a tool to measure power density and temperature

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Abstract. *NaGdF₄:NaGdF₄:Yb³⁺/Er³⁺@NaGdF₄ nanoparticles are characterized by photoluminescent measurements. Based on the same upconversion emission spectra, we were able to develop a primary thermometer and a NIR radiation sensor. This feature can be particularly useful in medical applications, where the delivered NIR radiation must be regulated. Therefore, this multifunctional system can monitor the temperature while controlling the excitation power density delivered to the recipient.*

Online-coupled atmospheric-aerosol regional forecast model for solar energy production

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Abstract. *Solar radiation has been explored for energy usage purposes as a renewable energy source. The installation and running of solar energy systems require a good solar radiation climatology and radiation forecast. Such information has been obtained to a great extent using atmospheric numerical models, but aerosol interaction with radiation and clouds is frequently omitted in these models. However, the radiative forcing of aerosols and clouds can be considerable under particular conditions. It is now established that atmospheric aerosols must be included in atmospheric and climate models to improve numerical weather prediction (NWP) and climate simulations. Despite the existence of studies on the feedback mechanisms related with aerosols, there are still scientific questions to answer regarding their influence on the radiation budget, atmospheric dynamics, and thermodynamics. The work proposed here intends to include the effects of the aerosols in NWP and climate models, by implementing an online coupled atmospheric-chemistry model for the Iberian Peninsula, and hence improve the radiation simulation at the surface for solar energy production.*

Shadows of hairy black holes

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Abstract. *The Event Horizon Telescope (EHT) produced in 2019 the first image of a black hole candidate with resolved horizon scale structure. Imaging the strong gravity region around such compact objects can test the Kerr hypothesis. This hypothesis states that astrophysical black holes are well described by the paradigmatic Kerr solution. In the last few years, new black hole solutions and horizonless compact objects have been proposed considering the interaction with novel ultralight bosonic particles, which can work as a proxy for dark matter. Kerr black holes with Proca hair are an example of such solutions. In this presentation we will briefly discuss novel results regarding the such objects.*

Geosciences

The Lusinde ferroan granite intrusion (Penalva do Castelo area, Central Iberian Zone): origin and petrogenesis

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Abstract. *The Lusinde pluton is a small granite intrusion emplaced into Precambrian-Cambrian metasediments of central Portugal (Penalva do Castelo region; Central Iberian Zone) at around 300 Ma. It is one of the intrusive units of the so-called Viseu-Fornos late-post-kinematic batholith, a large discordant granite complex emplaced in the Central Iberian Zone during the final stages of Variscan continent-continent collision.*

The Lusinde massif displays a fine-grained non-porphyritic texture and a primary mineral assemblage consisting of quartz + plagioclase + K-feldspar + biotite + apatite + zircon + monazite + ilmenite + allanite + pyrite. Mafic microgranular enclaves (MME) are often present.

Compared to the other intrusive units of the Viseu-Fornos batholith, the Lusinde granite and its MME (with ferrodioritic composition) show a very peculiar geochemical signature, characterised by: (a) extreme iron enrichment ($FeOT/[FeOT+MgO] = 0.90-0.92$); (b) alkalic / alkali-calcic affinities; (c) depletion in MgO, TiO₂, CaO and Sr and (d) high contents of Zr, Nb, Y, Ce, ?REE. Such features are typical of ferroan granites worldwide. A ferroan lineage is also supported by the presence of biotite with very high FeT/(FeT+Mg) ratios and points to a derivation from magmas with low fO₂. Ilmenite and pyrite are common accessory phases in reducing magmas.

Sr-Nd isotope data for the Lusinde intrusion ($^{87}Sr/^{86}Sr = 0.7097-0.7101$; $?Ndi = -0.39$ to $+0.59$; $TDM = 0.81-0.95$ Ga) exclude an origin from pure anatexis of upper crustal protoliths and suggest a mantle input in granite genesis. We therefore propose that the Lusinde granite could have resulted from hybridisation / contamination of mantle-derived basic liquids (with tholeiite basalt composition) with peraluminous crustal melts.

Alkaline activation in Adobes: improvement and assessment of its technical and environmental performance

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Abstract. Adobe can be defined as an earth-based building technique in masonry that uses blocks of raw earth molded without compaction or firing characterizing a low environmental impact construction technique. Some pathologies are common in adobe buildings, mostly related to atmospheric and water interactions, such as cracks, moisture spots, efflorescence, detachment of the mortar coating, and degradation (Varum et al., 2006). To consolidate earth construction as a sustainable alternative to contemporary building, it is necessary to improve its performance. Alkaline activation has been studied as an alternative stabilization method for adobes successfully on a laboratory scale (Costa et al., 2019; Elert et al., 2015). It consists of adding cations or hydroxides of alkali metals to react with the raw material (phyllosilicates, namely clay minerals), modifying its structural order through geopolymerization reactions, leading to an amorphous gel or component of low structural order (Davidovits, 2015). Life Cycle Assessment (LCA) is the compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle. This work focuses on the adobe's product phase (CEN, 2013) by assessing the choice of raw materials and the adobe production by combining local geomaterials, bio and waste-based stabilized with alkaline activators. The methodology is divided into a preliminary and a detailed phase. During the preliminary phase, 52 formulations of adobes combine different raw materials based on Aveiro's adobe characterization (Costa, 2019). These formulations are assessed by LCA methodology and tested for their physical, chemical, mineralogical and textural properties. The selected formulations presented better mechanical resistance through successful alkaline activation. The detailed phase aims to investigate the physical and chemical properties of the adobes through water interaction and durability tests. This characterization allows the development of a protocol for adobe curing at room temperature assessed by LCA. By combining raw materials and alkaline activation, adobes are produced with similar technical performance and lower CO₂ emission, allowing their application in the rehabilitation of buildings and also in new earth-based constructions. In this sense, this work aims to promote the use of local geomaterials from a sustainable perspective by using waste and bio-based materials. It also targets to encourage the use of LCA in the application of geomaterials by verifying the possibilities of using LCA as an eco-design methodology in earth building.

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Characterization, valorization and management of mine wastes from an abandoned mine in the Beni Mellal-Khenifra region- Morocco: The case of Tansrift mine

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Abstract. *The huge amounts of waste rocks and tailings generated by the mining industry cause negative and serious environmental impacts worldwide.*

In Morocco, several social and environmental challenges and issues are associated with mining industry, which required rigorous monitoring of the chemical and physical stability of the generated mining wastes. These wastes can contain significant amounts of sulphide minerals, which can be oxidized during water-rock interactions and generate acid mine drainage (AMD) if alkaline-generating minerals are not present and/or able to neutralize the acidity produced. In order to mitigate the environmental impacts, mine wastes must be properly managed to ensure an integrated risk management of mine wastes.

The Tansrift mine is located in the Beni Mellal-Khenifra region (about 20 km southeast of the city of Beni Mellal), in the northern limit of the central High Atlas (Morocco). This is an open pit mine that was mined essentially for copper. Thus, a huge quantity of waste rocks and tailings was deposited on the surface and has been exposed to weathering for many years. Presently, the mine is abandoned but a smelter continues operating in the mining facilities.

The purpose of this study is to: (i) make a full characterization (physical, mineralogical and geochemical) of mine wastes of the Tansrift mine; (ii) investigate the geochemical availability and speciation of potential toxic elements (PTEs) in tailings and waters; (iii) evaluate the feasibility of recovery of metal(loid)s from these tailings or its reuse for other purposes (e.g., construction materials) and/or establish a management plan in order to mitigate the impacts caused by these wastes/tailings.

An Assessment of Geophagic Materials in Nigeria Relative to other Domain: A Call To Establish A Geophagia Standard

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Abstract. *Geophagy is a known and common practice worldwide. The genesis and properties of the geophagic material determine its influence on human health. More so, the impact of trace elements on human health depends on the type of element, its concentration, and the bioavailability of the materials. Therefore, this research proposes investigating clay minerals and other geophagic materials (naturally occurring and processed) in southeast, Nigeria and comparing results with available databases from different regions. The study's relevance is in health risk assessment (examination of toxicity of clay minerals) and health benefit integration (possibility to be used as nutritional supplements). Results of studies might be helpful to establish a proxy in the Anambra Basin and a geophagy standard.*

GEOTECHNICAL ANALYSIS OF XILUVO CARBONATE FOR USE AS A GEOLOGICAL CONSTRUCTION MATERIAL. / EVALUATION OF THE POTENTIAL IN RARE EARTHS IN XILUVO CARBONATE.

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Abstract. *This project with the theme "GEOTECHNICAL ANALYSIS OF XILUVO CARBONATIT For USE AS GEOLOGICAL MATERIAL OF CONSTRUCTION", aims to study the geotechnical characteristics of Xiluvo Carbonatites for use as construction material, on the other hand, has as plan B, this project is to study the potential in rare earths of Xiluvo Carbonatite, since they have several applications and importance, depending on their characteristics and their chemical composition. In the construction industry and agriculture, carbonatitos are important, because the rock itself is constituted as an ore for the production of portland cement and limestone for agricultural cathes (correction of soil acidity), with this arise two general objectives and seven specific objectives, whether they will be aided by the general objectives. The study area is in the locality of Xiluvo, nhamatanda province district of Sofala in the central region of Mozambique, at coordinates 19°14'32.00"S latitude and 34°04'11.000e longitude at the elevation of 194m. The study area is located in the Bárue Complex (Chimoio Group). Pinna et al. (1987), in the 1:1,000,000 scale geological map, presents this complex divided into five lithostratigraphic units namely the groups of Nhamatanda, Madzuire, Changara, Canxixe and Matambo. The methodology to be used in this project, includes the specific bibliographic survey, geological field research, technological characterization, physical tests, finally the analysis and interpretation of the data obtained, the experimental data obtained will be made the correlation of the characteristics of the samples studied with the pre-established values, in order to perceive the potential in rare earths of the Carbonatites or the geotechnical characteristics for use as construction material. With the results obtained it may be possible to promote the technical, scientific, social, economic and environmental development of the carbonatite exploration region, and of Mozambique in general.*

Development of geopolymers from iron mine waste: study of thermal and mechanical properties

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Abstract. *There is a greater urge for mineral resources to meet the needs of a modern society. However, many of these resources are emitters of polluting gases into the atmosphere. It's becoming urgent to find more ecological solutions. One possibility is to replace Portland cement with geopolymers. The objective of this PhD is to combine a sustainable geopolymer, i.e., obtained from low energy consumption materials, being resistant to compression, weathering and with good thermal properties. For this, rock materials from Portugal are being explored to reduce the carbon dioxide emissions associated with the transportation of raw materials.*

Gerontology and geriatrics

Older adult peer-educator: A multiple case study in Portugal and the USA

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Abstract. *Ageist societal views on aging see older adults as a population with nothing to contribute. Seen as a source of expenditure and economic burden; they are often victims of discrimination and social exclusion. To the contrary of this belief; there is a new generation of baby boomers who live longer and healthier lives. Older adult peer-educators are volunteers working at lifelong learning institutions who exemplify productive engagement in later life. Productive engagement in later life has been found to enhance the aging process by providing older adults an outlet to contribute to society and achieve quality of life. Universities of the third age (Europe) and lifelong learning institutes (USA) have become a leading force of employment for older adult educators. While much research has focused on the effects of lifelong learning in elderly students; empirical research focusing on older adults as peer educators is limited. The research study utilizes a multiple case study approach of institutions of lifelong learning, to create a better understanding of the experiences of retired older adults as peer-educators in the USA and Portugal. Investigates their own aging process as well as each of these societies' views on productive engagement based on their collectivist vs individualist cultures. The methodology approach is qualitative including documentation review, in-depth interviews, followed by thematic analysis. Aims to highlight the lack in depth studies on the topic looking at it from an international perspective. Peer-educators are a strong contributing force to the economy, the organizations they volunteer for, and the people they serve; reason why their experiences and efforts must be recognized.*

Keywords: Peer-educator, Older Adults, Productive Aging

Feeding difficulties in institutionalized people with dementia: a social-ecological approach

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Abstract. *In advanced stages of dementia, people may have feeding difficulties, usually manifested by low food intake, oropharyngeal dysphagia, refusal to eat and aversive behaviors. It has been increasingly recommended that feeding difficulties can be reduced by applying a social-ecological approach to care. However, evidence of the effects of such model remains limited. Therefore, this project aims to develop, implement, and evaluate the ?Feeding Older adults with Dementia ? Eat, Assist and Train? (FOoD-EAT) an educational intervention program aiming to reduce the feeding difficulties of institutionalized people with dementia.*

A scoping review identified 32 feeding difficulties interventions that were divided into 4 categories: environmental, mealtime assistance, staff training, and multicomponent. Most studies have shown its impact on increasing food intake and improving behaviors such as agitation and aggression in people with dementia. The impact of interventions on care staff was related to better knowledge and attitudes towards mealtime difficulties. There is a lack of reporting on the impact of interventions in the care context/environment.

A new task was added to the work plan. A qualitative study, through individual interviews with direct care workers, will identify the perceptions, concerns, and difficulties regarding the feeding difficulties of people with dementia, as well as their learning/educational needs to improve performance in helping these people at mealtimes.

From April to June 2022, a research exchange was performed at The George Washington University (Washington, DC - USA), where the FOoD-EAT intervention sessions were designed and an experience as a research assistant was intensely experienced. These tasks were essential for the theoretical preparation for the experimental studies that will follow according to the work plan.

Keywords: feeding difficulties, person with dementia, social ecological model, intervention, long-term care; nursing homes

Gerotranscendence and well-being in institutionalized older adults

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Abstract. *Gerotranscendence is an adaptive theory of aging that postulates a mindset shift in late-life about time perception, connection with the universe, ego-integrity, and increased need for solitude. Gerotranscendence has been associated to higher levels of life satisfaction, well-being, and lower levels of depression; however how gerotranscendence can be developed and explored is still unclear. The aim of this project is to explore its usefulness as a guiding framework for an intervention program for institutionalized older adults. The first task consisted of performing a conceptual analysis on gerotranscendence and self-transcendence, aiming to differentiate these theories and provide an in-depth understanding of its associated concepts and relation with old age. In this study, fifty-four papers defining gerotranscendence, self-transcendence, and/or transcendence in late life were analyzed. The analysis revealed six clusters (1) late life shift, (2) enhanced awareness, (3) maturation process, (4) individual experience of transcendence, (5) boundaries expansion, and (6) transcendence level. Results indicated that the two theories share common transcendence aspects, such as overcoming ego matters, modifying ideas about death, and undergoing a maturation process indicating a different perspective about the same phenomenon. The second PhD task is to conduct a systematic literature review (currently being performed) to identify, characterize, and synthesize interventions based on gerotranscendence targeting older adults. This review is expected to provide the knowledge about how and if this theory can serve and guide psychosocial group interventions. Another important task being carried out is the validation of gerotranscendence scales in the Portuguese population. Currently, the study was approved by the ethics committee, and is on the data collection phase. It is expected that the results from the undergoing tasks provide the necessary elements to the intervention phase of this study.*

Perspectives on Death in Elderly Care Homes: Reports from Residents, Families and Professionals

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Abstract. *Death is a natural, universal and inevitable process, which many people are afraid to think about and talk about. In Portugal, approximately 4.34% of the elderly are institutionalized in Residential Structures for Elderly People (ERPI's), where when someone dies, their place will be taken by another resident. The general objective of this study is to contribute to the understanding of perspectives on death in ERPI, considering the main protagonists: residents, family members and staff. The methodology is mixed and includes three studies: 1) management of the death process in ERPI, from the perspective of technical directors (qualitative; focus groups); 2) attitudes towards the death of staff in ERPI (quantitative; questionnaire); 3) perspectives on death, narratives of residents, their families and staff (qualitative; participatory photography). This study is expected to develop guidelines composed of good practices for the management of end-of-life and death in the context of ERPI.*
Keywords: End-of-life; Death; Older People, Family; Staff; Residential Structures for Older People (ERPI)

Between_Generations: The role of older generations in families with rare inherited diseases

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Abstract. *Hereditary diseases are family diseases where an intergenerational perspective is relevant to understand the family adaptation to the disease. Older family members have been dealing with the disease for a longer time and accumulating experience about it. This study examined the health-related roles performed by the older generations in families with inherited diseases. Further, from an aging point of view, intergenerational roles may generate meaning for older persons. Therefore, this study examined the roles of older relatives towards younger ones, in Portuguese families with hereditary diseases (Huntington disease); and analysed generativity in older affected individuals (with familial amyloid neuropathy - TTR-related FAP). A mixed methodology was adopted and developed in two main stages. (i.) Qualitative methods (the Critical Incidents Technique, through semi-structured interviews) to assess older family-members' health-related roles in families with HD; (ii.) Quantitative descriptive-comparative to examine generative concerns (Loyola Generative Scale, Portuguese version); satisfaction with life (Satisfaction with Life Scale, Portuguese version); self-rated health (single item of self-perceived health) in older individuals affected with TTR-FAP; and to compare those with individuals with no known family history of a hereditary disease. Main findings indicated that i. older family members played relevant roles regarding younger generations health and disease management; ii. there were no significant differences for generativity, satisfaction with life and self-rated health between the TTR-FAP and the non-FAP group; and iii. Generativity was positively correlated with satisfaction with life and self-rated health in older TTR-FAP adults, but not in the non-FAP group. Findings are relevant for the provision of psychosocial support to families with inherited diseases, particularly by highlighting key intergenerational exchanges that may improve individuals and families' psychosocial outcomes. Additionally, older affected family members with TTR-FAP are attaining generativity, possibly due to the opportunity to contribute to their families, which seems to be meaningful to them. Our findings may also have implications for other hereditary diseases, particularly those with similar clinical characteristics and inheritance mode. Finally, they provide new contributions to developmental (particularly for older stages of life) and gerontological sciences, where the experiences of older persons in affected families remained unexplored.*

Technology-mediated dance intervention in older adults with mild cognitive impairment: impact on cognitive and physical functioning

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Abstract. *This project aims to add to the available knowledge on technology-mediated dance interventions by conducting 4 studies: i) a systematic review with meta-analysis on the effectiveness of technology-mediated interventions, including dance, for cognitive and physical functioning; ii) a feasibility pilot study followed by iii) a randomized, controlled, single-blind trial to assess the effectiveness of using an intervention mediated by a dance mat on the cognitive and physical functioning of older adults with mild cognitive impairment and iv) a secondary analysis of data from this trial to determine factors associated with the response to the intervention. The overall results will inform clinical practice and further research. To date, the systematic review was performed and is in the process of being finalized for submission. Thirty-two studies were included: nineteen with healthy older adults and thirteen with older adults presenting clinical conditions. We classified the cognitive function in eight domains (general cognition, immediate verbal memory, delayed verbal memory, working memory, processing speed, attention, inhibition, and short-term memory) and the physical function in five domains (general functional mobility, lower limb functional mobility, balance, endurance of lower limb, and endurance of upper limb). Results from the meta-analysis suggest no significant differences between interventions mediated by technology and traditional interventions for both healthy older adults and older adults with clinical conditions. This study will help us to guide the next study of the project (feasibility pilot study) in terms of duration and frequency of the intervention. The feasibility study protocol is under preparation to submit to the ethics committee of the University of Aveiro.*

Older adults' attitudes and willingness towards deprescribing

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Abstract. Polypharmacy is highly prevalent among older adults and a major worldwide patient safety health issue 1 as it is often associated with adverse outcomes, such as the increased risk of falls, frailty, cognitive impairment, functional decline, hospitalization, and death. Polypharmacy may be appropriate in a multimorbidity context or inappropriate if one or more medications have no benefit or are causing harm. Portugal is an aged country with one of the highest prevalences of polypharmacy in older adults (36.7%) in Europe. Thus, there is an urgent need to implement deprescribing strategies supported by research. Deprescribing is a process of withdrawal of an inappropriate medication, supervised by a health care professional to manage polypharmacy and improve outcomes. Nevertheless, deprescribing faces several barriers, including physicians', patients', and caregivers' attitudes towards the process, as well as the patients' beliefs towards medications. To study the patients' attitudes and willingness towards deprescribing. First, we performed the translation, cross-cultural adaptation, and validation of the rPATD (revised Patients' Attitudes Towards Deprescribing) questionnaire patient's version. Then, we conducted a cross-sectional study on community-dwelling patients aged ≥ 65 taking at least 1 regular medication. Data collection included demographic and clinical characteristics. The patient's attitudes toward deprescribing were assessed with the Portuguese rPATD questionnaire. The 2 rPATD global questions were dichotomized into the binary outcome agree (strongly agree or agree) and disagree (unsure, disagree, or strongly disagree). Binary logistic regressions were used to identify predictors for the binary outcome "willingness to deprescribe." P values ≤ 0.05 were considered statistically significant. The Portuguese rPATD questionnaire was successfully translated, cross-culturally adapted, and presents globally good psychometric properties, similar to the original rPATD questionnaire³. A total of 192 older adults were included in the cross-sectional study, had a median age of 72 years (IQR= 69-77), most were female (65.6%), and the great majority had a low education level (74,5% had primary school graduation or less). Polypharmacy was observed in 76.9% of the patients, and 91,6 % had ≥ 3 chronic medical conditions. Answers to the rPATD global questions revealed that 83.33% of the participants agreed that they were willing to stop one or more of their regular medicines if the doctor said it was possible. In addition, 90.62% were satisfied with their current medicines (58.8% agree, 31.8 % strongly agree). In the binary logistic regression analysis, the significant predictors of willingness to deprescribe were age (adjusted odds ratio (aOR)= 1.136; 95%CI 1.026,1.258), sex (aOR= 3.036; 95% CI 1.059, 8.708), and the rPATD concerns about stopping (aOR= 0.391; 95% CI 0.203, 0.754). The Portuguese rPATD presents globally good psychometric properties. Polypharmacy prevalence was very high in the study population. Most patients (90.6 %) were satisfied with their current medicines, but still, the majority (83,3%) were willing to reduce or stop the medicine if their doctor recommended it. Older age, female gender, and concerns about stopping medicines were significant predictors of willingness to deprescribe.

History of sciences and scientific education

And Galen crossed the Atlantic. The syncretism of luso-brazilian medical practices and knowledge (1500-1650).

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Abstract. *The purpose of this thesis is to study of the mutual impregnation of Portuguese and ?Brazilian? medical theories and practices in the 16th and 17th centuries. It aims, more precisely, at underlying the roles developed by the Lusitanians and indigenous people in the possible elaboration of a unique medical and medicinal knowledge at the crossroad of the two civilizations: has science been ?opened up? in this context of circulation, transmission and appropriation of knowledge? This question remains without a precise answer for the long 16th and 17th centuries.*

By defining the sources different point of view (simple description, capture and/or destruction of new knowledges), the issues of theory and practice transmission (who brought what to the other, forms of influence, acceptance or rejection of this influence) and the medical and medicinal consequences of bringing two civilizations in contact (sociologic, ethnologic, economic and environmental effects), we have been able to establish, last year, that the medical hybridization really started at the beginning of the 17th century because of a shortage of graduate physicians and European pharmacopoeia. If the Europeans, in the 16th century, seem to have dedicated themselves to the discovery and description of a ?new? medicine, the 17th century?s context rather corresponds to a need of applying this ?new? medicine. We finally concluded this year that what we call the ?tryptic business-conquest-religion? was the best resume for the Luso-Brazilian medical case. Science and innovation were here at the service of colonization and evangelization during those times of trouble. We think here, for instance, about the Jesuits grabbing the local medical and medicinal knowledge in order to replace the societal pillar that shamans are and to, ultimately, acculturate indigenous people. Science has been ?opened up?, indeed, but not for everyone and not in the same way.

The third year of this research (last year) has been perturbed a lot because of the pandemic. European archives and libraries have been closed for several months, and not simultaneously. The scientific trip to Brazil, planned in October 2020 and postponed, has unfortunately been delated because of the sanitary conditions. Thanks to the online archives, the work has not been totally shutdown but the original schedule has been delayed. We took advantage of this situation to become an assistant professor in Modern history with 2nd year students of History Degree during the first school semester. The University of Tours agreed a fourth year of thesis during which we were Professor of History and Geography at middle and high school, and now a fifth year during which we will be Professor of History of Sciences and Technics at the University of Strasbourg (Faculty of Medicine, Pharmacy and Politic Sciences). The next main goal is to visit the Italian archives during the next holidays (Archivo Apostolico Vaticano, Archivum Romanum Societatis Iesu) in order to collect the last missing data and, then, to achieve the redaction of the thesis.

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Study of archaea and History of Biology

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Abstract. *A molecular approach to Biology, based on applications of chemical and biophysical principles, has been developed since the 1930s. Along with developments in areas like microscopy and bioinformatics, the use of molecular techniques enabled researchers to analyse solutions found by organisms in response to a number of problems, many of which are common to other species.*

A paper entitled ?Phylogenetic structure of the prokaryotic domain: The primary kingdoms?, focusing on archaea (microorganisms formerly named archaeobacteria), was published in 1977 by Carl Woese and George Fox, posing a challenge to the scientific community. Some of the first questions to be raised involved the particular molecular characteristics of archaea and their adaptation to conditions which are harmful to other organisms. It was soon noted that archaea are distributed worldwide and play a significant role in biological cycles.

In the 1970s, data collections about archaea were organised for comparison with other taxonomic groups. These works resulted in evidence that eukaryotes evolved from ancestors in the archaeal branch, as reflected in the proposal for the Asgard superphylum (2017). Biological structures formed very early in geological history and some features were preserved through critical events. RNA studies, like the ones performed by Woese and Fox, were useful to demonstrate this and to create models for evolutionary history. Marine samples were an important source of information for such models.

In 1996, the first archaeal genome was sequenced and attempts for a metagenomic approach (assembly and analysis of sets of sequences that might be contiguous, after isolation from environmental samples) were already on course. The lower costs of genome sequencing moved targets towards the composition of global exploratory maps and databases of biological characteristics, within the scope of Biogeography. For these studies, interdisciplinary work is required.

The purpose of this work is to analyse the evolution of publications about archaea on the second half of the 20th century, as well as interdisciplinary connections and technological developments that made the discovery of archaea possible. Abstracts of articles about archaea/ archaeobacteria, obtained through searches on Publons/ Web of Science and Scopus engines, were analysed, categorised and used to select topics and keywords, in order to explore points of interest and their historical context. Different sources of information about the crossroads between archaea and technology will be explored. A case study involving interdisciplinary work will probably be included.

UMA PERSPECTIVA SOBRE A HISTÓRIA CIENTÍFICA BRASILEIRA: a criação da Sociedade Brasileira de História da Ciência

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Abstract. *This work aims to understand and reflect on aspects of the Brazilian scientific context through the genesis of the Brazilian Society for the Science History. To do so, a contextualized critical look was used on the perception of the importance of a scientific society focused on the study and development of the history of science, and a community of historians of science; together with the construction of a locus that contributes and encourages the (re)construction of broad scientific perspectives over time in Brazil. For this, the study included interviews with scientists, who relate to the construction of the Brazilian history of science and with the Brazilian Society for the Science History (SBHC). The work, in addition to having a moment of reflection, rescues the identity and characterizes what a scientific society is, as well as its importance within a historical context. The historical reconstruction by the interviewees guarantees a living memory of the path through which the history of science was institutionalized, and the analysis of the articles published in the SBHC magazine enable a reflection on the development of the field over time. In this way, it is interesting to think about how influences on political, economic, and social issues can affect the institutionalization of science. Within this context, the vision of the scientific societies progress, namely the Brazilian Academy of Sciences, the Brazilian Society for the Science Progress, until the arrival of the Brazilian Society for the Science History, reveals a depth regarding the perspective of multiple areas of research. know, traversing the modern scientific history development in Brazil.*

Keywords: Scientific Society; Brazilian Society for the Science History; Brazilian Academy of Sciences; Brazilian Society for the Advancement of Science; Historiography of Science; Science History.

Information and communication in digital platforms

Evaluation of Social Digital Games – Impact in Older Adults – Digital Competences on Online Communities

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Abstract. *As the World's population ages, and the digital ubiquity floods everyone's lives, new challenges are imposed to provide access and develop for an audience that has been neglected and has multiple barriers to entering the digital world – the older adults. Digital games and online communities present great potential for mitigating some of the age-related impairments, while stimulating cognitively and socially, and promoting older adults' inclusion in a progressively more digitized World. Social digital games emerge as a hybrid, where one plays for their personal goals, while sharing an understanding of other players' objectives, prioritizing social interactions, and reinforcing their shared intentionality that allows actions in the game to be socially meaningful.*

Through the Developmental Research method, combining mixed methods and a quasi-experimental configuration, this research aims – after designing, implementing, and testing – to assess the impact of social digital games, in the context of online communities, on older adults' digital competences. Participants aged 50 or older will be recruited and divided into an experimental group and a comparison group, allowing to acknowledge if significant differences in both groups are registered.

This thesis project describes the rationale for conducting this research; the research question that guides the study; followed by a literature review; the relevant research groups, projects and partners; relevant journals; the methods to be used to achieve the defined goals; the data collection instruments; and the main foreseen scientific contributions. At-last, the following results are expected: (i) successfully involve older adults with social digital games in online communities; (ii) have an implemented and functional version of the game prototype; and (iii) outline the design recommendations of social digital games in online communities capable of impacting older adults' digital competences.

Heuristic model of a health dashboard for citizen engagement in smart cities

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Abstract. *The sustainability of a smart city is a recurrent research topic in this last decade. Smart cities assume technology is being used to mediate several city services in the interest of the citizen. This investigation has the question: What characteristics should a dashboard of public health indicators for a smart city have to generate greater engagement of people? The main findings reveal the concept to be appropriate, needed and essential to developing a human perspective for smart cities and be capable of translating the citizen's motivations into performed citizen experience (CX). A greater engagement in the citizen experience improves the relationship between the citizen with the territory and its public agents.*

Empathic Playable Characters in Digital Games: a model proposal for the design of Playable Characters

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Abstract. *The research aims to understand and systematize playable characters' attributes in digital games capable of triggering Empathy in the Player, pointing out as the main result the proposal of a methodology for the design of empathic playable characters.*

The problem that motivates the research is the lack of a methodology for designing empathic characters. However, a player's identification with a game character is a known and observed phenomenon.

This research is conducted following Grounded Theory methodological principles wherein a first phase of the study, besides the bibliographical analysis, a document analysis of playable characters throughout the history of digital games is carried out. Then, a survey is applied to gamers' online social networks to assess players' preferences regarding character characteristics. Based on the results obtained in the collection and the questionnaire, laboratory tests are carried out to quantify players' empathic responses to the behavior of the characters designed, taking into account the preferences measured.

In this communication, the research design is reported. The main tasks and the preliminary outcomes are systematized.

Evaluation of Gamification Strategies – Impact in the Information and Communication Services of Cyclotourism for Senior Citizens

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Abstract. *Currently, an extension of longevity is visible in society, resulting in a growing interest in active and healthy ageing. Also, in the present information and communication society, senior citizens are becoming better consumers of digitally mediated products, leading to a growing need to satisfy their requirements and preferences. That culminates into challenges and opportunities for creating engaging tools, such as gerontechnology and gamification, to promote senior citizens' interest, motivation, and changes in behaviour in certain activities.*

The purpose of this research is to identify, conceptualize, implement and test a set of gamified information and communication services to promote active and healthy ageing, through sustainable cyclotourism. It is intended to encourage the creation and dissemination of physical and virtual environments for cyclotourism that enhance sociability, participation and integration of senior citizens in communities; increase functional capacity and autonomy through physical activity inherent to cyclotourism; maintain and improve a social environment through digital platforms; and inform and change behaviour regarding sustainability through gamified cyclotourism.

Participants aged 50 years or older are being recruited, following a non- randomized process, and divided into an experimental group and a comparison group to assess the impact of gamification strategies on indoor and outdoor cyclotourism. It is intended to acknowledge if there are differences between groups in sociability changes towards active and healthy ageing, and in changes towards more sustainable behaviours. Data is collected through focus groups, scales, interviews, questionnaires, participant observation and field notes, being cross-referenced with results from the literature.

This exploratory mixed-method research that includes a quasi-experimental study has its scientific contribution aligned with the goals of the Sustainable Development Agenda of the United Nations for 2030 (SDG 3 ? good health and wellbeing; SDG 10 ? reduce inequalities; SDG 11 ? sustainable cities and communities), the objectives of the Portuguese National Strategy for Active and Healthy Ageing (ENEAS) and the Portuguese National Strategy for Active and Cycling Mobility (ENMAC). It is expected that this thesis will make an important contribution to the field of information and communication within the scope of Social Sciences, through the creation of requirements and guidelines for gamified strategies in cyclotourism, promoting a healthy and active lifestyle, as well as sociability and senior citizen integration. It can also lead to a deeper study, encouragement and improvement of countries' infrastructure, promoting and increasing sustainable tourism in different contexts.

Computer science MAP-i

Extraction and Access to Information in Natural Language for Non-Developers - Democratizing Information

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Abstract. *Named entity recognition (NER) tasks imply token-level labels. Annotating documents can be time-consuming, costly, and prone to human error. In many real-life scenarios, the lack of labeled data has become the biggest bottleneck preventing NER being effectively used in some domains and with some natural languages, with negative impacts on the quality of some tasks. To overcome the barrier of the lack of annotated data for new application domains in some natural languages, we propose a method that uses the output of an ensemble of NER's to automatically annotate the data needed to train a Bidirectional Encoder Representations from Transformers (BERT) based NER for Portuguese.*

Towards Improved Privacy in Service Environments

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Abstract. *Current communication platforms and infrastructures adopted concepts from cloud computing, heavily relying on virtualization and service orientation. It is becoming increasingly common for vehicles, homes and devices to be cloud assisted, and to interact with their environments. To this end, Application Programming Interfaces, and rich protocols also became a corner stone of current deployments, even being used in what before were constrained environments, such as IoT. At the center of the current technological landscape are users, who are exposed through the data they produce. In all scenarios, security by design became a requirement, first to keep the CIA constraints, but most importantly because of the risk created by the mass amount of personal data handled, the operational and brand impact of an attack, and the penalties of the legal framework. Due to the human dimension of these interactions, privacy protection became a relevant aspect to consider, expanding the much simpler confidentiality aspect.*

As users consume or produce content, execute services, interact with devices, command their homes, or simply possess mobile devices, privacy is being compromised. The result is a flood of data and metadata being produced that either directly identify users, as well as their behaviors, or may indirectly lead to their identification, violating their privacy assumptions. Cryptography has been the go-to solution to secure data, and to keep data confidential, but while cryptography targets data, it is not capable of securing behavioral patterns so well. Attacks to privacy can target multiples aspects of an infrastructure, including direct attacks that expose badly protected data, but also deidentification using poorly anonymized data lakes, and finally fingerprinting from amassing simple amounts of protocol data or metadata, even if encrypted. While much work as been developed to provide privacy protection to user data stored in databases and activity logs. Questions still exist in relation to the extent of privacy aspects indirectly presented by control plane, the resulting protocol data, and metadata, because of the multiple interactions between services and devices.

This topic proposes to explore and quantify the privacy dimension of protocols used in environments with services, with a special focus on future advances around smart homes, edge computing and 6G. Based on the assessment developed, it then aims to propose improvements and mechanisms to towards enhancing the privacy protection in said environments.

Weighted Intelligence for Networking Control

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Abstract. *The benefits of the most recent generations of mobile networks such as fifth-generation (5G) and beyond 5G (B5G) wireless networks have been exploited by emerging technologies such as the Internet of Things, Vehicle to Everything (V2X), Augmented Reality, Virtual Reality, etc. To achieve this, many works have been proposed that use Artificial Intelligence (AI) techniques to obtain an efficient coexistence of these services, but they almost never consider derivated costs. Our goal in this Ph.D. thesis is to improve the state-of-the-art in quantifying the cost of using AI for Networking control. In the first stage, we intend to investigate the types of costs derived from this trend (e.g., energy, hardware resources), to finally, define a global cost indicator. Then, we will develop a methodology or intelligent model to estimate these costs.*

Dynamically Flexible Custom-fitted Networks

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Abstract. *The introduction of cloud-based mechanisms into mobile networks has allowed the development of concepts that leverage the flexibility and dynamism provided by virtualized network functions deployment. This capability has allowed operators and vendors to pursue an economy of scale in their system deployments, by shifting their monolithic deployments to fully virtualization-supported and orchestrated network services. Future 6G networks will fully exploit these features. Although this flexibility has been amply explored in mobile network system deployment, it has not been explored in terms of the mobile network architecture itself.*

Dynamic and decentralised inter-domain orchestration of network resources and applications

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Abstract. *This presentation focus on the current status of Dynamic and decentralized inter-domain orchestration of network resources and applications. Currently, the author is still researching the existing gaps; therefore, this presentation is an excellent way to present the challenges surrounding this research topic.*

Marketing and strategy

The seduction of entrepreneurial universities: are Europe facing an entrepreneurship 'myopia'?

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Abstract. *Entrepreneurial universities are a significant element of entrepreneurial ecosystems and aspire to foster entrepreneurial initiative through their 'third mission'. However, while entrepreneurial ecosystems are scrutinized using a contextual approach to detect differences and similarities and how they affect entrepreneurship, little is known about how entrepreneurial universities impact entrepreneurial initiatives in general, considering multiple environments. Drawing on entrepreneurial university and entrepreneurial ecosystem theories, a conceptual framework is proposed that aims to explain the effect of the entrepreneurial university on an entrepreneurial initiative through its three 'missions', using an entrepreneurial ecosystem taxonomy. Based on individual data from the Global Entrepreneurship Monitor, this entrepreneurial initiative analyzed 18 European countries in 2017. The results do not generally support the importance of entrepreneurial universities to entrepreneurial initiative. The relevance of entrepreneurial universities increases in more fragile entrepreneurial ecosystems since individuals need support over multiple dimensions. Conversely, the entrepreneurial universities that are embedded in stronger entrepreneurial ecosystems lose relevance and negatively affect the entrepreneurial initiative. Therefore, the value of entrepreneurial universities is reduced when individuals receive greater support from other dimensions. The variations across both groups suggest that the concept of entrepreneurial universities is not a contemporaneous phenomenon; however, their effect is progressively revealed by the maturity of each university's mission. This perspective substantially changes the understanding of entrepreneurial universities as a thwartwise strategy, suggesting that the universities' impact is expanded as their missions gradually evolve. Overall, the study contributes to an understanding of the implications for universities that blindly follow entrepreneurship, neglecting the exogenous environment, namely, the entrepreneurial ecosystem and individual drive.*

GIG ECONOMY PLATFORMS: A FIRST STEP TOWARDS ENTREPRENEURSHIP INTENTION

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Abstract. *The emergence of digital platforms aggravated by the COVID-19 pandemic spawned a variety of business models that use the gig economy (GE) as the structural basis. It refers to the intermediation of peers in a short-term contract, constantly associated with sharing economy. Authors discuss its impact on the entrepreneurial activity through two main perspectives: (1) serve the interests of the platforms by promoting an independence appeal to hide their intention on responsibility exemption/market hegemonies that result in poor micro-entrepreneurship; or (2) empower worker autonomy and provide resources that contribute to their entrepreneurial knowledge/experience and well-being. A focused review of literature, through a bibliometric analysis and a machine learning topic model, pointed out that there is a common ground in which the GE will keep growing and is prone to contribute towards individual's entry into the entrepreneurial landscape; yet, there is no empirical evidence about the main facets of adhering that for this purpose. Hence, to fill this gap, this work investigates behavioral and psychological factors, in the relationship between GE workers and the GE platforms, as resources constraining solutions to support nascent entrepreneurs in their orientation and intention towards venture creation. It answers how technology-mediated entrepreneurship based on GE impacts: affective experiential and instrumental cognitive attitude, self-efficacy, perceived controllability, risk perception, proactiveness, autonomy, and innovativeness while bonding/bridging social capital. These variables shape the components of the theory of planned behavior and individual orientation construct; and will be accessed as the measure of entrepreneurial intention/orientation. The objective is to summarize the results to help scholars and practitioners develop structured policies and actions to empower the role of the individual towards entrepreneurship and impact its social welfare.*

Family Wine Tourism: Experiences and challenges for holidays with children in wine destinations

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Abstract. *Wine tourism is traditionally a segment associated with middle-aged couples who travel without children seeking wine knowledge and tasting experiences. However, recent studies suggest that families constitute a potential wine tourist market, constrained by the lack of activities and experiences suitable for the whole group, especially children. Meanwhile, some wineries have developed family-friendly facilities and experiences. This research seeks to understand the experiences of family tourists in wine destinations and the related opportunities and challenges faced by wineries' managers. Through a mixed-methods approach, it describes services and experiences offered by family-friendly wineries in different countries; analyses family wine tourists' perceived benefits, experience dimensions and most critical winescape components; explores the influence of the presence of children in the behaviour of adult family wine tourists and identifies opportunities and challenges perceived by managers of wineries in Central Portugal regarding this market. Preliminary results suggest that family wine tourists do search for wine tasting and learning experiences, combined with gastronomy, but in a way that also involves and entertains their children, meeting each group's needs and motivations. Pioneer wineries in different countries, like the U.S., Australia, France, South Africa and Spain, offer wine tourism experiences for the whole family or cater to children separately so that adults can enjoy their own time and experience. In the studied Portuguese wine routes, there is still no structured offer for this public. Most wineries' managers reveal a lack of knowledge of its potential, even though the region is a relevant family tourism destination.*

Customer experience, service quality, loyalty, and churn: studies in telecoms industry

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Abstract. *A industria de telecomunicações é um mercado cada vez mais concorrencial, onde os diversos operadores lutam entre si por angariar novos clientes. A elevada rotatividade de clientes é um dos principais desafios enfrentado pelo setor das telecomunicações, e para o qual são ainda insuficientes os contributos na literatura, particularmente em relação aos serviços em pacote, serviços esses que representam mais de 80% de penetração em diversos países. Isto leva-nos à seguinte questão? Quais as razões levam um cliente de serviços em pacote, a mudar de operador de telecomunicações??.*

O objetivo deste estudo é contribuir para esta área de investigação através de quatro estudos sobre a rotatividade de clientes nas telecomunicações.

O primeiro estudo, uma revisão bibliométrica de literatura, teve como objetivo a identificação dos artigos que tiveram maior impacto sobre a investigação da rotatividade de clientes e mapear a estrutura conceptual e intelectual do campo de estudo, no período compreendido entre 1995 e 2020. Conclui-se que existem duas grandes linhas de investigação, sendo uma, a que se dedica a compreender o que leva à rotatividade de clientes, como a satisfação, a qualidade de serviço, os custos e barreiras à mudança, as diferenças demográficas, entre outros, e uma segunda, que se dedica ao desenvolvimento de modelos preditivos com, com recurso a algoritmos.

O segundo estudo, uma revisão sistemática de literatura, teve como objetivo a identificação de todos os antecedentes da intenção de mudança, ou da própria mudança, no período compreendido entre 1999 e 2020. Concluiu-se que a satisfação, a idade, o género, os custos e barreiras à mudança e a qualidade de serviço são os principais determinantes identificados, sendo que a esmagadora maioria dos estudos incide sobre serviços de telecomunicações móveis. É interessante também observar que a técnica estatística mais utilizada nos estudos sobre intenções de mudança é a análise de equações estruturais, enquanto no estudo do churn é a regressão logística.

O terceiro estudo, um estudo quantitativo com 910 clientes de serviços em pacote, teve como objetivo compreender quais os fatores com maior impacto na intenção de mudança de operador. Os resultados demonstram que os serviços de internet e de televisão têm o maior impacto na satisfação global com o operador, enquanto o serviço de telefone fixo tem um efeito insignificante. Igualmente, observou-se que a satisfação tem um efeito positivo na reputação da marca, na perceção de valor, na lealdade, mas também nos custos e barreiras à mudança. Os custos e barreiras à mudança, são fortemente influenciados pela perceção de ?prisão administrativa?, no entanto esta não tem um efeito direto na intenção de mudança. A lealdade por sua vez, mostrou que tem um efeito negativo nas intenções de mudança.

Já o quarto e último estudo, teve como objetivo compreender quais os fatores com maior impacto na mudança de operador, utilizando para isso 3004 clientes de serviços em pacote. Os resultados, vieram demonstrar que a lealdade tem um impacto significativo na mudança, e que os determinantes com maior impacto na lealdade, num serviço múltiplo de telecomunicações, são o serviço de internet e o serviço de televisão. Observou-se ainda que a probabilidade de churn desce de acordo com o aumento da lealdade, sendo que nos níveis mais elevados, a probabilidade de churn é bastante reduzida.

Mathematics & Applied mathematics

time-dependent Jacobi matrix polynomial

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Mathematics

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Abstract. *Under some integrability conditions We find explicit formulas for the left and right raising and lowering first order differential operators for orthogonal matrix "time-dependent Jacobi"polynomials. We derive recurrence relations for the left and right coefficients in the raising and lowering operators. We also derive a second-order differential equation satisfied by these polynomials. The non-Abelian extensions of a family of discrete Painlevé IV equations are discussed.*

Inverse Conductivity Problem

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Abstract. *We present our research on the Inverse Conductivity problem in 3D following the approach of Quaternionic analysis as an extension to the usual approach of complex analysis to the 2D scenario.*

Study of some Diophantine equations

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Abstract. *The tools used in Wiles' proof of Fermat's last theorem proved very fruitful in studying solutions of many other Diophantine equations. Of particular interest are equations of the form $Ax^p + By^q = Cz^r$. If A, B, C, p, q, r in this equation are fixed, with p, q, r restricted to the condition that $1/p + 1/q + 1/r < 1$ and r is prime, Darmon and Granville (1986) proved that this equation has only finitely many solutions. Furthermore, the ABC conjecture implies that the equation has finitely many nontrivial primitive solutions, not just fixing all parameters, but even if we allow them to vary.*

An example of the kind of problems to be considered in the present thesis project is the equation $x^2 + dy^6 = z^p$. We were able to prove that such an equation does not have solutions for r large enough prime number for certain values of d . Different techniques were used, focusing specifically on using the symplectic method. The Ph.D. plan is to study other instances of this kind of equation and prove the non-existence of primitive solutions for them as well.

Light Ring and Shadow of A Black Hole

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Abstract. *The light rings (LRs) topological charge (TC) of a spacetime measures the number of stable LRs minus the number of unstable LRs. It is invariant under smooth spacetime deformations obeying xed boundary conditions. Asymptotically at equilibrium black holes (BHs) have, generically, $TC=-1$. In Einstein-Maxwell theory, however, the Schwarzschild-Melvin BH - describing a neutral BH immersed in a strong magnetic field - has $TC=0$. This allows the existence of BHs without LRs and produces remarkable phenomenological features, like panoramic shadows. Here we investigate the generalised Schwarzschild-Melvin solution in Einstein-Maxwell-dilaton theory, scanning the effect of the dilaton coupling a . We find that the TC changes discontinuously from $TC=0$ to $TC=-1$ precisely at the Kaluza-Klein value $a=3$, when the (empty) Melvin solution corresponds to a twisted Kaluza-Klein reduction of ve-dimensional at spacetime, i.e: the dilaton coupling a induces a topological transition in the TC. We relate this qualitative change to the Melvin asymptotics for different a . We also study the shadows and lensing of the generalised Schwarzschild-Melvin solution for different values of a , relating them to the TC.*

Spatio-temporal models for time series of counts and their application to health outcomes

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Abstract. *Modelling and predicting the temporal dependence structure of time series of low counts have received considerable attention over the last years. Nevertheless, extensions to the analysis of time-space count data are still at a quite embryonic stage. Hence, we develop the new class of Space-Time Integer-valued Autoregressive Moving Average (STINARMA) models. This class is, simultaneously, a multivariate extension of binomial thinning integer-valued univariate INARMA models and, the integer counterpart of continuous space-time STARMA models. We have derived the first and second-order moment structure for both AR and MA models, as well as their corresponding space-time autocorrelation function. Additionally, we have developed moment-based, conditional least squares and conditional maximum likelihood estimation method, which have been efficiently implemented in R programming language via sparse matrices, C++ (Rcpp) and code parallelisation.*

Queens graph and its generalizations

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Abstract. *The n -Queens' graph, $Q(n)$, is the graph associated to the $n \times n$ chessboard (a generalization of the classical 8×8 chessboard), with n^2 vertices, each one corresponding to a square of the chessboard. Two vertices of $Q(n)$ are adjacent if and only if they are in the same row, column or diagonal of the chessboard.*

This research plan includes the deepening of the study of the combinatorial and spectral properties of $Q(n)$ and the study of these properties for its generalizations.

In this pitch, the progress so far and the next steps of the investigation will be presented.

A comparison of feature selection methods in COPD

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Abstract. *Criteria to choose appropriate methods to select features to be used in linear models (LMs) are unclear. Automatic stepwise selection and the least absolute shrinkage and selection operator (LASSO) are common approaches. Normalized entropy (NE), which measures the information content of a particular model or feature, might also be considered. We aimed to compare feature selection (FS) methods and describe the effect of the coronavirus disease 2019 (COVID-19) lockdown, sociodemographic and clinical features on the overall upper-limb muscle strength of people with stable chronic obstructive pulmonary disease (COPD). The handgrip muscle strength (HMS) was measured at baseline and 5 months after and the difference was considered as the outcome. Twenty-one features were used. FS was performed in numeric standardized data: (i) LASSO used the penalization parameter that produced the lowest 5-fold cross-validation mean squared error; (ii) automatic stepwise selection consisted of a backward process from a LM with all features in order to obtain the lowest Akaike's information criterion (AIC) and bayesian information criterion (BIC); (iii) NE is obtained through optimization of the supports. LMs and fit measures were applied. A LM with the features ordered by NE that returned the lowest BIC was computed with non-standardized data. A total of 38 participants with mean age 65.3 years (standard deviation 7.0), 3 to 4 comorbidities (63.2%) and a mean HMS of 35.13 kg (standard deviation 9.8) were included, 22 (57.9%) of whom in the pre-lockdown group. LASSO selected the existence of acute exacerbations of COPD (AECOPD) against the same eight chosen by the AIC and BIC approaches. AECOPD had the lowest normalized entropy (0.895). The brief physical activity assessment tool for moderate physical activity (BPAAT moderate) score, the percentage of the predicted forced expiratory volume in 1 second, the existence of respiratory hospitalizations and the age registered a value under 0.98. The LM with the four features with lowest NE showed that a unit increase in the BPAAT Moderate score or having 2 or more AECOPD tend to decrease baseline-post HMS difference by 1.14 (95% confidence interval [0.18,2.09]) or 9.62 kg (95% confidence interval [4.54,14.70]). Generally, those with respiratory hospitalizations do not tend to clinically improve. The LM obtained by the entropy approach was at least not worse than the remaining.*

Multiperfect numbers in unique factorization domains

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Abstract. *A multiperfect number is an integer N such that the sum of all its divisors is a multiple of N and N is perfect. If the sum is equal to $2N$. The concept of perfect numbers was extended by Spira to the ring of Gaussian integers and to the ring of Eisenstein integers by McDaniels. The Euclid-Euler theorem gives a structure formula based on Mersenne prime numbers for even perfect numbers and analogues of this theorem were obtained by McDaniels for some unique factorization domains (UFD). If N is an odd perfect number, Euler proved that N must be of the form $p^e k^2$, where $p \equiv e \equiv 1 \pmod{4}$ and p is prime and does not divide k . We propose to study generalizations of the Euclid-Euler theorem for multiperfect numbers in certain UFD, as well as structure formulas for a number to be multiperfect.*

Multimedia in education

CINEMA PARADIGMA: um estudo de caso sob a perspetiva dos coordenadores de escola do Plano Nacional de Cinema

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Abstract. *O projeto CINEMA PARADIGMA insere-se no campo de trabalho convergente entre Educação e Cinema - mais especificamente no âmbito da Literacia Fílmica - e manifesta-se através de dispositivos orientados para a aprendizagem, de e com linguagens fílmicas, numa lógica integrativa e plural da construção do conhecimento. Em contexto de doutoramento, assume a forma de um estudo de caso que tem como público-alvo os coordenadores de escola/agrupamento do Plano Nacional de Cinema. A informação recolhida traduzirá os hábitos de consumo, práticas e conhecimentos sobre cinema destes professores, bem como recomendações baseadas nas suas experiências em contexto escolar. A súmula da investigação tem ainda como propósito confrontar aquilo que a literatura recomenda com aquilo que é a realidade das práticas em escolas portuguesas, destacando o que as aproxima e também aquilo que poderá ser melhorado, ou que, na sua singularidade, enriquece o âmbito sem comprometer as indicações dos especialistas. Por fim, a meta será a proposta de um dispositivo que possa atender às dificuldades identificadas, que reflita a discussão dos resultados e que possa ser utilizado por professores como apoio no planeamento das suas atividades.*

Developing Open Educational Resources for doctoral education training: an Educational Design Research approach

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Abstract. *Open Educational Resources (OERs) can bring numerous benefits to educators, institutions and governments. However, there is still some resistance to the use of OERs in doctoral programs and higher education in general. The research question that guides this investigation is which characteristics should an OER developed for doctoral education training have in order to make its use more engaging? Under the methodological approach of Educational Design Research, this investigation will consist of three phases: context analysis, development and formative evaluation, and semi-summative evaluation. In the first phase, a systematic literature review will be conducted to analyze the use of OERs in doctoral education training, and a survey will be carried out among PhD candidates, researchers and practitioners to identify which characteristics can contribute to make OERs an engaging solution to doctoral education training. In the second phase, the OER prototype will be conceptualized, designed and developed. This prototype will go through cycles of formative evaluation, and as feedback is being received, adjustments and improvements will be carried out. In the third and last phase, a semi-summative evaluation will be performed to make the last adjustments to the OER and finally disseminate the results in doctoral programs in TEL.*

Main results of the EduPARK Green Educational Guide about students' attitudes towards nature conservation

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Abstract. *This study explores nature conservation attitudes of students in basic education. It's framed by the EduPARK project that created an innovative app for authentic learning, supported by mobile and augmented reality (AR) technologies, for game-based approaches in Infante D. Pedro Park, in Aveiro. The EduPARK activities for this study aim to investigate how playing a game, supported by an interactive mobile AR app, in an outdoor environment, may promote sustainable development learning in an interdisciplinary way and improve motivation for learning. To achieve this goal, we've developed an interdisciplinary educational guide, focusing on attitudes towards nature conservation, which was integrated into the EduPARK app. Data was collected through direct observation of students during the sessions in the park, questionnaires, interviews with students, and logs of the EduPARK app. This research follows a qualitative approach and fits as a case study. The main target public are students of basic education in formal and non-formal educational contexts.*

Students revealed a positive perception regarding the value of using the app to acquire curricular knowledge. The collected data suggests that there is a consolidation of knowledge during the activity, especially in questions where AR or multimedia content are associated with the introduction or feedback of the questions. Students mentioned that EduPARK promotes meaningful learning, namely about biodiversity, since the learners must answer questions based on what they observe locally. After the activity, the students' future intentions are essentially focused on saving resources/combating waste, reducing pollution, recycling waste, and protecting biodiversity. Also, students were revealed to be more confident and showed a willingness to teach friends and family about what they have learned.

Peer mentoring and its impact on peer mentors' academic performance based on participation in a technology-enhanced program

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Abstract. *This Multimedia in Education PhD project combines the study of peer mentoring as a flexible and innovative pedagogical approach with that of the support provided by digital technologies to address two major gaps: little scientific evidence of the impact of peer mentoring programs on peer mentors' academic performance and the lack of systematic guidelines to support the design of digitally enhanced peer mentoring programs. Under the framework of Educational Design Research (EDR), the project comprehends three milestones: (i) the preliminary research stage, involving a state of the art analysis, including literature review and the study of five peer mentoring projects implemented in five Portuguese educational institutions; (ii) the development stage, related to the design and implementation of the prototype of a technology-enhanced peer mentoring program, including challenge- and project-based learning, and involving English as a Foreign Language (EFL) upper and lower secondary students from three Portuguese basic & secondary schools; (iii) and the assessment stage, related to finding evidence of participation impact, particularly on mentors' academic performance, under the cognitive (as for metacognitive skills), affective (as for motivation for learning), and social (as for collaborative and communication skills) dimensions as well as the role of digital technologies to promoting the practicality, and effectiveness of the program. According to the study findings, participation in the program had a positive and significant impact on the development of peer mentors' metacognitive as well as collaborative and communication skills. The role of digital technologies was of utmost importance to improving communication and collaboration between learners and between these and the teachers as well as the practicality and effectiveness of the learning experience. Contributions of the study are expected to improve teaching and learning quality in basic and secondary education and provide more engaging, authentic, and personalized peer mentoring experiences in line with the development of 21st century skills.*

The potential of the Internet of Things to promote participatory citizenship

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Abstract. *This study is based on the issue of the poor involvement of students in their respective educational community, as far as participatory citizenship is concerned. To gather answers for the research question ?What strategies can be developed within the scope of a Smart School Lab, with the aid of the Internet of Things, to enhance the participatory citizenship of students??. open and interventionist design-based research (DBR) strategies were applied. An iterative evolutionary approach was also used, involving action and reflection in an interchanging way, with integrative activities that fueled the project in a cyclical process.*

In the first phase of the DBR study, three semi-structured interviews, two data gathering surveys and a teachers' focus group were implemented and analyzed. The data collected provided a closer analysis of students' participatory citizenship and their engagement in community issues, as well as the teachers, parents, and municipality's perspective of the dialogue and communication among local participants. To achieve the addressed goal, a fifty-hour teacher training course was implemented in a cocreation process within a smart educational community, supported by a network of mentors (students, teachers, parents, local actors, and municipality). We report on the first design cycle of open learning guidelines on citizen sciences by reviewing the open learning guidelines created by the teachers on a co-creation process with stakeholders in the teachers' training course and teachers' self-awareness reflection notes.

In the second DBR cycle, implemented in the current school year, teachers from STEAM (Science, Technology, Engineering, Arts, and Mathematics) areas attended an initial workshop, where the didactic kits built in the first DBR cycle were presented. Based on this work, teachers designed/ adapted new kits that were implemented in their classes. Data from classroom observation, teachers' self-awareness reflection notes, and two surveys, students' pre and post-test, were gathered and analyzed, provided a closer analysis of students' participatory citizenship and their engagement in community issues, after the implementation of the didactic kits.

Regarding the results expected with this study, we highlight: design principles and technology innovation, i.e., the production of ?education? and ?citizen? didactic kits, which will contribute, per se, to the common good, with the detection of environmental problems in the target city of study; the improvement of the students' citizen science skills and their participatory citizenship; and the realization of the potential of the IoT by the teachers who took part in the study, mainly as far as the development of pedagogical-didactic and social-communicative skills are concerned.

Que características deverá ter um modelo de intervenção, que através do jogo promova a educação para a saúde mental entre jovens?

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Abstract. *O presente projeto de Doutoramento em Multimédia em Educação pela Universidade de Aveiro, propõe uma investigação de plano misto baseada no modelo Educational Design Research (EDR; Akker et al., 2007), para compreender e delimitar a relação entre a educação, a saúde mental e os jogos. Consiste numa investigação de paradigma sociocrítico, natureza orientada para a prática, plano misto, multietápico e sequencial, com integração metodológica em todo o processo (Coutinho, 2014).*

Procura-se desenvolver um modelo de intervenção eficaz e útil na aquisição, desenvolvimento e/ou consolidação de conhecimentos, competências ou habilidades (Mattar, 2018), orientadas para a melhoria do bem-estar, satisfação e qualidade de vida, potenciadas pela experiência de jogo, assente na diversão, absorção, ativação, pensamento criativo, ausência de afeto negativo e domínio (Eppmann et al., 2018). A população-alvo são jovens entre os 16 e os 25 anos, estudantes em Portugal entre o ensino secundário e a licenciatura (ensino superior), pela fase de desenvolvimento e conjuntura social que aumentam a vulnerabilidade psicológica neste grupo, precipitando problemas de saúde mental (Matos et al., 2022; Sequeira et al., 2022).

O processo de investigação envolve três etapas distintas e interdependentes ? preliminar, desenvolvimento e avaliação ? articuladas através de um processo dinâmico, coerente e transparente, visando consolidar e validar a adequabilidade da investigação e os resultados face aos objetivos propostos ? contribuir para a inovação na ciência e prática educativa ? considerando os autores de referência em EDR (Akker et al., 2007; Akkerman et al., 2013; McKenney & Reeves, 2021; McKenny & Reeves, 2012).

Aprendizagem Baseada em Problemas e Competência Digital: um estudo com professores do ensino fundamental

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Abstract. *Esta investigação envolve aspectos relacionados ao processo de ensino aprendizagem, que consiste na abordagem de uma estratégia didática em que os alunos são participantes ativos no próprio processo de conhecimento, e na competência digital (CD), contemplando a capacidade de uso das tecnologias digitais (TD). Para responder à questão orientadora da investigação, ?Como a estratégia didática Aprendizagem Baseada em Problemas pode contribuir para o desenvolvimento da Competência Digital de professores em contexto de ensino e aprendizagem??. foi delineado o objetivo principal desta, que consiste em investigar o impacto da ABP no desenvolvimento da CD nos professores/formandos. Esta é uma investigação que se insere no paradigma interpretativo, de natureza qualitativa, e que se enquadra no estudo de caso. O estudo foi organizado em duas fases, a primeira consiste em uma vivência dos professores/formandos com a ABP, recorrendo-se as TD, considerando o modelo de implementação da ABP delineado por Delisle, e a segunda etapa corresponde a implementação do contexto pelos professores/formandos.*

Os dados foram recolhidos ao longo das duas etapas em que se organizou o programa de formação, utilizando-se, para tal, diferentes fontes e instrumentos de recolha de dados (questionários, diário da investigadora, relatos de observação, e portefólio digital dos professores/formandos). Esta apresentação foca-se apenas nos dados recolhidos na primeira etapa da formação, pretendendo evidenciar o desempenho dos professores/formandos com a estratégia didática ABP e com as TD.

A análise dos dados obtidos permitiu perceber que, de um modo geral, houve desempenho favorável dos professores/formandos em relação às atividades desenvolvidas a cada etapa da ABP, assim como na capacidade de uso das TD. O maior envolvimento dos professores/formandos em relação às TD, foi detectado nas primeiras sessões realizadas. Os professores/formandos mostraram-se motivados em relação à situação problema proposta, o que proporcionou o desenvolvimento de recursos digitais criativos para as atividades dessas sessões, assim como de atividades colaborativas. No decorrer da vivência, os professores/formandos utilizaram, principalmente, TD em atividades colaborativas. Houve busca de informação em vídeos e em artigos disponíveis na internet, compartilhamento de material digital no mural disponibilizado pela investigadora, assim como inserção de links nos portefólios criados, em praticamente todas as etapas.

A análise dos dados relacionados à segunda etapa do programa de formação é ainda necessária para se concluir a resposta à questão problema, mas os dados recolhidos até ao momento permitem evidenciar indícios de contribuição da ABP para o desenvolvimento da CD, tendo em conta as atividades realizadas pelos professores/formandos ao longo das sessões da formação. Convém referir o desempenho dos professores/formandos nas duas primeiras etapas da ABP, período em que eles estavam de férias das atividades laborais, o que proporcionou maior envolvimento deles com as TD, motivados pela estratégia referida.

Dimensões da Ética em QDAS em Análise Qualitativa: uma proposta em estudo de caso.

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Abstract. *Este estudo é parte integrante e fruto da reflexão em Investigação e Desenvolvimento da Tese em curso no Programa Doutoral em Multimédia em Educação na Universidade de Aveiro em Portugal aliada à proposta em estudo de caso em QDAS sobre as dimensões da ética em análise qualitativa. Tem como Objetivo: destacar as dimensões da Ética da Informação, da Ética em Segurança de Dados, da Ética em Pesquisa, da Ética em Transparência e da Ética em Educação, todas aplicadas como âncoras em análise qualitativa quando realizadas com suporte de QDAS, em que se utiliza como base para este estudo de caso o webQDA. A Metodologia foi de revisão e criação da taxionomia das dimensões com elaboração de checklist avaliado por cinco especialistas em QDAS e aplicado em grupo focal, e como Resultado apresenta-se um checklist sobre Ética em QDAS como um contributo em Análise qualitativa apoiada por software.*

Music

Not only Böhm! Transverse flutes as alternative to the Böhm system in Germany in the second half of the 19th and the beginning of the 20th century

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Music

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Abstract. *Las flautas de Maximilian Schwedler (1853-1940) constituyen un capítulo importante en el desarrollo de la flauta travesera. Capítulo hoy olvidado, pero que en ese momento histórico fue crucial para el desarrollo de la forma de tocar la flauta travesera en Alemania, donde la invención del sistema de Theobald Böhm (1847) no fue aceptada. Flautistas y directores de orquesta criticaron la homogeneidad de su sonido y de su afinación, escribiendo públicamente su posicionamiento en contra del sonido del nuevo sistema y a favor del de las flautas cónicas de madera de sistema antiguo. Esta tradición sonora se perpetuó en Alemania hasta bien entrado el s. XX. Siguiendo esta corriente nos encontramos el último eslabón de flautas de sistema antiguo en las innovaciones de Maximilian Schwedler (modelos de 1885, 1895 y 1898), construidas con la idea de poder competir en volumen sonoro y en facilidad técnica con la flauta de sistema Böhm, pero sin perder el color del sonido de las antiguas.*

El objetivo de mi investigación artística es descubrir cómo suenan estas flautas alternativas a las de sistema Böhm. Con esta investigación pretendo crear un documento sonoro con las flautas originales de ese período, un documento que se sirve de la investigación musicológica, de la organológica, pero sobre todo de la experimentación. Este documento sonoro es lo único ¿vivo? que nos queda de estas flautas, el resto de informaciones son escasas y cortas descripciones de ellas en libros y artículos en alemán o en inglés.

Es por ello que se hace necesaria una investigación artística, para crear ese nuevo imaginario sonoro, para buscar nuevos caminos interpretativos que den pie a la reflexión y a una implicación personal del intérprete, poniéndolo a éste en el centro de la actividad musical. A través de esta experimentación se consigue un enriquecimiento en la búsqueda tímbrica del sonido de la flauta, permitiendo nuevas reinterpretaciones de las fuentes históricas.

Así vemos cómo la investigación artística nos da una nueva manera de difundir los procesos y los resultados de la investigación, dándonos la posibilidad de modificar nuestra concepción de la interpretación.

The Franco-Belgian and Russian schools as references to perform Latin American repertoire for violin and piano: an artistic research project through the works of Luis Carlos Figueroa and Mario Gómez Vignes

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Abstract. *The purpose of this artistic research project is to put forward a performance proposal of music for violin and piano composed in Colombia by Luis Carlos Figueroa and Mario Gómez Vignes. Taking as references the divergences of the sound and stylistic aesthetics of Franco-Belgian and Russian violin schools, which are pedagogical and performance approaches that remained in force until much of the twentieth century, showing particular characteristics regarding the sound production and use of musical expressive elements that made the most difference between the violinists representing each one of these two schools. Taking into account that in Latin America and more specifically in Colombia there has been no pedagogical and performance tradition of the violin with its own aesthetic, as it has occurred in Europe. By taking these two schools as references, paths and possibilities can be opened for the performance of academic repertoire for violin that has been composed in Latin America.*

With Tiger Claw: Endemic piano performance in Baja California Sur from 1880 to 1980

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Abstract. *Geographic and social conditions in Baja California Sur, Mexico from the end of the 19th century until the 1980's, determined a particular way of playing different piano repertoires, where regional piano performances practices developed differently of the rest of Mexico, remaining till now some interpretative practices used before the 20th century, and developing techniques and aesthetic concepts that respond to an own aesthetic determined for their situation of almost insularity.*

The main objective of my research is to propose and create an interpretation for different piano repertoires with the socio-cultural and musical distinctive performative practices found, that I define as "endemic performance" is a concept that can be used instead of the "national performance schools", that don't include smaller and forgotten places.

This research has been very important to define women's roles in piano performance, contrasting those with the myth surrounding femininity and interpretation, migration, and minority's influences and forbidden repertoire.

Is also important to show how the ethnographic study, the regional aesthetic codes, the perspective of gender and the reflexive phenomenology have been lived and experimented in daily piano practice actively in first person as a part of an autoethnographic study, where technologies has been included as part of the artistic result and music and its repertoires have been rewritten in relation to the score, the canonical tradition, and boundaries between time, genre, gender, geography and identity.

Jorge Peixinho: Homage as a vehicle for musical gestures

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Abstract. *Jorge Peixinho (1940-1995) was a major Portuguese composer of the avant-garde musical movement from the second half of the twentieth century. Jorge Peixinho's works catalogue, elaborated by Delgado, Machado, and Machado (2002), was consulted as the main source for the identification of 21 guitar works (some with several versions) composed through a period of 24 years (1971-1994).*

Set in the framework of Artistic Research, as understood by Correia (2017), this work is characterized by the articulated juxtaposition of two interdependent components: the creation of verbalizable knowledge, through conventional methods of investigation, and the creation of non-verbalizable embodied knowledge, through creative processes specific to artistic production.

This communication proposal focuses on an original composition for solo guitar, entitled "Jorge Peixinho - In Memoriam", which was crafted from musical gestures and other specificities found on Peixinho's guitar output. The aim is to spread Peixinho's music through this homage, quoting 11 of his barely known guitar works, which deserve to be part of the main guitar repertoire from last century's European art music.

The Electric Bass Revisited: a creative study about the potencialities of the instrument

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Abstract. *This artistic investigation, a work in progress, aims to expand the possibilities of performance and musical creation for the electric bass by developing a proposal for its harmonic use. Organologically classified as melodic, the instrument has tonal and ergonomic characteristics that enhance its use beyond this designation. In this perspective, an increasing number of bass players are looking to use the electric bass as a harmonic instrument, however, the lack of research on this approach hinders its development. Based on an alternative tonal system to consolidated practice, called LCCTO (Russell, 2001) and guided by a research design structured according to the concept of Affordances (Gibson, 1977) and on the theory called Perceptual Learning (Gibson & Pick, 2000), the investigation seeks, through experimentation, (i) the definition of a harmonic vocabulary for the electric bass and (ii) the creation of musical works from this vocabulary. The result of this work is intended to contribute to the construction of a new paradigm for the practice of the instrument, for the academic discussion about it and, consequently, bring pedagogical implications.*

The results achieved so far point positively to the potential of the electric bass for the development of a, here called, Harmonic Approach to the Electric Bass. The experiments already concluded provided a number of 1153 viable possibilities for playing chords on the instrument, which have been organized in the form of a dictionary, as well as an extensive material resulting from the articulations (simultaneous execution) between these chords and the different scales proposed in the LCCTO. Also included in this material resulting from the experiments, are the ?Creative Applications?, organized in the form of studies and which reflect, through composition, the musical use of the contents already obtained.

Nanosciences and nanotechnology

Targeting cancer at the nanoscale: crossing over the bridge between porphyrins & carbon nanomaterials

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Abstract. *The functionalization of graphene-based materials with photoactivable molecules has been acquiring an increasing importance, namely in biomedicine. This PhD project aims to develop new synthetic routes to obtain these hybrid materials, through the conjugation of porphyrins or phthalocyanines with carbon nanomaterials, such as graphene oxide (GO) and/or graphene quantum dots (GQDs). Several chemical interactions were explored to promote the functionalization of both systems and to understand, from a molecular point of view, their role in different anticancer therapies. Among the multiple bioapplications, a focus is given to photodynamic therapy (PDT) on tumor cells and to telomerase inhibition via detection and stabilization of deoxyribonucleic acid (DNA) G-quadruplexes. The main goal is to correlate the hybrids' molecular, structural and morphological characteristics in order to optimize their anticancer potential.*

Nanostructures for biodetection: Synthesis, surface modification and application in protein enrichment and diagnosis of cardiovascular diseases

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Abstract. *Several biomarkers have been identified and their levels are associated with various cardiovascular diseases (CVD) or cardiovascular risk outcomes. Two of these CVD biomarkers are the C-reactive protein (CRP) and galectin-3 (Gal-3), which have been associated with the risk of developing CVD [1] and with heart failure [2], respectively. These biomarkers have been detected using various approaches such as ELISA-based assays that offer low limit of detection (LOD) [3,4]. However, these strategies require the use of costly chemicals, are time-consuming, and can be difficult to perform [5]. In addition, most of the assays with low LOD use more than one nanomaterial and expensive equipment to perform the detection assays [6,7]. There is a demand for new strategies that provide low-cost and, high-sensitive detection of CRP and Gal-3 using common laboratory equipment. Gold nanoparticles (AuNPs) are frequently applied to biosensing due to their chemical stability, straightforward surface modification, high molar absorption coefficient and biocompatibility. Also, their distinctive localized surface plasmon resonance (LSPR) band enables the development of colorimetric methods based on plasmonic coupling [8,9]. The strategies described in this research demonstrate the versatility of AuNPs to detect colorimetrically CRP [10] and Gal-3 in biofluids using UV-VIS spectroscopy.*

3D printed and injectable laminarin nanocomposite cryogels

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Abstract. *It is still challenging to develop a biomaterial that comprises all the criteria and key features in one, traits as, bioactivity towards tissue regeneration, easy appliance and avoidance of host-rejection. In detail, biomaterials often lack one of the aspects, nutrient diffusion, cell migration or biological cues. Henceforward, these present disadvantages during the design of novel biomaterials. Here, we showcase the development of a novel anisotropic nanocomposite cryogel, through an affordable and versatile 3D-printing approach. By freeze casting, we achieved a lamellar topography, and high porosity content. Our material has proven to be injectable up to a 40% strain. Moreover, mesoporous silica nanoparticles covalently attached on the cryogel matrix - made of a glucan (laminarin) - allows us to enhance the bioactivity apropos of bone regeneration. Lastly, cryogels developed by our method were compared with a conventional cryogel production method, using the same materials, where they excel in stiffness, toughness, energy hysteresis and recovery after injectability. Thus, our results have demonstrated, that these materials are highly reproducible, easy castable into multiples structures, injectable, bioactive and with an oriented structure. Likewise, this system has proven to have no cytotoxic effect on human mesenchymal stem cells, and we envision that this methodology prompts the development of highly tunable anisotropic nanocomposite cryogels, with a user-programable degree of structural complexity.*

Multifunctional magnetic bionanocomposites for simultaneous cancer treatment and bone regeneration

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Abstract. *There is a high demand to develop new strategies to treat malignant bone tumors and to regenerate bones defects produced by the tumor resection. Multifunctional bioactive 3-D scaffolds have potential to address simultaneously the regeneration of bone defect and eradicate residual cancer cells. Our strategy is based on a hybrid scaffold composed by different materials that have a potential synergetic effect to simultaneously promote bone regeneration and avoid cancer remissions. Chitosan was chosen as the main matrix due to its wide spectrum of properties suitable for tissue engineering, such as biocompatibility, anti-bacterial, and osteogenic behavior. Hydroxyapatite, due to its similarities with native bone, will be incorporated as a matrix filler to increase its mechanical resistance and to enhance osteoconductivity and osteogenesis contributing to the bone regeneration. Magnetite (Fe₃O₄) nanoparticles (NP) have been applied in bone regeneration promoting bone osteogenesis. Thus, these NP will be also incorporated in the chitosan matrix to increase its mechanical strength and to be used as heat mediators in Magnetic Hyperthermia Therapy (MHT) to produce a therapeutic heat. This heat can induce cancer cells apoptosis without injuring health tissue, overcoming the conventional therapeutic drawback. A natural sulfated polysaccharide, namely fucoidan, will be incorporated as NP coating, to promote their stabilization. Moreover, it is expected that fucoidan can stimulate bone tissue regeneration and induce cancer cell apoptosis through their immunostimulatory and antitumor properties as a novel application for this compound.*

The methodologies selected are easy and eco-friendly. Using different chitosan concentrations (1, 1.5, 2 and 2.5% w/v) it was possible to produce, by freeze-drying, highly porous scaffolds (>80% of porosity), a required feature for BTE applications. The Fe₃O₄ NP are produced by co-precipitation with an Intrinsic Loss Power around 1.6 nHm²kg⁻¹, revealing their potential to be used as thermal agents in MHT. These particles were incorporated on the chitosan scaffolds, showing an enhancement of its mechanical properties without compromising the scaffolds porosity. According to these results, chitosan-Fe₃O₄ scaffolds could have potential for cancer therapy by MHT using magnetite NP and simultaneously to support bone tissue regeneration.

Ionic-liquid-supported magnetic nanomaterials for the recovery of high economic value chemical elements

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Abstract. *The increasing demand for critical raw materials along with the increasing need of making the industrial processes sustainable highlight the importance of obtaining them from secondary or alternative sources. Lithium, cobalt and nickel, as well as other critical elements, such as platinum, palladium, gallium and germanium are present in wastewaters of automotive industry, and should be recovered due to their high economic value and within the circular economy concept.*

The development of techniques and new materials with high efficiency to remove contaminants has proved to be important to allow the reuse of these elements and, eventually, the waters after treatment. Magnetic nanomaterials have gained interest as sorbents by allowing the removal of contaminants from the water by magnetic separation. In addition, the chemical modification of magnetic nanoparticles with ionic liquids (ILs) will allow to improve selectivity and sorption efficiency for critical elements. Moreover, this type of approach in principle allows the sorbents regeneration and thus represents an additional economic advantage.

The research communicated here concerns the sorption of high economic value chemical elements in ionic-liquid-supported magnetic nanomaterials for their removal and recovery from the water which contain them by using magnetic separation techniques. Fe₃O₄ NPs were synthesized, coated with silica, modified with ILs at the surface and then characterized using various techniques as follows: XRD, FTIR, TEM, Elemental Analysis, BET method and magnetic measurements. Subsequently, these magnetic NPs were evaluated for their sorption characteristics of lithium, cobalt, nickel, platinum, palladium, gallium and germanium, testing variation of amount of ionic liquid at the surface, variation of amount of sorbent, different pH values and the effect of ionic strength of the solution. The isotherms of the removal experiments are being carried out, as well as assesment of nanoparticles recycling and ecotoxicity.

Development of Advanced Biopolymeric Nanostructured Bioinks for 3D Bioprinting Applications

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Abstract. *Three-dimensional (3D) bioprinting is an innovative technology, which allows the fabrication of 3D living constructs by the layer-by-layer deposition of cell laden materials, the so-called bioinks. Within the field, the development of high performance bioinks with adequate mechanical and rheological properties and high cell viability, is still a major challenge. Currently, the development of novel nanocomposite bioinks has been widely explored as a strategy to improve the properties of bioinks. For instance, the incorporation of biobased nanofibrous materials into hydrogel-based bioinks improves the structural stability and shape fidelity during and after printing, as well as the cell growth, proliferation, and differentiation. In this context, the main goal of this PhD project is the formulation of advanced nanocomposite hydrogel-based bioinks with high performance in terms of bioprintability, mechanical stability, as well as cell density and viability, by combining protein nanofibers with other biopolymers. These novel bioinks were characterised in terms of physicochemical parameters, rheological behaviour and cytotoxicity and the production of tissue analogues via extrusion bioprinting was optimised. Herein, we present the results from the first concluded work, focused on the development of novel nanocomposite bioinks based on alginate hydrogels reinforced with lysozyme nanofibers. The obtained hydrogels showed improved mechanical performance, good printability and non-cytotoxicity towards HaCaT cells (human keratinocytes), and with high cell viability (~90%) within the bioprinted scaffolds up to 7 days.*

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Cold Sintering for the manufacture of lead-free piezoelectric ceramics towards sustainable electronics

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Abstract. *Sintering is a vital step in ceramics manufacturing. However, conventional high-temperature sintering (800-2000 °C), used by the ceramic industry, is energy-intensive, pollutant, and costly. Low-temperature sintering techniques are, therefore, very important from the industrial, economical, and environmental perspective.*

Also, the high-temperature sintering may cause compositional and microstructural changes in some of the processed materials, deteriorating their properties. This is the case of potassium sodium niobate (KNN) ceramics, one of the most promising lead-free piezoelectrics. When conventionally sintered, KNN requires temperatures > 1000 °C to achieve relative densities above 90 %. Unfortunately, KNN presents difficulties during conventional sintering, related to alkaline components volatilization, stoichiometry alterations and microstructural inhomogeneities. Therefore, development of low-temperature sintering routes is crucial for rendering KNN competitive.

In this context, the present work aims at the development of Cold Sintering Process (CSP), which is currently considered to be the most economically attractive sintering technique, for the lead-free KNN ceramics. CSP utilizes a second phase, a transient solvent (4-20 wt% added to the initial powders) that facilitates mass transfer for densification via a dissolution-precipitation process at low temperature (< 300 °C) over a short time when uniaxial pressure is applied. The main objectives of this work are: i) to design and construct the Cold Sintering reactor, ii) to optimize the composition of a solvent for Cold Sintering of KNN, taking into account the tendency of KNN to incongruent dissolution, iii) to sinter the KNN ceramics by Cold Sintering and to determine the most adequate parameters of the process, iv) to characterize the KNN ceramics prepared by Cold Sintering and to identify the relations between conditions of the process and properties of the material.

It is expected that achieving these objectives will contribute to the knowledge development in the field of sustainable ceramics processing, namely KNN and to its application in the production of electronic devices, as well as to establish an advanced, energy efficient sintering technology with the significant potential application in the fabrication of a broad range of functional electroceramics.

Sustainable Piezoelectric Flexible Materials

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Abstract. *Our world is rapidly evolving into a technology era, where automation and artificial intelligence will positively impact our society. The Internet of Things (IoT), i.e. the network that connects the physical objects, allows this evolution, by connecting every part of our day and improving live styles. These tasks can be achieved through nanosensors and nanogenerators that are embed in the devices, continuously feeding information, depending on their final applications, and successfully performing tasks that were once man-made. What most comprises the feasibility of these devices is their short battery life and difficult to reach location for maintenance cycles. This is where energy harvesting, mainly piezoelectricity, becomes a promising route. Piezoelectric materials are able to convert mechanical stresses into electric voltage and vice-versa. Electric power can be harvested from environmental vibrations resulting from e.g. human motion, working machines, wind and waves. Nowadays, electronics are based on dense ceramics and thin films to act as rigid sensors, actuators, capacitors, etc. Synthesis routes often involve hazard and toxic compounds, as well as high temperatures of crystallization. Furthermore, the disposal of these devices already represents a concern around the world, leading to negative impacts in the environment. This pleads for a change by reducing both the hazard conditions and compounds utilized for manufacturing and replacing them by biodegradable materials. On the other hand, flexibility allows to take full advantage of the piezoelectric effect, being imperative to add this property to these devices. This can be mainly achieved by adapting the crystallization conditions or using alternative manufacturing methods and materials. In this PhD work, we intend to build barium titanate (BT) piezoelectric thin films and nanocomposites through two different approaches: reduction of the crystallization temperature through wet chemistry methods and incorporation of previously crystallized BT nanoparticles into polymer and biopolymers. BT is a well-known lead-free piezoelectric, being the best alternative to PZT and other lead-based piezoelectrics. Furthermore, following the biodegradability trend, we intend to use biopolymers, mainly chitosan and PHA, as substrates and matrices. The main goal is to develop a flexible and piezoelectric material to be integrated into a nanogenerator or nanosensor, depending on its electrical tests and consequent performance. Work so far as covered the production of barium titanate nanoparticles at low temperatures (200 °C), through two different methodologies in order to better understand which particles have better piezoelectric behaviour. Furthermore, some work has also been done regarding the effect of UV and low temperature on the annealing of iron doped zinc oxide filmes and nano-patterned barium titanate films.*

Temperature-responsive nanomagnetic logic gates for 3D monitoring of cellular hyperthermia

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Abstract. *Fe₃Se₄ nanoparticles have had a special attention from our Research Group in the past years due to their distinguished magnetic properties. These nanoparticles work as logic gates by recording a binary response: 1, if a given temperature threshold (in this case 42 °C) is exceeded during an heating event, or 0, otherwise. In the past, an experiment was conducted in which a layer of these nanoparticles was applied under a layer of cells, submitted, later, to hyperthermia assays using different heat doses, to identify which doses resulted in surpassing the 42 °C threshold. This layered design, without direct contact between nanoparticles and cells, works perfectly for 2D-assays. However, most applications concern 3D-objects where heat flows in 3D leading to a 3D temperature threshold distribution. During my PhD, I will bring the recording of a possible surpass of the temperature threshold after hyperthermia from 2D to 3D, from a layer of cells to tissues. Aiming this, I will develop materials incorporating Fe₃Se₄ nanoparticles, such as hydrogels and microcapsules, and test their biocompatibility. Later, these materials will be incorporated in Pancreatic Cancer tumours and the use of Magnetic Resonance Imaging for 3D temperature threshold mapping will be explored.*

Optimization of deposition and annealing conditions to grow highly compact, crystalline and large grain sizes absorbers for CIGS solar cells

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Abstract. *The precursors (Cu₃Ga/In) were deposited onto Mo-coated soda-lime glass using an RF sputtering technique. The annealing was done under a vacuum in the deposition chamber. The influence of the precursor stacking sequence and low-temperature pre-annealing on the morphology of the film for CIGS solar cell fabrication was studied. Pre-annealing the precursors was discovered to help achieve a uniform surface, large grain size, and significantly reduce the amount of In lost in the absorber during the annealing phase (on the order of 50%). Depositing the precursors with the CuGa closer to Mo was seen to be more advantageous than depositing the precursors with the In closer to Mo, as the latter, despite having a reduced In loss, resulted in a rough and non-uniform surface in the final product.*

Biodegradable and active fruit packaging using agrifood by-products as raw materials

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Abstract. *A large amount of fruit is lost worldwide due to their delicate nature and short shelf-life, thus requiring packaging materials able to minimize this global problem, while ensuring the fruit quality and safety [1]. Recently, the incorporation of scavengers of ethylene, a phytohormone that is responsible for inducing biochemical, physiological, and structural changes during the fruit ripening process, into bio-based polymer matrices has been studied as an alternative approach for promoting the overall packaging sustainability and fruit preservation [2]. Potassium permanganate, nanosized TiO₂, activated carbons, and silica-mesoporous materials are the most used materials for inhibition of ethylene action [3]. However, a strong effective, low-cost, biocompatible, and sustainable platform for ethylene scavenging is still a challenge. On the other hand, several food by-products, rich in biopolymers, are largely produced and wasted by food processing industries. To value these by-products, water tolerant and flexible bioplastics have been developed [4].*

This PhD Thesis boosts the European Green Deal action plan by moving towards the circular economy. Agrifood by-products, namely potato by-products and pine nut peels, are used as alternative raw materials for the 'green' development of biodegradable bioplastics based on starch as matrix and polysaccharide-based porous particles with ethylene scavenging activity that, when combined, will provide a sustainable active packaging for fruit preservation with a competitive physicochemical and mechanical performance compared to the existing bioplastics on the market.

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Si₃N₄-TiN as a substrate for BDD electrodes: from cutting tools and biomedical applications to water treatment

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Abstract. *Boron-doped diamond (BDD) thin films hold great promise for the future of water remediation, being able to completely mineralize persistent pollutants into CO₂ and water, requiring only electrical energy through electrochemical oxidation. However, the main challenges encountered in applying BDDs on a large scale relate to the substrate material. Electrode failure typically occurs due to BDD delamination from the substrate. Silicon nitride (Si₃N₄) ceramics are well-known for their excellent properties, such as high wear resistance, chemical stability, high hardness, high fracture toughness, and high elastic modulus, ideal for cutting tools and biomedical applications. By adding an adequate amount of titanium nitride (TiN) particles to a Si₃N₄ matrix, it is possible to produce an electroconductive Si₃N₄-TiN composite, which combines metal-like conductivity with the Si₃N₄ ceramic properties and high affinity for diamond film growth by Chemical Vapor Deposition (CVD). In this work, BDD films were deposited through Hot Filament CVD (HF-CVD) on a Si₃N₄-30vol% TiN substrate. The resulting BDD/Si₃N₄-TiN electrodes were evaluated, including microstructure analysis, diamond quality, conductivity, adhesion strength, and electrochemical properties. In addition, the performance in the electrochemical oxidation of pollutants was evaluated by choosing phenol as a model pollutant. The BDD/Si₃N₄-TiN electrodes could remove up to 99% of phenol after 4 hours of direct anodic oxidation of an aqueous solution contaminated with 1 mM of phenol. The results indicate that the BDD/Si₃N₄-TiN electrodes have much potential and could be the solution for producing long-service life BDD electrodes for large-scale water treatment by electrochemical oxidation processes, particularly if using electricity from renewable sources.*

Biopolymeric nanomachines for cancer theranostics

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Abstract. *Conventional nanosystems for cancer theranostics show considerable promise in this field owing to their ability to simultaneously detect and deliver therapeutic agents to tumors. However, despite showing favorable results in vitro, when translated to clinical trials, many are doomed to fail. One of the causes for this lies on the inability of most nanoparticles in overcoming the biological barriers in the human body, namely countering blood flow, surviving the attack from the protein corona, and achieving deep tumor tissue penetration for efficient drug delivery, among other challenges. In this regard, self-propelled nanomachines offer a novel approach, as they are able to achieve self-propulsion, enabling the navigation through tumor microenvironments with controlled motion, therefore being able to penetrate deep into the core of tumor regions and deliver the therapeutics with increased efficacy. Herein, this PhD project aims to assemble, characterize, and evaluate the performance of multifunctional biopolymer-based nanomachines for cancer theranostics. Biopolymers such as cellulose or chitosan are widely abundant, biocompatible, and easily functionalized biomaterials that will be employed as the basis for nanomachines development. Emphasis on Janus nanoparticles will be given on this project, since their asymmetric nature is known for their applications as nanomotors, as it provides directional control of the nanoparticles. Using cellulose acetate (CA), a derivative of cellulose, nanobeads were produced by nanoprecipitation, and functionalized with curcumin as the therapeutic agent against cancer cells. During the first year of this PhD, the methodology for the production of CA beads was optimized and loading and release assays with curcumin are being conducted. Further functionalizations with both gold and magnetic ferrite nanoparticles will be attempted in the future for imaging and self-propulsion capabilities, respectively. In addition, to achieve better selectivity for cancer cell targeting, functionalization with folic acid will also be considered. Finally, these biopolymer-based systems will also be characterized in detail regarding functionalization, propulsion, and drug loading, evaluating their potential for cancer theranostics.*

Exploiting cellulose nanofibres to design nanostructured bioinks for 3D bioprinting

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Abstract. *Three-dimensional (3D) bioprinting is promoting great advances in a variety of fields, including tissue engineering and regenerative medicine, the creation of innovative drug testing models, and diseases research. This technique consists on the deposition of bioinks (biomaterials and cells) in a previously defined special pattern, following a layer-by-layer fashion. Nowadays, there are many polymeric materials (synthetic and natural) that can be used for the development of bioinks, in particular hydrogel-based bioinks. Nonetheless, the availability of bioinks that combine good rheological and mechanical properties, high printability, and high cell viability is still a challenge. So, in this work we combined nanofibrillated cellulose (NFC) with gellan gum (GG) in four different NFC:GG mass proportions, namely 90:10, 80:20, 70:30, and 60:40, to produce hydrogel-based bioinks with improved performance. The obtained hydrogels revealed a shear-thinning behavior, and the addition of GG improved the mechanical properties, specifically increasing the compressive strength from 114.02 ± 10.93 kPa for 90:10 to 337.16 ± 34.03 kPa for 60:40; and stress from 18.27 ± 1.32 Pa for 90:10 to and 47.17 ± 3.59 Pa for 60:40, respectively. The recovery of the hydrogels also increased from $70.05 \pm 3.06\%$ for the formulation 90:10 to $82.63 \pm 1.21\%$ for the 60:40 one. Furthermore, NFC:GG hydrogels are non-citotoxic towards human keratinocyte (HaCat) cells, with cell viabilities above the threshold of 70% for all samples. Moreover, the LIVE/DEAD assay revealed that the bioprinting process did not affect in a great extent the cell viability as it was $80.78 \pm 6.51\%$, one day after bioprinting, and it increased up to $89.92 \pm 3.23\%$ after seven days. These results suggest that the combination of NFC and GG is a promising strategy to produce bioinks with improved properties for the 3D bioprinting applications.*

This work was developed within the scope of the projects CICECO- Aveiro Institute of Materials, UIDB/50011/2020, UIDP/50011/2020 & LA/P/0006/2020, financed by national funds through the FCT/MEC (PIDDAC), and CESAM, UIDP/50017/2020 & UIDB/50017/2020 and supported by the project I&D NANOBIOINKS ? Engineering bio-based nanofibers for the development of high-performance nanostructured bioinks 3-D bioprinting, CENTRO-01-0145-FEDER-031289-funded by the Operational Program of the Center Region, in its FEDER/FNR component, and by national funds (OE), through FCT/MCTES. Nicole Lameirinhas acknowledges the PhD grant SFRH/BD/140229/2018.

Reversible electro dialysis for salinity gradient power

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Abstract. *The energy demand worldwide has been increasing in the last decades due to population growing and rising living standards in emerging countries. Modern day human lifestyle relies on the energy produced from fossil fuels, whose resources are fast depleting. The global dependence on large amounts of fossil and nuclear fuels that represents serious environmental and geopolitical threats. The rising concerns on the impacts of greenhouse gas emissions and global warming is forcing the world to search for alternative clean and green energy resources. This reality is of public domain, and is now, in general, accepted the need of new, clean, sustainable, and renewable resources-based energy systems. The salinity difference in sea and river water has available energy equivalent to a 280 meters high dam. In theory, one could extract 0.8 kilowatts per cubic meter of fresh water. The amount of fresh water running to the sea in the world's estuaries could allow harnessing 980 GW of electric power. An additional 18 GW could be obtained by the wastewater released in the ocean. Reverse electro dialysis (RED) is a non-polluting, sustainable technology, used to produce energy by mixing water streams with different salinity. RED is non-intermittent electrochemical process that uses ion-exchange membranes (IEMs) to directly draw electric power from the flow of ions. Ions are driven to balance concentration across a selective permeable IEM, building an electric tension called Donnan potential. This potential across the membrane results from equilibrium between the chemical potentials for the ion crossing in each direction and is proportional to the concentration gradient and membrane permselectivity. The device voltage will result from the sum of the Donnan potential contribution of each membrane stacked alternating cation exchange membrane (CEM) with anion exchange membrane (AEM) in between chambers of high and low salinity solution chambers for salinity gradient. Ion transport via inert electrodes is converted to electrical energy by a reversible redox reaction. RED can be used directly for energy conversion or combined with other technologies like, desalination and water treatment. RED application can have a positive environmental contribution while improving electric conversion power density.*

Development of functional biocomposites using green carbon nanostructures

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Abstract. Carbon nanostructures, such as the graphene family, have remarkable electrical, textural, and mechanical properties. Therefore, these nanomaterials are considered fillers of election to design functional composites for a wide range of applications [1]. Nevertheless, carbon nanostructures are frequently synthesized by non-sustainable procedures with associated toxicity, which prevents their application in the food and biomedical fields. The synthesis of carbon nanostructures using natural precursors and green methodologies is an alternative to avoid these limitations [2]. In addition, the incorporation of green carbon nanostructures in biopolymeric matrices is a strategy to obtain non-toxic and sustainable biocomposite materials [3]. Herein, green carbon nanostructures were prepared using saccharose and liquid caramel as carbon sources and sepiolite clay as porous support. The graphitization of carbon precursors was accomplished by different strategies, namely hydrothermal carbonization, conventional pyrolysis, and microwave pyrolysis. The most promising carbon nanostructures were incorporated in different amounts in chitosan and zein biopolymers to prepare biocomposite materials. Films were obtained by solvent casting and their electrical conductivity was evaluated by direct current measurements. The film containing 70 wt% filler achieved a maximum electrical conductivity of 329.6 $\mu\text{S}/\text{cm}$ in-plane and 6 $\mu\text{S}/\text{cm}$ through-plane direction. Furthermore, biocomposite coatings were applied on the surface of an aluminum alloy by dip-coating. The corrosion protection offered by the coatings was evaluated by electrochemical impedance spectroscopy in 0.6 M NaCl solution for one month. The coating containing 5 wt% filler inhibited the corrosion of the aluminum substrate. The biopolymer-based biocomposites containing green carbon nanostructures are versatile materials, with promising features for electrically conductive food packaging and corrosion protection applications.

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Acknowledgements

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Preliminary evaluation of the behaviour of an additively manufactured insert under industrial injection moulding conditions

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Abstract. *The aim of this work is to evaluate the behaviour of an additively manufactured insert made of three different materials (18Ni300 and H13 steels and 18Ni300 reinforced with 4.5 vol% nano-TiC) using real industrial working conditions. The insert manufactured by selective laser melting (SLM) was properly assembled in a mould, and 350 parts were made of glass fibre reinforced polypropylene. The surface of the insert before and after the parts were made was evaluated with optical profilometry to qualitatively distinguish the behaviour of the three materials. This work should open new considerations for mould makers and show that the SLM process can be used to manufacture functional inserts that benefit from "geometric freedom" but also from tailored properties.*

Magnetic composites for multifunctional protective coatings

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Abstract. *Degradation of materials caused by the effect of aggressive environment and/ or mechanical damage leads to the loss of strength and functionality and shortening the service life of systems, causing significant economic losses. While most of the conventional protective coatings are just passive barriers, the development and application of SMART coatings with ability to provide responsive functionalities such as self-healing, self-cleaning or antifouling properties, is an important challenge.*

In our work, we investigate the application of induction heating ability of the magnetic nanoparticles (MNP) under an external alternating current magnetic field for dissipation of heat to the surrounding polymer matrix, rendering responsive functionalities to the polymeric-based composite coatings. For this purpose, various types of iron oxide based MNP were synthesized via co-precipitation and characterized structurally, morphologically, and magnetically. The influence of synthesis parameters on the particle's properties and resulting heating ability was investigated. The effect of the limited space freedom of the embedded inside the composites MNP on their heating efficiently was evaluated.

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Protein nanofibrils based biomaterials for myocardial infarction tissue regeneration

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Abstract. According to the World Health Organization, cardiovascular diseases, particularly myocardial infarction, are a leading cause of death, being heart transplantation the only form of treatment. Tissue engineering, that combines biomaterials and cells, is an alternative which have already demonstrated promising results. However, the design of biomaterials with suitable properties is still an important limitation.

Protein nanofibrils are misfolded proteins that self-assembled into long nanofibrils with remarkable mechanical performance, thermal stability, and insolubility in aqueous media. These nanofibrils have been used in the design of scaffolds for regenerative medicine, for example, for bone, muscle, or spinal cord regeneration. However, they have never been explored to produce biomaterials for the regeneration of myocardium. In this context, the objective of this PhD thesis is to exploit the potentialities of protein nanofibrils for the development of biomaterials for myocardial regeneration.

Injectable hydrogels of hyaluronic acid and gelatin reinforced with lysozyme nanofibrils (LNFs) loaded with gold nanoparticles (AuNPs) were prepared envisioning the regeneration of the infarcted myocardium. LNFs containing AuNPs were prepared by in situ synthesis of AuNPs. After confirming the injectability of the prepared hydrogels, further characterization revealed that the presence of LNFs increases the antioxidant activity, enhances the mechanical properties, and improves the swelling and bioresorbability ratios of these materials. Furthermore, these hydrogels showed electrical conductivity due to the presence AuNPs. These improvements were achieved while maintaining other properties of interest for the intended application, such as the rheological properties, hydrogel pore size and morphology, and biocompatibility towards cardiomyoblasts.

Additionally, it was also investigated the effect of the addition of LNFs to oxidized nanofibrillated cellulose (OxNFC) patches, envisioning the same application. The OxNFC-LNFs patches were likewise characterized in terms of physicochemical and biological properties. Once again, it was revealed that the presence of LNFs improves the mechanical properties, and antioxidant activity, while maintaining the biocompatibility of the materials. Additional characterization will be carried out in the future, namely the assessments of the bioresorbability, and drug release profile.

Considering these results, LNFs showed to be very promising functional nanostructures for the development of innovative biomaterials for the regeneration of myocardium.

Acknowledgments

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PIIC

Boas práticas de divulgação de ciência e de comunicação externa

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Abstract. *A comunicação/divulgação de ciência tem vindo a assumir um papel fundamental e incontornável nas instituições de ensino superior, fundamentalmente num âmbito mais ligado à investigação. No entanto, estudos continuam a demonstrar que as iniciativas são insuficientes e que os investigadores não priorizam esta dinâmica nas suas tarefas, por diversas razões, sendo apontada a falta de apoio das unidades de investigação (UIs) como uma delas. Assim, o DigiMedia (Centro de Investigação em Média Digitais e Interação) decidiu assumir um papel ativo nesta frente e desafiou os estudantes a olharem para boas práticas de divulgação de ciência, não exclusivamente, mas mais numa perspetiva de comunicação externa. Tendo em conta este objetivo foram realizadas as seguintes tarefas: 1. Levantamento de UIs nacionais e internacionais de referência da área de média digitais e respetivos sites e redes sociais; 2. Análise das práticas de comunicação/divulgação de ciência e de comunicação externa das UIs identificadas, com maior enfoque nas redes sociais; 3. Elaboração de um plano de comunicação para o DigiMedia que inclua propostas de boas práticas de divulgação de ciência e de comunicação externa.*

Senior Cyclotourism Using Jizo: Implementation of a Co-Designed Gamified App

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Abstract. *There has been a growing interest in the use of Information and Communication Technologies addressed to an ageing population. Since senior citizens are becoming better consumers of digitally mediated products, there has been an increasingly need to meet their demands and preferences, while fostering active and healthy ageing. The aim of Jizo app is to motivate and change senior citizens' behaviours through cyclotourism. A total of 46 participants aged 55 years and over, with different nationalities were involved in focus groups, co-design, eye-tracking and interviews to develop a gamified app from and for senior citizens. Jizo is being developed to assure the pre-, in loco and post- experience, whereas the highlighted game elements are social relationships, progression, challenges, competition, feedback and rewards. The implementation process focused on balancing functionality and content, consolidating system state, improving navigation and interactivity, and making the design consistent. Additionally, it was developed in React Native with Firebase data storage, including friend connection, API for maps, location marker, calendar and weather, and inclusion of cyclotourism routes with a GPX to GeoJSON converter.*

Who's socially gaming? Results of a pilot study on online social gaming trends of the 50+

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Abstract. *With the ever-increasing ageing of the World's population, and the rising of digital platforms' ubiquity, understanding the context, motivations, and needs of older adults becomes progressively relevant when designing technological solutions ? in which online communities and digital games are included. However, little information is available regarding the Portuguese context, imposing additional barriers to already challenging products. Thus, a questionnaire was designed to understand older adults' context regarding their relationship with information and communication technologies, more specifically on (social) digital games and online communities. This questionnaire is divided into two major sections ? i.e. demographic and technological characterization, and the relationship with digital or analog games. Its implementation is two-fold: (i) firstly, a pilot validation session was conducted with 10 older adults, aged between 66 and 81, from the Laboratório do Envelhecimento; and, (ii) secondly, the questionnaire will be distributed online to older adults aged 50 or over. Lastly, regarding future work, online mass distribution, in-depth quantitative data analysis, and dissemination of the results will be performed.*

Debunking Composition in Photography?

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Abstract. *No ensino da fotografia são abordadas leis relacionadas com a composição. O seu propósito é orientar a organização e relação dos elementos existentes numa cena fotografada. Não há, nem se pode afirmar que exista uma posição ideal no que toca à utilização dessas leis, mas estas estão fortemente enraizadas na cultura visual, podendo condicionar a forma como se percebem as fotografias. Existem diversos estudos académicos, muitos dos quais no domínio da pintura, que com o recurso a dispositivos de Eye Tracking, procuram avaliar a relevância dessas leis e o seu impacto na referida percepção. O presente estudo, desenvolvido no âmbito de uma unidade curricular da licenciatura de Novas Tecnologias da Comunicação da Universidade de Aveiro, onde se abordam as referidas leis, procura fundamentar empiricamente e validar alguns dos conteúdos aí lecionados sobre a composição. Os principais resultados encontrados serão integrados nos conteúdos pedagógicos da unidade curricular, potenciando novas atividades a desenvolver com os estudantes e um envolvimento proativo e crítico destes.*

Avaliação da intervenção digital "Um marco na vida"

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Abstract. *A intervenção digital tem demonstrado ter um amplo potencial e impacto positivo no incremento da literacia da população universitária em saúde mental. "Um marco na vida" é um podcast de literacia em depressão desenvolvido por estudantes da Licenciatura NTC da Universidade de Aveiro, no âmbito do Projeto eMental. Com o objetivo de avaliar este podcast, foi proposta uma estratégia que permitisse convidar participantes para o estudo, e distribuição dos áudios e do questionário de avaliação (online). A convocatória dos participantes baseou-se no envio de uma mensagem convidativa através das redes sociais Instagram e WhatsApp, assim como as ligações ao formulário do consentimento informado. Com isto, foram contactados um total de 55 estudantes. No entanto, apenas nove assinalaram a intenção de participar, e apenas seis estudantes participaram integralmente. A pouca adesão dos estudantes, foi, possivelmente, influenciada pelo facto de os convites terem sido concretizados no período final do ano académico e possivelmente o cenário pós-Covid. A partir desta experiência, propõe-se que sejam adotadas estratégias inovadoras e cativantes, de forma a integrar os estudantes em propostas futuras.*

An analysis of CTC students' media use for socialization and entertainment purposes

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Abstract. *Several studies report that there were remarkable changes in the ways and media that were used for such different tasks as communication, socialization and entertainment in the past two years. The aim of this project was to draw a picture of media use by students in the area of Communication Sciences and Technologies (CTC), in two dimensions of their daily activities: socialization and entertainment. A survey was designed, validated, and applied, consisting of 17 questions organised according to the following dimensions: demographic data, media ownership, media use (academic purposes), media use (social networks) and media use (entertainment). Preliminary results show that the most reported uses of social networks for academic purposes were for establishing and maintaining contacts (70.7%) and for preparing homework, reports, etc... (58.6%). Regarding the use of media for entertainment purposes, the contents with the highest reported frequency were series (70%) and movies with 45%. There was a significant increase in the subscription of services such as Netflix and Spotify and respectively 80% and 70% of respondents stated that their consumption of series and films increased or increased a lot during the pandemic confinements.*

As sonoridades dos Estudantes da UA

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Abstract. *O projeto pretende responder a? pergunta ?Como nos relacionamos com o a?udio e as sonoridades?? e tem como objetivo compreender a relac?a?o dos estudantes da UA com o a?udio, com o intuito de vir a desenvolver produtos educativos sonoros. Em conjunto estudantes e docentes procederam a? elaborac?a?o do questiona?rio (?Tu e as Sonoridades?), implementaram o questiona?rio na plataforma web e formalizaram os procedimentos para validac?a?o da recolha de dados na UA. O projeto constituiu uma oportunidade dos estudantes se integrarem em projetos concretos de investigac?a?o na academia, tendo sido muito enriquecedoras as trocas de pontos de vista e as aprendizagens realizadas entre estudantes e docentes. Como aspetos positivos da experie?ncia destacam-se: as interac?oes estudantes- docentes num ambiente de trabalho informal, integrador e nivelador; a adoc?a?o do formato a dista?ncia para as sesso?es de trabalho e a oportunidade de estudantes e docentes ficarem vinculados para ale?m do tempo do projeto.*

FlavourQuest: data collection, transcription and analysis of user experience evaluation

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Abstract. *The FlavourGame project (PTDC/COM-CSS/31024/2017) is developed in collaboration between the University of Aveiro, University of Minho and Catholic University of Portugal (Porto). A serious hybrid game model is being developed in the scope of the project, which combines a digital component with a board game. The objective of the hybrid game is to support the autonomy and motivation of children from 10 to 12 years old regarding healthy food choices. FlavourQuest was the contribution to this major project, which was carried out by a group of students of the Degree in New Communication Technologies. The main tasks developed by the students was the redefinition of the game narrative, the production of visual content, the development of a web application prototype, and the user experience evaluation of the game. In this communication, we presented the results of the user experience evaluation that included playing the game and interviewing a group of children aged 10 to 12 (7 boys and 2 girls), in order to obtain feedback about the game components (design, narrative and gameplay) and to better understand our target audience and also their expectations and suggestions.*

Contextos temáticos de Game Design no âmbito do projecto Gamers4Nature

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Abstract. *Digital games' potential to enhance motivation for learning and its relevance in education has been recognized a few years to this part, research indicating that involving students in the creation of their own games increases the interest on the addressed theme. Nevertheless, research also points out some obstacles in involving students to explore educational contents through game design, namely low or undeveloped programming skills which may lead to difficulties and frustration when implementing the game.*

In this context, this project seeks to answer the following research question: How to promote computational thinking without programming tools, and by using tangible artefacts?

The study was articulated in two axes: (i) a literature review, analysing strategies to teach programming with scratch in unplugged activities, (ii) the development of a prototype of a tangible artifact to understand how children, through a reverse engineering process, understand the computational logging of coding blocks.

Construção/personalização de cenários educativos para ambientes web imersivos

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Abstract. *O projeto "Construção/personalização de cenários educativos para Ambientes Web Imersivos (AWI)", proposto por três investigadores da Universidade de Aveiro (UA), no âmbito dos seus trabalhos de doutoramento, foi divulgado e sujeito a apreciação de alunos e investigadores, numa apresentação pública organizada pelo students@digimedia, a qual contou, a partir dessa data, com a colaboração de 3 alunos de licenciatura em Novas Tecnologias da Comunicação, que de forma voluntária, se propuseram a colaborar nas atividades: criação de recursos tecnológicos de apoio à aprendizagem e construção/customização de salas de aula imersivas. O desenvolvimento destas atividades permitiu-lhes consolidar competências que já tinham, e ganhar outras, que lhes serão úteis no futuro, de acordo com as opiniões expressas pelos estudantes. Os recursos construídos pelos alunos com supervisão dos investigadores serão disponibilizados, numa fase posterior, aos professores do ensino básico e secundário, candidatos a uma oficina de formação na UA. O programa students@digimedia revelou ser eficaz na aproximação de alunos e investigadores a projetos reais ao desenvolver novas metodologias de trabalho colaborativo e desencadear novos conhecimentos de índole prática.*

Accessibility4Blind: audio description creation for the promotional video

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Abstract. *This work is part of the Accessibility4Blind project, which is a mobile application that aggregates accessibility solutions for people with visual impairment, with the main goal of informing and training its users about these accessibility solutions. The contribution of this work in the Accessibility 4 Blind project involves the creation of an audio description of a 1 minute and 15 seconds video that promotes the prototype of the mobile application. The video only has background music, and it is intended to make it accessible to people with visual impairments. The main tasks performed in this work were the following: i) analysis of the promotional video; ii) creation of the audio description script; iii) creation of the audio description through natural voice; iv) integration of the audio description in the video through an editing software; and v) exporting the video. The tasks were successfully completed by the students, and, in addition, they were able to extend certain sections of the video so that the audio description could be synchronized, with the aim of not losing important information to the viewer.*

Accessibility4Blind: interpretation of the preliminary UX evaluation

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Abstract. *This work is part of the Accessibility4Blind project, which is a mobile application that aggregates accessibility solutions for people with visual impairment, with the main goal of informing and training its users about these accessibility solutions. The contribution of this work in the Accessibility4Blind project is the interpretation and writing of the results of the preliminary UX evaluation of the application, performed by 4 participants, since it is intended that the evaluation and the results be disseminated through a scientific article. The main tasks performed in this work were the following: i) analysis of the results of the UX evaluation (which are already described in a preliminary version); ii) final interpretation of the results of the UX evaluation; iii) writing of the results of the UX evaluation; and iv) its integration in a section of a scientific paper in a conference or journal in the area of accessibility and/or universal design. The tasks were successfully completed by the students and there was also the opportunity to conduct a methodological review of the study, positioning it within the perspective of a proof of concept.*

Reminiscence storytelling experiences triggered by 360° Cinematic Immersive Realities

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Abstract. *Recent events, such as the COVID19 pandemic and the lockdowns that either took place or are still taking place in various parts of the world, have created social environments that have promoted the appearance or rapid decay of a hard-to-grasp number of cases that, due to medical conditions associated with Dementia and Alzheimer, are losing their ability to orally communicate with caregivers, family and friends. Research on these issues, in particular regarding the use of 360° cinematic virtual reality videos in reminiscence therapies, are currently ongoing concerns at DigiMedia. The study conducted developed experiences with the goal of understanding users' behaviour, in terms of oral communication activity, when viewing 360° cinematic immersive videos with and without links to the users' personal memories. Results attained suggest great potential in the use of 360° cinematic virtual reality videos, closely linked to the user's memories, in reminiscence therapies as a means to trigger spontaneous oral communication activity through storytelling. Future work may hopefully contribute to slowing down the decay of the user's oral communication competencies and, by doing so, contribute to the user's and his closer social sphere's wellbeing and quality of life.*

Health Education in the first school years in Portugal – a perspective based on official Portuguese curriculum documents

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Abstract. *De acordo com a Organização Mundial de Saúde, o conceito de Saúde envolve o estado de completo bem-estar físico, mental e social e não apenas a ausência de doença.*

Esta característica ampla, com desafios permanentes, é partilhada pelo conceito de Educação para a Saúde, equacionando a Educação e a investigação médica, culminando na promoção da Saúde em todas as suas dimensões. A UNESCO ambiciona fortalecer a ligação entre a Educação e a Saúde, pela interação entre o Objetivo de Desenvolvimento Sustentável (ODS) 3, que objetiva a globalização do acesso à saúde de qualidade, e o ODS 4, que objetiva a globalização do acesso à educação de qualidade.

Este estudo visa identificar os tópicos relacionados com o tema 'Educação para a Saúde' presentes nos documentos curriculares do 1.º e 2.º Ciclos do Ensino Básico, partindo da questão: que áreas da saúde estão a ser contempladas nos documentos curriculares portugueses?

Para compreender o que a comunidade científica entende sobre o tema; quais os objetivos de aprendizagem relacionados com o mesmo, realizou-se uma revisão de literatura. Por fim, procedeu-se à análise documental dos documentos curriculares - Aprendizagens Essenciais (2018 e 2021).

Os resultados indicam a presença da Educação para a Saúde nos documentos curriculares, mas sem interligação explícita das diversas áreas do saber e com pouca exploração de certas categorias definidas em documentos internacionais orientadores. Conclui-se que Portugal considera a Educação para a Saúde como parte integrante do currículo, mas com margem para melhoria da abordagem e do enfoque colocado nas diversas categorias.

My experience during the visit of Professor Bruce V. Lewenstein (Cornell University, USA)

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Abstract. *During the visit of Professor Bruce V. Lewenstein (Cornell University, USA), I have the chance to join some of his visits, where his knowledge in the education, didactics and science, give me a different point of view of the science teaching and of what science its to have my own refletions about how to be a modern teacher.
In an age where the virtuality and the interaction its important to the child, the teaching must change, and get adapted to a new world, where technology, smart devices and internet means everything.*

Promover a leitura no âmbito de uma Educação Científica inclusiva: o contributo de uma Bolsa de Iniciação à Investigação Científica

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Abstract. *Nesta comunicação apresenta-se o trabalho desenvolvido no âmbito de uma Bolsa de Iniciação à Investigação Científica na área da Educação (PIC-EDU) e em articulação com o acordo estabelecido entre o Centro de Investigação em Didática e Tecnologia na Formação de Formadores (CIDTFF) e a Cartas Com Ciência, uma spin-off da associação sem fins lucrativos Native Scientists.*

Uma das tarefas envolveu o apoio à dinamização da campanha de recolha de livros ?Livro a livro, rega-se o gosto pela ciência? para a Escola da Trindade de São Tomé e Príncipe e as bibliotecas de escolas básicas e pré-escolares de Cabo Verde.

A campanha decorreu entres os meses de março a maio de 2022 e através da mesma foram recolhidos mais de 350 livros. Estes livros foram catalogados com base num conjunto de variáveis (ex.: data de publicação, área científica, idade do público-alvo, estado de conservação, entre outros) no sentido de auxiliar na seleção do conjunto de livros (num total de 45 kg) a serem enviados para São Tomé e Príncipe. Neste momento, os alunos da Escola da Trindade já receberam mais de 90 livros, utilizando-os no âmbito das atividades do ?Laboratório de (re)escrita de textos? da mesma escola.

Almeja-se com esta comunicação ilustrar que uma campanha de doação de livros é muito mais do que uma simples recolha, envolvendo a análise e sistematização de dados. Por fim, reforça-se a mais valia de cooperação entre a Academia e a sociedade civil, em prol de uma educação científica inclusiva.

Poly-UNiverse in Teacher Training Education (PUNTE)

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Abstract. *Inserido no PIC-Edu, um programa de iniciação científica que promove a interação de estudantes na investigação científica na área da educação, o projeto Poly-UNiverse in Teaching Training Education (PUNTE) apresenta-se como uma ferramenta didática que procura diversificar o processo de aprendizagem na área da Matemática. Um dos objetivos do PIC-Edu, recorrendo ao PUNTE é conceber, implementar e avaliar atividades pedagógicas com alunos do Ensino Básico e Secundário.*

Esta ferramenta didática combina características como as formas geométricas e as suas cores. Conta com um conjunto de peças que inclui peças com a forma de um triângulo, de um quadrado e de um círculo. A combinação de cores torna cada uma destas peças uma peça única.

Um dos trabalhos a desenvolver no projeto PUNTE era conceber uma atividade pedagógica com alunos do Ensino Básico.

Foi desenvolvida uma atividade pedagógica que conta com duas fases distintas. Uma primeira fase introdutória na qual foi apresentado o projeto PUNTE, bem como as características das peças. Nesta fase, os alunos puderam manipular e interagir com as peças, em que nesta atividade exploratória realizaram uma construção livre com as peças.

Numa segunda fase, procurou-se explorar o conhecimento dos alunos no âmbito do tema Geometria e Medida, com uma tarefa de construção de triângulos e sobre o conceito perímetro.

Um outro objetivo do projeto PUNTE, está relacionado com a disseminação da investigação realizada, que foi concretizada na apresentação em formato de poster na 1ª Conferência Internacional Building Bridges in STEAM Education in the 21st Century.

UA Informa: a science project for the community

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Abstract. *UA Informa is a pioneering project that articulates Education, Training, and Research, aiming to promote the sustainability of the University Campus and of the city, through the creation of open educational resources linked to QR codes, spread across the campus. These QR codes give access to the UA Informa subweb, which includes topics, such as Water, and Mobility. The project is especially relevant to students, visitors, and the wider community.*

A master's student, with a scholarship of the Program for Scientific Initiation of young students in Education (PIC-Edu), integrated the research team and collaborated on the development of the UA Informa campus visit game. The game comprises nine points of interest, and allows the participants, through the exploration of information on the subweb, to know more about the UA and its sustainability practices. Examples include the existence of recycling bins on the campus and the innovative gardens' management towards pollinators wellbeing. In each point of interest participants must access the QR code information, analyze it, observe the surroundings, and choose the correct answer option for each question.

In the XPERiMENTA'22 edition, the game was implemented with a 10th grade class. The results were acquired through an individual and anonymous questionnaire, where the 23 students gave their opinion about the experience. Overall, although the students revealed some difficulties in searching and retrieving information in textual format and through observation, they reached a good performance and revealed a positive perception of the learning value of the game for Education for Sustainability.

Adapting evidence-based cognitive rehabilitation programs: Proposal of a cultural adaptation model

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Abstract. *Cultural adaptation of pre-existing programs can be a way of privileging interventions that have already been validated and with evidence of effectiveness. In the context of cognitive rehabilitation programs, there is a lack of specific guidelines for their adaptation to another culture. As part of a broader project, which aimed to adapt a cognitive rehabilitation program for cancer survivors from the USA to Portugal, a specific model for the cultural adaptation of these programs was developed. A literature search was carried out to systematize cultural adaptation models of evidence-based interventions with relevance to the field of cognitive rehabilitation. Based on international guidelines for cultural adaptation, more specifically for interventions in public health and psychotherapy, a 10-step model was developed, with three major phases: A?Exploration Phase (1. Needs assessment and review of cognitive rehabilitation programs; 2. Selection of intervention and initial contact with the original team); B?Preparation Phase (3. Translation and technical accuracy check; 4. Cultural adaptation; 5. Independent review of the translation and cultural adaptation by an expert panel; 6. Contents and cultural adaptation appraisal by the target population; 7. Systematization of previous contributions and recommendations; 8. Improvement of the final text of the program; 9. Fidelity check by the original program team); C?Implementation Phase (10. Assessment of its acceptability, feasibility and effectiveness). The evidence-based model developed can be useful for researchers who want to culturally adapt cognitive rehabilitation programs.*

Improving the Thermal Management of Power LED Arrays with Diamond

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Abstract. *High operating temperatures have a negative impact on the performance and efficiency of power light emitting diodes (LEDs). Due to the direct contact between the LED die and the carrier, the thermal conductivity of the carrier plays a key role in the ex-traction of heat away from the junction, and some manufacturers use high- materials, such as aluminium nitride, as die carrier. The board also impacts the transport of heat to the ambient and metal core printed circuit boards (MCPCBs) are the standard choice for power applications. Artificial diamond has also been gaining momentum for demanding heat management applications. To evaluate the impact of integrating diamond plates with power LEDs, the temperature profile of two 3x3 arrays of Cree white XLamp XB-D LEDs with AlN/diamond carriers mounted on MCPCB/diamond boards was obtained with Ansys for different current levels. The impact of the junction temperature on the LEDs? lifetime was evaluated for each carrier/board combination based on the datasheet of the devices. The results provide additional knowledge regarding the potential impact of diamond on the reliability of power LED arrays.*

Influence of WC grain size on the corrosion resistance of hardmetals

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Abstract. *In this project, the effect of the WC average grain size on the corrosion resistance of WC hardmetals was studied. Industrial samples of WC-Co (constant volume % of Co) were prepared with WC average grain sizes ranging from ultra-coarse to submicrometric, namely, 6, 4, 2.5, 1.2 and 0.8 μm . The study was conducted in 0.5 M NaCl (corrosive media) using electrochemical techniques such as corrosion potential (OCP) monitoring, linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS) for assessing the corrosion behaviour of the composites together with scanning electron microscopy (SEM). The SEM results showed that the industrial composites did not follow the same distribution in grain size as that of the particles they were produced with - no significant differences in the average grain size were depicted for the samples with larger particles. As for the electrochemical results, it was possible to see that there are slight changes in the corrosion resistance of the different grades although no trends were observed. This suggests that the similarities seen in the samples' average grain sizes affect their electrochemical behaviour equally, hinting at the need for improved sample production.*

Hot Weld Cracking in Automotive Transmission Laser Welds

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Abstract. *Weld cracking is unpredictable and frequently not detected in early quality control which can result in structural and mechanical level issues. The main objective of this research is the acquisition of technical knowledge in the field of laser welding in an industrial context. The study was developed from an existing case of hot cracking in the connecting weld of claw and gear shaft by Nd:YAG laser welding. The solution focused on optimization of welding parameters such as laser power and speed welding, ensuring the overall compliance of the final product. Several samples with different parameters sets were tested by ultrasonic machine (US 100%) and analysed using optical macroscopy in order to validate the conformity of the revised weld bead and then submitted to mechanical tests. The desired results were replicated and normalized, resulting in updated production parameters.*

Desenvolvimento de elementos resistivos com grafeno induzido por laser

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Abstract. *LIG (laser-induced graphene) é produzido em alguns materiais isoladores com carbono na sua composição através de um processo foto-térmico pela interação da radiação laser com a superfície do material, criando uma espuma de grafeno nessa mesma superfície. O LIG é condutor elétrico e pode ser usado, por exemplo, como elemento resistivo. Pela conjugação com sistemas opto mecânicos, é possível modelar em 2D um perfil para ser impresso numa folha de material (neste caso Kapton) uma resistência com um processo fabríco simples, facilmente modificável e com alguma flexibilidade. Este trabalho consiste na elaboração de uma resistência de aquecimento elétrica com a finalidade de aquecer líquidos usando LIG como material resistivo, substituindo-se assim aos tradicionais elementos resistivos metálicos. Sendo assim, é necessário otimizar um perfil que, dadas condições de funcionamento desejadas, seja estável sobre carga e atinja os valores de resistência pretendidos distribuindo calor uniformemente por uma área definida. Nesta otimização recorreu-se ao apoio de um software de modelação por diferenças finitas para acelerar o processo iterativo.*

Photo- and electroluminescence of CIGS solar cells

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Abstract.

Solar cells are interesting devices that are made up of semiconductor materials. The evaluation of the defects on these materials is important to ensure good performance of the device. In this regard, this work seeks to describe two optical characterization techniques that allow the study of the material's electronic structure. Photo- and electroluminescence techniques were applied on thin film CIGS based solar cells and the presented results will be discussed within the scope of the physical principles of the techniques.

Kilo.Health: a case study on planning for innovation

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Abstract. *The present work's goal is to develop an innovation plan for a real company (Kilo.Health) that was proposed in the context of a university course. It was made a bibliographic review prior to the work and we consulted 26 references during the realization of this work. Kilo.Health offers digital solutions, in the form of mobile apps, for personal health and wellness monitoring. It already has more than 4 million users and was the second fastest growing technology company in Europe in 2021. There are many applications for all operating systems that monitor various aspects of human health but there's still no application system that controls all these aspects in a single account. With this gap, the opportunity arises to create a system that gathers health data from all these applications, being able to inform the user in a much more complete and general way than just considering individual health factors. This collection of data can, eventually, be presented to the family doctor as an aid in assessing the user's health status. Another opportunity is the creation of a sleep monitoring application. The sleep monitoring application will consist of an application that analyses sounds, movements and behaviours during sleep in order to give a report of the duration and quality of sleep. These parameters control can be done by the smartphone itself through the microphone and the infrared sensor or through a smartwatch if the user has one. We also suggest new marketing approaches, more specifically, improving the proximity to traditional western health media and, when appropriate, advising the use of other company applications during the use of the chosen application.*

Automatic Adjoint Differentiation for special functions involving expectations

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Abstract. We explain how to compute gradients of functions of the form $G = 1/2 \sum_{i=1}^n (E y_i - C_i)^2$, which often appear in the calibration of stochastic models, using Automatic Adjoint Differentiation and parallelization. We expand on the work of [1] and give faster and easier to implement approaches. We also provide an implementation of our methods and apply the technique to calibrate European options.

[1] D. Goloubentsev and E. Lakshtanov. Remarks on Automatic Adjoint Differentiation for gradient descent and models calibration, arXiv:1901.04200 [q-fin.CP]. 2019.

Modifications to a classic BFGS library for use with SIMD-equipped hardware and an AAD library

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Abstract. *BFGS is an optimization method for solving unconstrained nonlinear problems. It is the most used quasi-Newton method due to its robustness and fast convergence. We studied its limited memory version LBFGS and a library that implements it in C++, LBFGS++. We modified the interface and implemented SIMD parallelization in the LBFGS++ library. This allows the user to take advantage of modern hardware without any extra work. We also made a new interface for users of the AADC library. This library implements Automatic Adjoint Differentiation and simplifies the use of SIMD tools like AVX and multithreading. We used quantitative finance applications LIBOR Market Model and Open Source Risk Engine to test our modifications which increased efficiency by up to 70%.*

(Dis)similarities of primary health care indicators

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Abstract. *Primary Health Care (PHC) are focused on the needs of people and communities and focuses on aspects of physical, mental, social, and well-being health, and therefore it is necessary to monitor whether services are being well provided to the community.*

In recent years, there has been the implementation of health indicators whose objective is for the health unit team to manage it and improve its worst points according to the results of the indicators. Their results are used for the weighted calculation of the Global Performance Index which gives an indication, as the name implies, of the overall performance of that unit.

This study aims to find a possible correlation and proximity between certain indicators and what is their impact on improved management in the Health Unit.

Was performed a hierarchical time series clustering by using Shape-based distance (based on coefficient-normalized cross-correlation), with the dtwclust package as shiny app in software R.

The cluster analysis was carried out based on the results obtained from the dimension consistencies. It was found that indeed the consistency of the dimensions influences the results of the cluster analysis.

The analysis performed allows for more detailed knowledge about the indicators and thus better planning for continuous improvement of the quality of health services.

Characterization of reported mental health issues in the region of Aveiro – A retrospective analysis

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Abstract. *The world has acknowledged the important role of mental health. However, in the last decade, mental health disorders increased by 13%. Portugal has Europe's 2nd-highest prevalence of psychiatric illnesses and further studies show that 57% of the Portuguese population presents psychological distress. This study was conducted to investigate the registered psychological problems between 2009 and 2021 in the region of Aveiro. Exploratory data analysis began with obtaining the number of problems per year and the number of problems for each comorbidity. The number of problems per year for each county, gender, age group and for each psychological problem was accessed. Statistical analysis was applied to the county variable through cluster analysis. A total of 1092760 psychological problems were reported, being 2021 the year with more reports. Women had more than twice as many problems compared to men. The county with the most psychological problems registered in 2021 was Ovar; Anadia stands out because it reported the least psychological problems per 100000 habitants. The most reported problems were Depressive and Anxiety Disorders, consistent with country and world's results. This study revealed that some counties behave similarly when taking the report of psychological problems into account. This study might alert the population and its doctors to be more aware of the Portuguese's needs and it could help to identify local risk factors. Some limitations are present as only aggregated data was studied, where duplicates are present but impossible to resolve.*

A note on a prey-predator model with constant-effort harvesting

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Abstract. *We study a prey-predator model based on the classical Lotka-Volterra system with Leslie-Gower and Holling IV schemes and a constant-effort harvesting. Our goal is twofold: to present the model proposed by Cheng and Zhang in 2021, pointing out some inconsistencies; to analyse the number and type of equilibrium points of the model. We end by proving the stability of the meaningful equilibrium point, according to the distribution of the eigenvalues.*

Optimal Control Problem for an Irrigation Mechanism

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Abstract. *Based on the previous study of Sofia Lopes, we designed a system that controls the water flow into two irrigation fields in order to minimize the use of water brought by the aquifer system of a certain location.*

The system is designed as a chain that connects a main water reservoir to two secondary ones which in turn are connected to two different crop fields. The water in the main reservoir, is provided by rainfall and also by the tap, whenever the rainfall water is not enough to supply the needs of the secondary reservoirs. Such needs are satisfied by the flow rates of irrigation water, also a recovery reservoir was designed to recover the deep infiltrated water, in order to reduce the amount of water used.

Tailoring the crab shell properties for CO₂ adsorption

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Abstract. *Each year about 8 million tons of seafood waste is produced and then dumped in landfills or in the ocean without being treated. However, given its relevant chemical and physical characteristics (e.g., presence of chitin, proteins and natural porosity), these residues may be reused in gas capture application, as CO₂ adsorption. In order to understand the CO₂ adsorption, we implemented acid and basic aqueous treatments to optimize the proportion of certain components, calcium carbonate and proteins, respectively, and to increase the porosity towards optimal CO₂ capture. CO₂ adsorption capabilities of the obtained materials were evaluated using several characterization techniques including gas adsorption isotherms and solid-state NMR. Our results show that the blended crab shell has a CO₂ adsorption capacity of 0.18 mmol/g. After, the blended crab shell was subjected to two basic, two acid treatments and a final extra basic treatments. The resulting material is enhanced in quantity of chitin and porosity, adsorbing almost twice of the CO₂ amount observed for the pristine material at the conditions of 1 bar and 298 K. The success of this project will allow reusing large quantities of seafood waste, namely crab, to produce an inexpensive and environmental-friendly material for CO₂ adsorption.*

Resembling the oil recovery process from a silica surface through C8E6 surfactant; A molecular dynamic computer simulation approach

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Abstract. *Bearing in mind the population growth (more than 9 billion people in 2040) besides the climate change awareness, the evolution of the oil demand in the next decades is uncertain. Thus, in the global energy context with unstoppable oil prices, oil producers focused on the optimization of extraction processes in their existing natural deposits. Since two-thirds of the oil remains trapped in the reservoir after primary and secondary (water flooding) recoveries, the third consists of an Enhanced Oil Recovery (EOR) process in which an aqueous solution of surfactants and polymers, that have physicochemical features remarkable for oil recovering, is injected inside the reservoir. The C8E6 is a PEO consisting of a linear alkyl chain of 8 carbons and 6 ethylene oxide groups.*

Like other surfactants, Polyethylene oxide (PEO) alkyl ether surfactants (CiEj) non-ionic compounds reduce water-oil interfacial tension (ITF) and can self-assemble in spherical and worm-like micelles or long range ordered phases when the concentration is increased. Therefore, this work aims to develop a computer simulation framework to resemble EOR processes, a powerful tool that can aid the oil industry. Thus, to be able to capture in detail the interactions between surfactant, water, oil, and the walls of the reservoir, a coarse-grained molecular dynamics (CG-MD) computer simulation framework was developed involving a silica surface, resembling the seabed natural oil reservoir walls, dodecane, water and the C8E6 surfactant. The CG-MD simulations performed in this work were carried out with the GROMACS package for MD simulations and the MARTINI 3 forcefield. Details about the analysis of the literature data, CG-MD model validation, construction of the simulation boxes, equilibrium and production runs, post-processing tools and the difficulties that have been encountered, will be explained in detail.

Água: a matriz da vida ou um espetador passivo?

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Abstract. *Cerca de dois terços da superfície da Terra é coberta por água. Além disso, a água representa cerca de 65% da massa de um ser humano, sendo, portanto, essencial à vida. Nas últimas 4 décadas tem-se tornado cada vez mais evidente que a água não é simplesmente um observador passivo, mas sim uma matriz ativa: uma substância que interage com as biomoléculas de um modo complexo e subtil. Neste projeto, tentou-se contribuir para o esclarecimento de como a água interage com os solutos nela dissolvidos. A compressão deste fenómeno poderá, em última análise, esclarecer o papel central da água nos fenómenos da vida.*

Como moléculas modelo estudaram-se o ácido acético e a n-butilamina, como representativos dos grupos carboxilo e amina presentes em todas as proteínas. As técnicas experimentais utilizadas incluíram espectroscopia de ressonância magnética nuclear (RMN), espectroscopia no infravermelho com transformada de Fourier (FTIR), condutividade, pH, entre outras. A abordagem utilizada consistiu no estudo do perfil dos espectros RMN do protão (1H RMN) dos compostos modelo, sobre a influência de diversos sais inorgânicos, tanto na presença como na ausência de água.

Observou-se que o efeito dos sais nos espectros 1H NMR dos compostos modelo é diferente, dependendo se o mesmo se encontra no estado puro ou dissolvido em água. Os dados foram interpretados como indicadores da participação da água no comportamento dos solutos nela dissolvidos, através de um mecanismo que resulta da perturbação da autoionização da água induzido pelos sais. Futuramente pretendemos testar a hipótese com outros solutos mais complexos.

Desenvolvimento de um biossensor à base de diamante - Imobilização da enzima L-asparaginase

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Abstract. *Biossensores são dispositivos analíticos que combinam um componente biológico, com um transdutor, para que possam ser captados e interpretados sinais provenientes de uma reação química. Existem alguns tipos de biossensores, mas de momento poucos ou nenhum estudo mostraram a possibilidade do uso de termístors para este efeito. No presente trabalho, pretendeu-se utilizar a capacidade inerente desta da tecnologia de deteção à base de diamante dopado com boro, conferindo ao diamante características de excelente condutividade térmica e elétrica, para iniciar o desenvolvimento de um biossensor, com a imobilização da enzima a L-Asparaginase (L-ASNase), uma enzima de interesse medicinal e alimentar. De forma a iniciar a primeira fase de desenvolvimento, estudou-se a imobilização da L-ASNase em superfícies de diamante policristalino funcionalizados com plasma de O₂ e NH₃. Foi realizado também um estudo da caracterização superficial do material, de forma a correlacionar os resultados obtidos com a morfologia e composição do diamante. De acordo com os dados obtidos, verificou-se a adsorção da enzima no material de forma semelhante, com ou sem funcionalização, sendo que as estruturas cristalinas não possuam traços de impurezas (grafite) significativos, a análise do ângulo de contacto permitiu confirmar que a superfície do material funcionalizado o torna mais hidrofílico e posteriores análises por FTIR-ATR permitiram a confirmação da presença da enzima na face com diamante policristalino.*

Sobre a agregação das proteínas globulares em solução

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Abstract. *As proteínas, quando dissolvidas em água, manifestam diversas formas (monómeros/agregados) e estruturas secundárias (hélice- α /folha- β). Por outro lado, desempenham diversas funções biológicas sem as quais não existiria vida tal como a conhecemos. Não se sabe ao certo se existe uma relação entre as diferentes formas proteicas e as estruturas secundárias, ou se os monómeros/agregados são idênticos ou diferentes. A clarificação destas questões poderá, em última análise, ter consequências importantes em todos os domínios científicos onde as proteínas estão envolvidas.*

Nesse sentido, neste trabalho estudou-se a propensão das proteínas para agregar. Como proteínas modelo escolheu-se a albumina do soro bovino e a lisozima do ovo da galinha. Como variáveis experimentais utilizaram-se a influência da concentração proteica e de metanol (a baixas concentrações). As técnicas experimentais incluíram eletroforese em gel de poliacrilamida com dodecil-sulfato de sódio (SDS-PAGE), cromatografia de exclusão molecular líquida de alto rendimento (SEC-HPLC), dispersão de luz dinâmica (DLS), dicroísmo circular (CD), espectroscopia de Raman, condutividade, entre outras.

Observou-se que a propensão das proteínas para agregar aumenta com a diluição e diminui com a adição de metanol. Observou-se também que a condutividade molar das proteínas aumenta com a diluição e mantém-se constante com a adição de metanol. Os dados foram interpretados como indicadores da presença de dois tipos de monómeros proteicos, em que apenas um deles apresenta uma propensão natural para agregar cuja ocorrência relativa aumenta com a diluição. Futuramente pretendemos testar a hipótese com ensaios de atividade biológica, estrutura secundária bem como alargar os estudos a outras proteínas.

Sobre a atividade biológica das proteínas

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Abstract. *As proteínas desempenham diversas funções biológicas em solução sem as quais não existiria vida tal como a conhecemos. Por outro lado, as proteínas encontram-se em solução em diversas formas (por exemplo agregadas ou monoméricas) e não se sabe ao certo qual ou quais destas formas são biologicamente ativas. Neste projeto pretendeu-se investigar esta questão, cuja clarificação, em última análise, poderá ter consequências importantes em todos os domínios científicos onde as proteínas estão envolvidas.*

*Como proteína modelo escolheu-se a lacase de *Trametes Versicolor* (comercial). Como variáveis experimentais utilizaram-se a influência da concentração proteica e de metanol na sua oxidação catalítica de 2,2'-azinobis(3-etilbenzotiazolina-6-sulfonato). Observou-se que a atividade específica da lacase aumenta com a diluição e diminui com a adição de metanol. Os dados foram interpretados como indicadores da presença de diferentes tipos de moléculas proteicas, identificadas como ativas e não ativas, em que a ocorrência relativa das primeiras aumenta com a diluição.*

Na tentativa de corroborar a hipótese, complementou-se a informação experimental com estudos de agregação, estrutura secundária e grau de pureza. As técnicas experimentais incluíram cromatografia de exclusão molecular líquida de alto rendimento (SEC-HPLC), dispersão de luz dinâmica (DLS), dicroísmo circular (CD), espectroscopia de Raman, absorvância UV-Vis, condutividade, entre outras.

Apesar dos dados de condutividade corroborarem a hipótese, conclui-se que a proteína comercial era substancialmente impura, pelo que os estudos de agregação e estrutura secundária não foram conclusivos. Futuramente pretendemos levar a cabo estes ensaios após purificação da lacase comercial bem como testar a hipótese com outras enzimas.

Ionic liquid-based aqueous biphasic systems for human serum pretreatment

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Abstract. Biomarkers are biomolecules detected in body fluids such as proteins in human serum, whose quantification can be used for the diagnosis, prognosis, and treatment of diseases. Unfortunately, detection of biomarkers is a difficult task due to the complex nature of human serum proteome. In serum, there are high abundance proteins, namely human serum albumin (HSA) and immunoglobulin G (IgG), that interfere in the detection of proteins present at lower concentrations such as biomarkers. To reduce serum complexity, there is the need for prior pretreatment step to remove high abundance proteins. Conventional pretreatment strategies include liquid-liquid extraction, solid-phase extraction, and protein precipitation. However, these are limited by low sensitivity and use of organic solvents. To overcome these drawbacks, ionic liquid-based aqueous biphasic systems (IL-ABS) were tested in this work due to their bio-friendliness and structural versatility. In these systems, the removal of HSA and IgG from human serum occurs at the interphase of the ABS, while intact target biomarkers are expected to be completely extracted in one of the liquid phases. Using IL-ABS, depletion efficiencies of 100% were obtained for high abundance proteins, demonstrating that ABS can be used as a simpler and cost-effective alternative for the pretreatment of human serum.

This work was developed within the scope of the projects: CICECO-Aveiro Institute of Materials, UIDB/50011/2020, UIDP/50011/2020&LA/P/0006/2020, financed by national funds through the FCT/MEC (PIDDAC) and PTDC/EMD-TLM/3253/2020 funded by national funds (OE) through FCT/MCTES.

Purification of antileukemic drugs through silica-based supported ionic liquids

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Abstract. *The enzyme L-Asparaginase (L-ASNase) is a relevant enzyme in the pharmaceutical industry, where it is used as an anti-leukemic biopharmaceutical; and in the food industry, as a mitigating agent for acrylamide. In order to use an L-ASNase in the pharmaceutical field, a highly pure enzyme is required. Conventionally, chromatographic processes are the most common techniques used in the purification of L-ASNase, increasing the costs of the final product. Thus, it is important to explore new efficient and economical methods to purify the enzyme. Therefore, the main objective is the development of a new purification technique for L-ASNase from a cell extract from a fermentative broth of Bacillus Subtillis, using silica-based supported ionic liquids (SILs), namely dimethylbutylpropyl ammonium chloride ([Si][N3114]Cl). Particularly, different experimental parameters such as cell extract total protein concentration, SIL/ cell extract ratio (w/v) and contact time were optimized. From the results obtained, the favorable experimental conditions to purify L-ASNase are: extract concentration of 3 mg/mL, 100 mg of [Si][N3114]Cl and contact time of 30 min. In these conditions, the L-ASNase purity increased 6.06 times in a single-step. Summarizing, [Si][N3114]Cl is a very promising material to develop a new efficient and economic methodology to purify L-ASNase.*

Levodopa extraction from *Mucuna pruriens* seeds

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Abstract. *Mucuna pruriens* is a plant rich in the amino acid Levodopa, that is used for the treatment of Parkinson's disease. First, a screening of the most suitable acids and their concentrations was performed on the high-pressure-assisted extractor, at 100 bar, 2 mL/min, 60 °C, and 60 minutes, with 10% citric acid by weight leading to higher yields and purity of levodopa. After, the effect of the pressure in the yield and purity of levodopa in the extracts obtained was also studied (20 bar to 100 bar), applying the most promissory solvent. Aiming to find the most efficient extraction processes were also studied the following techniques, microwave-assisted extraction (MAE), ultrasonic-assisted extraction (UAE), and conventional extraction. For 10 minutes were obtained similar recovery yield of levodopa for the HP extractions at 100 bar and 20 bar, around 2%; the best yield was obtained in the UAE, around 4.5% of levodopa, and the worst yield was obtained with MAE, with less than 1% recovery of levodopa. At last, the extracts were used to synthesize gold nanoparticles to examine the possibility of biomedical application of the extracts obtained. The particles were analyzed by STEM and UV-Vis which showed the growth of the particles and the increase of absorbance.

3D printing for fabricating organ on a chip devices to model human diseases

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Abstract. *Currently available 2D cultures and 3D spheroid models to screen new anti-cancer therapeutics do not represent an accurate depiction of tumor's microenvironment in the human body owing to their inherent limitations associated with static cell culture. This project aims to develop a highly reproducible and versatile cancer study model by applying and developing the organ-on-a-chip concept with a 3D bioprinter. The developed chip was built with extrusion 3D printing, mimicking human physiologic properties such as vascularization, by printing with a sacrificial ink, and tissue flexibility, by printing the chip case with an elastomer ink. This also demonstrated the ability to effectively 3D print this new elastomer with an unmodified 3D bioprinter, which, after optimization, the chip exhibited similar morphology to the CAD models and good structural stability upon thermal crosslinking. Apart from vascular structures the tumor component was also modelled in the chip, through the use of cancer cell-laden microbeads, which presented an acceptable cellular viability. Further studies should refine the vascularization process, test endothelization and study the cell behavior over time. This technology may provide significant advances over current microfluidics platforms that are limited in achieving anatomical accuracy, thus enabling more realistic in vitro modelling of neoplasias.*

Purification of L-Asparaginase with silica-supported ionic liquids

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Abstract. *L-Asparaginase (L-ASNase) is an enzyme with applications in food and pharmaceutical industries, with its use as a biopharmaceutical requiring a high degree of purity. In this sense, it is critical the search for novel, efficient and cost-effective purification methods of L-ASNase, since the currently protocols, namely chromatographic methods, increase the price of the final product and avoids their widespread use.*

In this work, the purification of L-ASNase from a fermented broth of Bacillus Subtilis using silica-based supported ionic liquids (SILs) was investigated. Particularly, the SIL based on triethylpropyl ammonium chloride, [SI][N3222]Cl, was used. Several experimental conditions, namely the total protein concentration of the cell extract (containing L-ASNase and other impurities); SIL/ extract (w/v) ratio; and contact time between the proteins and the material, were optimized.

The results revealed that the use of [SI][N3222]Cl in the purification of L-ASNase in optimum conditions (cell extract of 5 mg/mL with 100 mg of [SI][N3222]Cl during 30 min of contact), a purification fold of 3.71 was observed. Therefore, this work presents a very promising, fast and economic technique to purify L-ASNase from a complex media in a single-step purification.

Public policies

Cross-Border Higher Education: an overview of quality assurance public policies

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Abstract. *Higher Education (HE) has been changing over the past decades. The increase of Cross-border Higher Education (CBHE) provision is one of these changes and brings new possibilities and challenges for HE systems. This project intends to study the multiple facets of CBHE in Europe and its quality assurance, understood as a public policy. The research question is defined as: How is Cross-border Higher Education being operated in Europe and what are the main challenges it poses for quality assurance? This project follows a qualitative research approach, framed in the development of case studies. Three case studies will be elaborated under this research: Portugal, the Flemish Community of Belgium and the United Kingdom. To elaborate the cases, systematic literature reviews will be performed on the themes of CBHE and quality assurance in higher education, as well as document analysis and interviews with relevant actors, both at institutional, national and supranational levels.*

AS POLÍTICAS PÚBLICAS, AS TÉCNICAS DE PROcriação MEDICAMENTE ASSISTIDA E A CRISE NA NATALIDADE EM PORTUGAL

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Abstract. *Com o passar dos anos a realidade social evolui e as perfectivas e circunstancias obrigam a novos enfoques e novas abordagens, neste seguimento, a presente investigação procura contribuir para um maior conhecimento sobre as Políticas Públicas na Procriação Medicamente Assistida (PMA), pois apesar de existirem vários estudos em Portugal sobre este tema, a maioria destes estudos focam-se muito na vertente da medicina e não tanto na vertente social e aquilo que se pretende é exatamente isso é perceber qual a intervenção do Governo nesta área uma vez que com o adiamento da fertilidade levantam-se novas questões e geram-se outros constrangimentos nomeadamente o da concretização da fertilidade, daí a importância de se saber como é que a PMA funciona em Portugal.*

Será levado a cabo um estudo etnográfico, sendo que este método possibilita que o observador se coloque como instrumento do seu próprio estudo, permitindo adquirir conhecimento através de uma abordagem mais empírica o que é enriquecedor para a investigação.

Migration Policies and Asian Immigrants in Portugal; Cases of Bangladesh, Iran, and Nepal

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Abstract. *This research aims to investigate the influence of Portuguese migration policies on the integration status of Bangladeshi, Iranian, and Nepalese immigrants. Notably, with changes in the government's policies towards migration, Portugal has become an immigrant-accepting country in recent years, specifically admitting a wave of Asian immigrant communities. Accordingly, this study is hoped to provide an in-depth evaluation of the outcomes of the current migration policies and suggestions for improving Asian Immigrants' integration in Portugal. As to integration, the classical dimensions in this field of research, namely cultural (language, society, and basic norms), social (education and welfare systems), economic (labor market and employment), and political (the right to vote and to stand for election usually acquired through naturalization) will be addressed. In order to achieve the above stated goals, a combined qualitative and quantitative research methodology will be adopted that comprises the analysis of documents, surveys, deep interviews, and content analysis.*

Keywords Migration, Portugal, Pull and Push, Public Policy, Integration.

Gendered Career Pathways of Doctorate Holders

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Abstract. *After the Strategy of Lisbon, the creation of the European Research Area, aiming to foster gender equality in scientific careers, represented a landmark to the European scientific research system. Following the so-called knowledge society and the previous reforms that, over the last decades, were implemented in higher education systems worldwide, regarded as affecting women and early-career researchers the most, it is relevant to analyse the career trajectories of doctoral graduates and if there are gender differences in these paths. As countries are expected to have more doctorate holders and to align doctoral education towards the non-academic labour market, namely the private sector with fewer legislative interventions to reduce the gender gap, this study aims to understand how the evolution of the scientific research system influenced the career pathways of PhD holders over time. Drawing upon semi-structured interviews with doctorate holders graduated in the short to long-term, it intends to examine the career trajectories of this qualified group and to explore if gender inequities in the transition from the doctorate into employment, as well as equity issues within employment structures, are observed. Finally, the impacts for the individual life will also be considered.*

Economia Circular e os desafios da sua Implementação no contexto das Políticas Públicas - Um estudo de caso na regiões do Alentejo (Grupo Nabeiro - Café Delta)

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Abstract. *Atualmente, a economia circular surge como uma alternativa ao modelo linear ainda predominante, englobando na sua abordagem os aspectos ambientais relacionados com o desenvolvimento económico. Como principais motores da economia, as empresas assumem assim um papel fundamental na concretização e sucesso desta transição. Especialmente por sua responsabilidade social, as empresas tentam fomentar as normas impostas pelas políticas públicas locais, gerando novos valores e maior competitividade para a própria indústria. Nesse sentido as empresas podem contribuir na busca de maior transparência, coesão territorial e inovação social.*

Nos últimos trinta anos, apesar dos avanços tecnológicos e do aumento da produtividade dos processos que extraem 40% mais valor económico das matérias-primas, a demanda neste mesmo período aumentou 150% (UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION ? UNIDO, 2013; <Industrial Development Report 2013 \ UNIDO >, data: 12.06.2022).

Um dos caminhos para o enfrentamento desse problema é por meio de um modelo económico circular, que associa o crescimento económico a um ciclo de desenvolvimento positivo contínuo, que preserva e aprimora o capital natural, otimiza a produção de recursos e minimiza riscos sistêmicos, com a administração de estoques finitos e fluxos renováveis. (ELLEN MACARTHUR FOUNDATION, 2017; <How to build a circular economy \ Ellen MacArthur Foundation >, data: 12.06.2022)

O objetivo do trabalho é uma reflexão sobre o entendimento das definições de Economia Circular (EC) como instrumento alternativo ao modelo linear económico. Assim como pretende refletir sobre as oportunidades, os desafios e suas limitações, em especial no tangente a sua implementação como instrumento de Políticas Públicas a nível local. Em particular pretende-se observar i) qual o papel do setor privado no processo de implementação, a exemplo do Grupo Nabeiro, indústria do café na região do Alentejo; ii) se a implementação da EC na indústria do café aponta para dificuldades recorrentes em outros setores da indústria e em outras regiões; iii) observar boas práticas na implementação da EC e de que forma as mesmas poderiam ser aplicadas em outros setores da indústria, em outras regiões/territórios; vi) se a implementação da EC setorial na região do Alentejo fomentou maior nível de coesão territorial e de inovação social locais.

CHANGES IN BUDGET RULES AND THEIR IMPACT ON THE DISTRIBUTION OF PUBLIC EXPENDITURE: ANALYSIS OF THE MUNICIPALITIES IN BRAZIL AND PORTUGAL

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Abstract. *Analysis of the impact of changes in budget rules, social spending and public debt in municipalities in Brazil and Portugal.*

Digital health literacy in Portugal: Framework and public policies

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Abstract. *Digital health technologies are critical for promoting the well-functioning of health systems and empowering individuals. Thus, health and digital health literacy among both health professionals and the general population should be prioritized to ensure that digital health interventions are properly implemented, while also reducing health disparities through improved access to digital health services.*

This study aims to conduct a sociological analysis of the digital health literacy in Portugal through a multidisciplinary approach. As a result, this study will allow for a more in-depth assessment, therefore complementing and adding new and credible information to this pertinent issue. The overall aim of this research work is to explore the digital health literacy levels in Portugal, as well as critically analyze and quantify the impact and effectiveness of the actions and governmental policies designed to improve it.

Thus far, this PhD project has had a significant focus on the eHealthResp project (PTDC/SAU-SER/31678/2017). A usability study of an e-health tool to aid clinical decision and empower the population has been conducted, resulting in one journal publication. The educational contents that comprise the eHealthResp educational intervention are being validated through a pilot study, and it is expected to result in two journal articles within the next month. Furthermore, a systematic review on the influence of sociodemographic factors on digital health literacy is being conducted, and a paper on the concepts of digital health literacy and the Portuguese context has been accepted for publication.

Considering the high focus on the eHealthResp project, the second task has suffered slight delays. However, important contributions to the scientific community have been already disseminated under the scope of the eHealthResp research project and regarding the impact of the COVID-19 pandemic on the Portuguese population. Bearing in mind the work already conducted and the aims of this PhD project, the next steps are to finish the systematic review on digital health literacy and begin the second task.

Urban sustainability transformation through Environmental Assessment: the role of actors in decision-making processes

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Abstract. *Urban systems are at the center of economic, social and environmental debates as places where sustainability issues arise, but at the same time they provide an arena to drive local and global development towards the transformative change needed for resilient and sustainable urban systems. Rethinking how to effectively promote sustainable transformation in urban systems is an urgent need. This paradigm change is closely linked to understanding the challenges, decision-making processes and governance issues in urban systems. Environmental Assessment (EA) is an environmental policy tool that promotes and integrates sustainability into decision-making processes and has the potential to bring about a shift towards sustainability in urban systems. Against this backdrop, this research main objective is to understand how EA can contribute to urban systems sustainability through decision-making processes and the role of actors (i.e., decision-makers, practitioners and local community) to enhance sustainability in these systems through EA.*

To achieve this objective, the PhD project employs an integrative literature review and a multiple case study of twelve Strategic Environmental Assessment (SEA) in the Portuguese context, carried out through a mixed method approach with qualitative and quantitative analysis. The PhD project is divided in five phases with specific objectives and scientific tasks: i) integrative literature review; ii) document analysis and surveys; iii) social network analysis and in-depth interviews; iv) analytical framework; v) thesis integration. The main contribution is expected to be the development of an analytical framework - that applies a complex adaptive system approach - to support public decision-making processes that aim urban sustainability transformation in Portugal. It is also expected that the research produces four scientific articles to be published at international peer reviewed journals.

A Inovação Social e os desafios da qualificação das Políticas Públicas de Desenvolvimento

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Abstract. *As Inovações Sociais (IS) são geralmente definidas como novas ideias sob a forma de produtos, processos, serviços ou novas formas de relacionamento e colaboração entre vários atores. Pressupõem a criação de valor social, motivadas pela resolução de desafios societários e necessidades sociais, não satisfeitas pelo Mercado ou pelo Estado, promovendo a capacidade dos atores para agir e conduzir à mudança social, de forma duradoura. É aqui que podem enquadrar-se os méritos da IS, na sua abordagem à Política Pública (PP). Neste sentido, a opção metodológica da escolha pela abordagem qualitativa, está relacionada com o ganho de sensibilidade em várias frentes. Destarte, os estudos de caso procuraram: (i) captar os novos enquadramentos que a PP está a seguir ao nível da macroeconomia, enquanto modelo de desenvolvimento; (ii) ganhar sensibilidade para a atuação conjunta com os diversos grupos sociais, em áreas mais desfavorecidas e rurais; (iii) compreender como se enquadram as PP de desenvolvimento em Portugal. No fundo, esta investigação deverá identificar quais as linhas estruturais de atuação e trajetória de mudança na PP, e qual o contributo expresso da IS, na co-construção/formulação de PP mais justas e eficazes e, diversos contextos.*

Sustainability Assessment in Higher Education Institutions

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Abstract. *Fostering sustainable development (SD) practices, initiatives and policies in Higher Education Institutions (HEIs) has been gaining ground in the research arena. The present research project proposes a holistic approach on sustainability assessment tools for HEIs, aligned with the Sustainable Development Goals (SDGs). The main aims to be achieved are (i) to bring a new, broader, participative and more comprehensive paradigm to the sustainability assessment tools available to HEIs; (ii) to help HEIs understand their alignment with the Sustainable Development Goals; (iii) to provide support to decision-makers to pinpoint critical areas for intervention within their Institutions; (iv) enabling HEIs to better perceive their position with regard to the three dimensions of sustainability: economy, society and environment and other Institutions; and (v) to develop, apply and test in a pilot case an innovative approach to develop a comprehensive sustainability assessment tool, with recommendations for further improvement of practices and policies. The mixed methodological approach that is intended to be carried out promotes the collection and surveying of data through the cooperation and co-creation with the actors involved in HEIs, engaging cases within and outside Europe, with the aim to develop the assessment model. University of Aveiro (UA) will be the pilot case to implement the first version of the tool.*

The role of Academic Engagement in a Knowledge Society: a global comparative analysis on aims, trends, and policy implications

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Abstract. *Under the Knowledge Society narratives, European policy has been emphasizing the role of knowledge production and innovation in fostering economic competitiveness and addressing the ?grand societal challenges. In this context, Higher Educations Institutions (HEIs) are considered key institutions in the innovation systems and academics are increasingly expected to engage with industrial and social partners.*

Taking this into account, this thesis aims to contribute to the discussion on the role of academic engagement in a Knowledge Society, attempting to answer the following research question: ?How is European Policy influencing the way academics engage with society at national, European and even global levels??

For this purpose, we propose a comparative analysis of the academic’s attitudes regarding academic engagement, applying a quantitative approach based on a unique international survey.

We expect to find significant country differences in the patterns of engagement regarding the academics’ characteristics, social and business partners and types of activities. Nevertheless, we also anticipate some (global) trends regarding the academics’ willingness to collaborate with society.

The contemporary challenges of combating racism - the case of the Brazilian student community in Portugal

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Abstract. *O racismo contemporâneo tem-se apresentado como uma problemática mundial. Nos últimos anos, as relações entre Brasil e Portugal têm-se acentuado, nomeadamente através da imigração brasileira para o território português, em particular de estudantes do ensino superior, totalizando 20.627 em 2018/19, e permanecendo a maior comunidade de nacionalidade estrangeira, a representar 27,8% de acordo com o último relatório do Serviço de Estrangeiros e Fronteira. Este fenómeno tem vindo a suscitar tensões sociais, verificados por crescentes episódios de discriminação e racismo veiculados nos media. Neste sentido, esta investigação pretende: i) compreender o racismo como um sistema transnacional de discriminação; ii) produzir estudos acerca das políticas públicas de combate ao racismo desenvolvidas em Portugal iii) estudar as dinâmicas do racismo em Portugal, em particular as discriminações contra a comunidade brasileira, no contexto do ensino superior; iv) propor novas ferramentas de políticas públicas antirracismo numa ótica de emancipação dos grupos racializados.*

Term Limits and Financial Sustainability of Portuguese Municipalities

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Abstract. *In representative democracy, the literature on the role of elections in determining the public official's behavior has been marked by controversial theoretical arguments and paradoxical empirical evidence. Through a panel data analysis for the 308 Portuguese municipalities, this research aims to advance this knowledge by introducing term limits in explanation of financial sustainability local public policies. Thus, the main objective of this PhD thesis is to assess the causal relationship between term limits and financial sustainability of Portuguese municipalities. It is also intended to clarify the conceptual definition and respective measurement of financial sustainability and to explain and characterize profiles of municipalities, according to term limits. For this purpose, three (complementary) analysis techniques will be developed: confirmatory factor analysis, structural equation model and cluster analysis of municipal profiles. A positive unidirectional causal relationship is assumed between the dimensions under study.*

Valuing endogenous resources in low-density territories on a supra-municipal scale

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Abstract. *This PhD project aims to identify the development mechanisms of the processes that lead to the formation of entrepreneurial ecosystems in low-density territories based on the valorization of endogenous resources, applied on a supra-municipal scale evolving intermunicipal communities.*

In a broad sense, it is relevant to consider the existence of endogenous resources, in which their existence or production does not occur on a large scale, which envisages the introduction of value. This mechanisms will be provided by the scientific knowledge approach from universities or from research centers. On the other hand, a synergistic exploit manage by stakeholders will contribute to increase economic growth as well as development of its territories.

This thematic framework presents, two important constrains, namely, some lack of knowledge and understanding mechanisms, both principles that will lead the valorization of endogenous resources, and the implementation of an entrepreneurial attitude. Its multiplier effect throw adding value to ancillary products can also fostering an positive impact on economic growth and development of these territories.

A GESTÃO DA ÉTICA INSERIDA NA ADMINISTRAÇÃO PÚBLICA: UM ESTUDO EM DUAS UNIVERSIDADES PÚBLICAS ? BRASIL E PORTUGAL

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Abstract. *A pesquisa abordará a gestão da ética pública pelas instituições do Estado, compreendendo que diferentes formas de gestão são criadas, em diálogo com as características dos contextos nacionais, com vistas a promover e proteger os valores e os princípios que regem a Administração Pública. Considerando que a Administração Pública se materializa por meio de diferentes órgãos e instituições, que variam conforme a área ou tema de interesse público, a pesquisa concentrará esforços analíticos nas Instituições de Ensino Superior, buscando identificar e caracterizar as formas de organização e desenvolvimento da gestão da ética no ambiente universitário. Para tanto, serão analisadas as experiências de gestão de ética pública de dois casos selecionados, são eles: a) a Comissão de Ética da Universidade de Brasília, que representa um caso brasileiro expressivo de como funciona o sistema de ética pública gerenciado pelo Poder Executivo Federal no país; e b) O Conselho de Ética e Deontologia da Universidade de Aveiro, em Portugal, caso representativo de experiência portuguesa de gestão. Os casos selecionados respondem ao tema desta investigação por representarem órgãos consultivos e de controle das referidas universidades, que possuem competência de promover e executar políticas de preservação dos princípios éticos e deontológicos. Esses casos são representativos de duas formas diferentes de gestão da ética pública, sendo o brasileiro expressivo de um sistema exclusivamente focado na gestão da ética pública, enquanto o português acumula competências de gestão de ética pública e ética em pesquisa. A análise dos casos será feita mediante o emprego de técnicas tradicionais de pesquisa social, dentre as quais se destacam a análise de conteúdo de documentos normativos e institucionais relativos à experiência de gestão de ética pública nas universidades selecionadas, a realização de entrevistas semiestruturadas com membros integrantes desses órgãos da ética e a revisão teórica sobre a gestão de ética pública.*

Electronic government contributions to increase citizen participation in the government decision-making process

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Abstract. *It is increasingly common for information and services to be made available on portals accessed through the world wide web. Governments do the same. The idea of an electronic government presupposes the use of information and communication technologies (ICTs) for the provision of public services and the existence of the opposite path, originating from the citizen's side and directed to the government, promoting and contributing to the strengthening of democracy. The research theme is inserted in the context of the reforms that the State has undergone, in order to make it more efficient and more open to the needs of society. It is intended to carry out a qualitative and quantitative research, having as case studies the implementation of electronic government in two countries. As a result, it is expected to identify possible relationships and correlations between the implementation of electronic government and the democratic capacity of citizens (e-participation).*

Public Value in Portuguese SNS: a case study

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Abstract. *Facing limited resources and when it is not possible to fully meet the needs of society, the choices made within the scope of public policies need to be substantiated. The evaluation of public policies is thus assumed to be a relevant topic for the literature on Public Administration. The definition of priorities is particularly sensitive in the specific case of health sector, given the impact of decisions on the human condition. As an alternative to evaluations based on cost-benefit analyses, appears an emerging approach based on public value theory, which intends to go beyond indicators based on efficiency and effectiveness.*

With this study, we intend to analyze the importance of public value theory for the Portuguese SNS and how measures have been taken to incorporate the guiding principles of public value theory. We also intend to investigate the resulting implications for the public hospital organizations that make up Portuguese SNS.

To pursue these objectives, we will use a qualitative methodology based on focus groups, document analysis and semi-structured interviews, adopting a case study based on public hospital entities belonging to SNS.

With this investigation, we intend to contribute to the literature on Public Value, to establish a relationship between the way SNS has carried out its course and the theory of public value and to help public hospital organizations that make up SNS to be able to draw lessons from decisions based on public value for the definition of their management processes.

Bem-estar no trabalho: Das políticas públicas às perspetivas de empregadores e trabalhadores/empregados da Região de Aveiro/Well-being at work: From public policies to the perspectives of employers and workers/employees in the Aveiro Region

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Abstract. *The constant changes in the labor market have brought an increase in the concern with workers' well-being, so public policies and organizations understand that work affects people's well-being. Therefore, organizations are concerned with developing practices that foster well-being at work (WBW) and there is a need for public policies to increase knowledge about the aspects that may enhance WBW.*

The literature shows that WBW is multidimensional. Its dimensions and subdimensions include different aspects, from salary, security, feeling positive emotions, and professional self-fulfillment. Generally, studies do not take into consideration the opinion of employees/workers and employers about the dimensions that confer WBW.

Thus, the main objective of the study is to know, from the perspective of public policies and of employees/workers and employers in the Region of Aveiro, which dimensions and sub-dimensions they consider to confer WBW. The methodological approach will be essentially qualitative, using interviews, questionnaires and documentary analysis, as well as content analysis. It is expected that the thesis will demonstrate that distinct dimensions and sub-dimensions of well-being can be referred.

Promoting sustainable mobility in Portugal: A comparative study of the mobility of students at the University of Aveiro and Coimbra

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Abstract. *Making trips by private car increasingly growing in urban areas and pertained emissions is one of the significant issues in decreasing world greenhouse gas emissions. road journey constitutes three-quarters of transport emissions., whilst the vast majority of this comes from motorized vehicles such as cars and buses which contribute 45.1%. the latest technologies solely are unlikely to decrease transport emissions pursuant to Europe and global alleviation goals. meanwhile, policy agencies and decision-makers examine various strategies aimed at working toward sustainable transportation. the idea of sustainable mobility presents travel patterns that potentially mitigate socioeconomic and externalities effects produced by private cars including environmental noise and carbon emissions. as students comprise a great percentage of the urban trip population between school and home, active modes of travel such as walking, and cycling would represent a sustainable mode of mobility with the purpose of increasing physical activity among adolescents and children. In this framework, the objective of this study is to explore and compare the mobility of higher education students within Aveiro and Coimbra university campuses. The University of Aveiro is located in the center of Aveiro city, which was founded in 1973, and consists of 16 departments, 4 polytechnic schools, and includes more than 13000 students. It is currently attended by approximately 17000 graduate and post-graduate students, 9% of whom are international students.*

A maturidade dos dados abertos no contexto das políticas públicas da união europeia. Estado da arte, desafios, oportunidades e fragilidades

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Abstract. *O tema desta tese está relacionado com a maturidade dos dados abertos avaliada no âmbito das políticas públicas definidas pela União Europeia (UE).*

O movimento open data e open government desde 2009 que surge na agenda política europeia refletido na publicação de sucessivos documentos normativos e ações que procuram melhorar o acesso aos dados abertos, promover a sua reutilização e aumentar o seu impacto. No âmbito das ações realizadas destaca-se a avaliação efetuada aos respetivos estados membros, desde 2015, relativamente à maturidade de dados abertos com consequente, atribuição de ranking do estado de desenvolvimento.

Neste contexto, a investigação segue, em termos teóricos e empíricos, uma inquirição relativa aos desafios, oportunidades e fragilidades colocados pelas premissas metodológicas e operativas da avaliação da maturidade dos dados abertos.

Partiremos da análise das dimensões, critérios, metodologia e resultados das avaliações efetuadas na perspetiva de identificar fragilidades e desafios assim como, desenvolver ou melhorar o quadro conceptual de referência.

Ocean, Public Policy and Development: the transformative role of Smart Specialisation Strategies (S3)

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Abstract. *O potencial de desenvolvimento associado ao mar (OCDE, 2020) e a problemática ambiental (Rudolph et al, 2020) justificam a abundância de políticas, a multiplicidade de focos e a atenção particular de instâncias internacionais como as Nações Unidas. No período 2014-2020, o mar assumiu protagonismo na Europa, no âmbito das Estratégias de Especialização Inteligente (RIS3) que têm vindo a servir como quadro de referência da política de coesão regional a nível europeu. As RIS3 tornaram-se o pilar central da estratégia Europa2020, sustentadas em processos participados de descoberta empresarial (Foray et al, 2011). O crescente reconhecimento da importância dos oceanos para um desenvolvimento sustentável (DS), a par dos efeitos negativos a que estão sujeitos pela ação humana (e.g. perda de biodiversidade, poluição e impactos aliados às alterações climáticas), tornam urgente a adoção de novas formas de cooperação institucional e de governação multinível. As RIS3, em termos gerais, espelham esta perceção e aproximam-se daquilo que é o reconhecimento da necessidade de adotar uma abordagem do mar enquanto "ecossistema". Múltiplas RIS3 europeias, entre as quais a maioria das portuguesas, integraram no Quadro de Apoio 2014-2020 ações dirigidas à economia azul e, em particular, a sectores emergentes, embora haja escassez ou ausência de informação que permita avaliar os impactos destas nos territórios (CE, 2019). A CE afirmou o enorme potencial da economia azul para o cumprimento dos Objetivos de Desenvolvimento Sustentável (ODS) 2030 e para uma recuperação ecológica, em resposta às graves repercussões da pandemia de Covid-19 (p.e. no turismo costeiro e marítimo, nas pescas e aquicultura). Perante este contexto, este artigo pretende responder à seguinte questão de investigação: qual a relevância das Políticas Públicas para o Mar e da economia azul nas estratégias de inovação e especialização inteligente das regiões da Europa? Para tal, a abordagem metodológica parte de um quadro conceptual já definido para a análise das RIS3 no contexto europeu e a sua articulação com a economia azul e os ODS 2030, a partir da revisão de literatura académica e cinzenta relevante; uma componente empírica, baseada numa análise comparativa de 63 RIS3 (2014-2020) de regiões europeias que definiram o mar como política prioritária, suportada pela recolha e análise de dados (quantitativos e qualitativos) de acordo com o quadro conceptual de partida. Uma fonte privilegiada de informação de apoio à investigação foi a plataforma criada pela União Europeia ? Smart Specialisation Platform e, em particular, a ferramenta Eye@RIS3: Innovation Priorities in Europe. Os resultados esperados do artigo correspondem, por um lado, a uma leitura à escala europeia do modo e do grau de implementação das RIS3 aliadas à economia azul, identificando-se as principais áreas da economia azul que foram desenvolvidas no período 2014-2020, iniciativas inovadoras de PP centradas no mar executadas à escala regional, e ainda, as mudanças operadas nas RIS3 das regiões europeias no quadro de financiamento 2021-2027 em relação à economia azul. Foi ainda analisado o contributo potencial das RIS3 para a concretização dos ODS da Agenda 2030 e o modo como as regiões europeias estão a operacionalizar a sustentabilidade nas suas políticas centradas na economia azul. Sumariamente, a investigação realizada mostra que a economia azul representa uma oportunidade de inovação e desenvolvimento sustentável na Europa: uma em cada cinco regiões da UE está especializada em pelo menos um dos domínios da economia azul, sejam eles tradicionais ou emergentes.*

O Sistema Científico Português: Políticas Públicas para o Emprego e o Desenvolvimento Nacional

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Abstract. *O desígnio da sociedade do conhecimento motivou os decisores políticos nacionais ao aumento gradual do investimento em educação superior, investigação e tecnologia (OCDE, 2021). Assim, entre 2005 e 2018, Portugal mais que duplicou o número de diplomas de doutoramento atribuídos (FCT, 2020).*

Segundo dados recentes, 83% dos doutorados no país trabalham no Ensino Superior (OCDE, 2021), desenvolvendo a maioria dos jovens investigadores atividades em instituições científicas e de Ensino Superior públicas, entre bolsas, contratos a prazo, vínculos pontuais e até sem remuneração, num contexto de limitado número de doutoramentos realizados em colaboração com empresas e de alta percentagem de doutores em pós-doutoramentos em detrimento de entrada no mercado de trabalho (FCT, 2020; Ferreira et al., 2021).

O Governo português reconhecendo a necessidade de profissionalização das atividades de investigação e desenvolvimento, criou medidas como PEEC, CEEC, PREVPAP ou o Observatório do Emprego Científico, mas o seu impacto tem-se revelado insuficiente (Ferreira, 2021; Delicado, 2021).

O projeto de investigação que se apresenta, através de uma abordagem metodológica mista, pretende refletir sobre o trajeto e características do sistema científico português e o contributo que as políticas públicas podem desempenhar na qualificação do emprego científico e no combate à precariedade, com a elevação da articulação do sistema científico com o sector privado e empresarial, no quadro das recomendações da OCDE (2021).

Governança Local em Angola desde a Independência até à Atualidade

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Abstract. *A articulação entre os diversos poderes públicos de um país é uma condição fundamental para se alcançar maior eficiência na afetação de recursos e um mais elevado nível de coesão territorial e de desenvolvimento*

Psychology

Supporting the WE-Disease experience in kidney failure: Steps taken to inform the design of family-based interventions in renal care settings

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Abstract. *Worldwide, thrice-weekly in-center hemodialysis (IHD) is the most common renal replacement therapy for patients with kidney failure. Described as one of the most burdensome treatment regimens, IHD has been frequently associated with poor adherence to medical recommendations, psychological distress, and reduced quality of life. Close family members are among the most important resources for disease management, often assisting patients with meal preparation and adherence to dietary and fluid restrictions, medication intake, care for the vascular access, transport to and from the dialysis unit, and providing emotional support. However, despite the profound changes caused by IHD treatments in the lives of patients and their families, self-management interventions in kidney failure tend to focus on the education of the patient, who receives information related to nutritional counseling, disease pathology, and treatment. In this sense, psychosocial support and skills training for people on IHD remain scarce and the role of family dynamics in disease management, adjustment, and behavioral change is often neglected. To help overcome this limitation, the goal of this project is to develop, implement, and test the effectiveness of family-based self-management interventions in renal care settings. It is hypothesized that this innovative approach, compared to traditional patient-focused programs, will facilitate patients' and caregivers' psychosocial adjustment to illness and maximize patients' treatment adherence. To inform the design of family-based interventions in kidney failure and test this hypothesis, different steps have been taken. Firstly, a meta-analytical study of 13 randomized clinical trials comparing the effectiveness of family-oriented vs patient-centered interventions in different chronic physical conditions was performed. The results favored family-focused approaches for several patients' and caregivers' outcomes, such as psychological distress, coping, capacity to mobilize social support, and improvements in the search and presence of purpose in life. In addition, semi-structured interviews were carried out with patients undergoing IHD (n=27) and family caregivers (n=32) to explore their needs, expectations, and preferences for disease self- and family-management. The overall findings suggested that participants wish to improve their disease and treatment-related knowledge, acquire better clarification on dialysis-related health behaviors, have easier access to available community resources, and receive professional psychological support to facilitate coping with the physical and psychosocial demands of IHD treatments. So far, our research has broadened knowledge about what educational and psychosocial support goals need to be considered when designing interventions focused on the family system in kidney failure. The next step is to develop the family-based program and test (pilot-study) its feasibility, acceptability, and preliminary effects.*

Web-based cognitive rehabilitation program for non-central nervous system cancer survivors reporting cognitive complaints

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Abstract. *This communication describes the work related to the ongoing doctoral project, aiming at the development of a web-based cognitive rehabilitation program for non-central nervous system (CNS) cancer survivors reporting cognitive complaints. Cancer-related cognitive impairment (CRCI) is one of the most common, feared, and worrying side effect related to cancer and cancer treatments. Several studies have reported the negative impact of CRCI on cancer survivors' quality of life, including work-related outcomes. The UCLA Cancer-Related Cognitive Rehabilitation Intervention Program is an evidence-based intervention developed in the United States of America designed to improve cognitive complaints of cancer survivors. Considering that cognitive rehabilitation programs are still lacking in Portuguese cancer treatment settings and that web-based interventions are emerging in the field of cognitive rehabilitation as a potentially valid delivery method of intervention, this doctoral project proposes the development of a web application for CRCI. This project comprises several steps. First, two systematic reviews with meta-analysis are being conducted to examine the relationship between CRCI and work-related outcomes of non-CNS cancer survivors, and to analyze the effects of cognitive rehabilitation interventions on cancer survivors. Second, two psychological instruments are being validated for the Portuguese population, to assess global cognitive complaints and work-related cognitive complaints. Finally, we are developing the web-based intervention ?CanCOG® - Cognitive Rehabilitation in Cancer?. This web application corresponds to the Portuguese adaptation and for online format of the UCLA Cognitive Rehabilitation Intervention Program, which was culturally translated and adapted from American English to European Portuguese. Currently, we are designing and developing the web application. Further studies include the study of the interface usability and the acceptability, feasibility, and piloting of the program. It is crucial to develop and test effective and accessible intervention options to alleviate the impact of CRCI and improve work-related outcomes of cancer survivors. This project aims to provide a useful tool for health practitioners working with this population.*

Open Science: Developing and sharing word-related research tools

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Abstract. *According to an evolutionary perspective, cognitive systems (such as memory) have evolved in order to enhance our odds of survival and reproduction (Nairne et al., 2008, Curr Dir Psychol Sci). Therefore, it is hypothesized that those systems should be particularly sensitive to the adaptive challenges faced throughout our evolution. An example of that is the animacy effect, which corresponds to the tendency for people to remember better animates/living beings (e.g., cat) than inanimates/nonliving things (e.g., spoon). Indeed, animates were, and still are, important stimuli for our survival and reproduction, as they could represent predators, prey, mates, kin, among others (Nairne et al., 2013, Psychol Sci). This effect is overly established in young adults, but its evidence among older adults is scarce. Most studies about the animacy effect use WORDS representing animates or inanimates as the to-be-remembered stimuli. However, to use words, one needs to solve various challenges: 1) animacy norming data are needed (i.e., words previously rated in terms of animacy, to allow a proper selection/manipulation of words in this variable of interest); 2) such norming data need to be adequate for the sample being used (young and older adults tend to process words differently, Fairfield et al., 2017, PLoS One); and, 3) there is a need to control for other words' characteristics (e.g., lexicosemantic and affective characteristics). To respond to the first need, we collected and published the European Portuguese Animacy Ratings for 224 words (Félix et al., 2020, Análise Psicológica). We are currently conducting two additional studies to extend the pool of rated words, and one of them is already pre-registered. Regarding the second challenge, we have collected animacy ratings among elderly European Portuguese (N=97; 224 words) and English native speakers (N=207; 500 words). Besides providing animacy ratings for additional words, and in a new age group, this study also allowed a preliminary comparison between the ratings obtained by different age groups (young vs. older adults; Félix & Pandeirada, 2021, poster APPE; Félix et al., 2021, poster SARMAC). The results suggested that, although young and older adults' ratings were largely in agreement, intergenerational differences were obtained, confirming the need for specific age-group norming data as some differences between the age groups also emerged on the ratings. The third challenge requires a careful gathering of information regarding several word variables. The characterization of European Portuguese words on such variables is still scarce and spread in various sources. This frequently results in ?duplications? of the work and efforts of researchers as they opt to run their own pilot norming studies when they need to control for such characteristics. To overcome this concern, we conducted a review of the European Portuguese datasets, congregating in just one database all the norming data for words available to date, and providing a review of the definition of several words' characteristics. The European Portuguese Animacy Ratings study and the combined database are openly available with the scientific community via the Open Science Framework (OSF): <https://osf.io/9ta3y/>. The data from the two studies with older adults will also be made available through OSF as soon as they are finalized. These rating data constitute an important asset to other researchers interested in this field of research.*

Extending the contamination effect to recognition memory

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Abstract. Remembering information that increases our chances of survival and/or reproduction particularly well should be an adaptive feature of memory (Nairne & Pandeirada, 2008). Disgusting things tend to accommodate pathogens that can threaten one's health. Thus, an enhanced retention of such stimuli would facilitate avoiding contact with them in future encounters or would prompt the engagement in sanitary or preventive behaviors. Often, in our daily lives, objects become potential contaminants by contact with a pathogenic source – law of contagion (Rozin, Millman & Nemeroff, 1986). Inspired by this law, Fernandes and collaborators (2017, 2021), developed a design in which objects became potential contaminants by being paired with pathogenic sources (sick faces) or remain neutral when paired with non-pathogenic sources (healthy faces). Such studies found a mnemonic advantage for potential sources of contamination (i.e., the objects paired with sick faces) using free recall tasks – the contamination effect. However, this type of process is relatively effortful and other less demanding processes – such as recognition – should also be sensitive to potential sources of contamination. Here we explored if this effect would hold on recognition memory. During encoding, participants saw objects paired with sick or healthy faces and, in an immediate memory test, identified whether a sick or healthy person touched the object. After a distractor task, participants performed a surprise recognition task (Old/New Task) for the objects previously presented. We found that participants recognized more objects previously paired with sick faces as compared to those previously paired with healthy faces. These results suggest that the contamination effect extends to recognition memory. The more automatic memory process of recognition could be of great importance to effectively avoid contact with potential health threats.

Chemistry

Chemically programmable and adaptive soft supramolecular multicomponent biomaterials for bone tissue regeneration

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Abstract. *Supramolecular biomaterials are of paramount importance in emulating extracellular matrix (ECM) supramolecular environment owing to their unprecedented modularity, tunability, adaptability, and responsiveness. DNA is one of the most exciting biomolecules in nature and is a highly versatile building block for precisely assembling sophisticated supramolecular nanostructures such as G-quadruplex structures. G-quadruplexes are noncanonical four-stranded structures that are formed in guanine-rich DNA sequences with multiple biological roles [1, 2]. The building blocks of G-quadruplexes are G-quartets (G4s), formed by Hoogsteen-type hydrogen-bonding interactions between four guanines in a square planar arrangement. Additionally, metal cations such as K⁺ and Na⁺, stabilize the system throughout a central coordination with the four guanines. Furthermore, a higher-order self-assembly is achieved by the π - π stacking of the G4 monomers obtaining a columnar four-stranded helical structure [2]. These aggregates can retain enough water to generate a gel-like material. The biocompatibility and biodegradability of the guanosine are key features for the development of biomaterials. Therefore, G-quadruplex hydrogels have been developed as a potential 3D platform for biomedical applications, particularly for intracellular drug delivery. However, despite several attempts, there is not yet a strategy to stabilize the G-quadruplex hydrogels, mainly due to major bottlenecks such as guanosine precipitation and the need for high concentration of metal cation. Moreover, the hydrophilic nature of the hydrogel also has an impact on G-quadruplex stability; in fact, the increase of water molecules surrounding the G-quadruplex structures can lead to its destabilization [3]. The formation of the G-quadruplex hydrogels based on synthetic polymers, namely polyethylene glycol (PEG) [4], has already been reported, however, the formation of these supramolecular hydrogels using natural polymers has not yet been explored. Natural polymers are relevant for biological, biotechnological, and biomedical applications due to their inherent biocompatibility, biodegradability, and similarity to the ECM of living organisms. Herein, we developed for the first time a supramolecular hyaluronic acid (HA)-based G-quadruplex hydrogel. Due to its dynamic nature, the hydrogel proved to be injectable, thermo-reversible, and self-healing. Since K⁺ is an alkali metal cation, the hydrogel also proved to be conductive. By making use of the intrinsic instability of the G-quadruplex structures, we developed perfusable hydrogels by resorting to HA-based G-quadruplex fibers. The fibers were obtained from the hydrogel extrusion, as a sacrificial material without the requirement of an external chemical or physical stimulus. By employing a non-invasive microfiber-based fabrication approach and selecting methacrylated gelatin (GelMA) as a supporting matrix, we were able to create a perfusable hydrogel with tunable channel diameters that holds great promise for being used in tissue regeneration, drug screening, or organ-on-a-chip.*

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Bioinspired complex coacervate?based for underwater adhesives for biomedical applications

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Abstract. *Standard surgical closure techniques involve the use of invasive procedures which entails further drawbacks, specifically, secondary tissue damage, microbial infection, and fluid loss [1]. Tissue adhesives are a novel approach to replace standard techniques currently used on surgical closure [2]. Several strategies have been employed to develop materials that meets all the necessary criteria to be used in clinical practices. However, most of the approved tissue adhesives fail into achieving adhesivity in wet environments, since water acts as a boundary layer between the patch and tissue, reducing drastically their interaction [3]. Nonetheless, many marine organisms have orchestrated a powerful wet adhesion mechanism through covalent bonding and multiple supramolecular interactions [4]. In this context, complex coacervation, used by sandcastle worm to glue sand particles plays a major role in the mechanism behind natural adhesion [5]. Here, we propose the development of a complex coacervate, composed by chitosan and hyaluronic acid modified with a thermoresponsive polymer (PNIPAAm). The smart complex coacervate will have unique mechanical properties and fluid-hydrogel transition controlled by the variation of the temperature, offering the possibility to be injected as a solution before contacting with the tissue.*

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Study of light-matter interactions using In situ illumination NMR

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Abstract. *Organic dyes may suffer dramatic alterations when they interact with light, leading to photochromism or tautomerization. These phenomena have important applications in organic light emitting devices and in responsive materials. The aim of this work is to understand at the molecular level light-matter interactions using an innovative in situ illumination NMR technique. The study includes the synthesis of several molecules displaying Excited-State Intramolecular Proton Transfer or photochromism. An in situ illumination NMR device using LEDs has been designed and built, offering the opportunity to better understand at the molecular level the photo promoted mechanisms and reactions. The fundamental understanding of light-matter interactions may enable controlling the reactivity of the dyes, and a better design of new chromophores.*

Contribution of water-soluble organic matter to the oxidative and immunomodulatory effects of inhalable fine air particles

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Abstract. *Structural features and health effects of water-soluble organic matter from atmospheric fine particulate matter*

Atmospheric particulate matter (PM) exposure has been recognized as a key public health issue, being associated with increased risks of lung cancer, cardiovascular, and respiratory diseases [1]. Moreover, PM exposure has been shown to affect the immune system, leading to an increased susceptibility to infections, or exacerbating other pre-existent lung diseases, such as asthma [2]. The main mechanisms through which atmospheric PM can affect the human health, include the induction of reactive oxygen species (ROS) and subsequent oxidative stress, the trigger or exacerbation of an inflammatory response, and PM related direct cytotoxicity, with these effects mostly affecting lung cells [1]. These toxicological effects have been associated with PM concentration, and its composition in metals, solvent extractable organics (e.g., polycyclic aromatic hydrocarbons), and water-soluble ions [3,4]. Although not receiving much attention by the research community, the fine aerosol water-soluble organic matter (WSOM) has also been recognized as capable of mediating cellular ROS generation [5,6]. Furthermore, WSOM can account for a significant portion of the overall fine PM mass, and it is therefore of great importance to better understand the impacts of the exposure to this PM fraction.

Hence, this PhD work aims to: (1) establish a better understanding of the spatial, seasonal and daily variation of the chemical characteristics of the WSOC present in PM_{2.5} collected in two distinct locations at the west coast of Portugal, within the region of Aveiro; (2) evaluate the direct cytotoxicity as well as the immunomodulatory and oxidative potential of WSOC from PM_{2.5} on macrophages and lung epithelial cells; (3) establish a link between the structural features of the studied WSOC samples and the biological effects they elicit. The currently available results from the studied samples collected in an urban location (i.e., the campus of the University of Aveiro) in the summer season, show that although similar PM_{2.5} atmospheric concentrations were observed in both studied periods (i.e., night and day periods) the WSOM concentrations were higher for the day period when compared with their night-time counterparts. Nonetheless, the atmospheric concentrations of chloride, sulphate and nitrate were higher in night samples when compared with their daytime counterparts.

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Potential of ohmic heating towards the sustainable synthesis of novel quinolones for cancer therapy

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Abstract. *Cancer is a major problem in our society. The multi-drug resistances cases are increasing and so it's necessary the search and development of new anticancer drugs. Quinolin-4(1H)-ones are present in many drugs and some of them presents anticancer activity beyond bacterial activity being known as ?anticancer antibiotics?. Cancer cells presents glucose avidity and the over-expression of glucose transporters, so glycosylated 4-quinolones arise as promising new anticancer drugs.*

The synthesis of these compounds will be using a combination of an alternative heating, green solvents and a supported ionic liquid phase catalysts

Extraction of products with cosmeceutical potential from *Cystoseira abies-marina* using green methods.

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Abstract. *Species from the Cystoseira genus display interesting biological activities like antioxidant, anti-inflammatory, antidiabetic, and anticancer. However, the cosmeceutical potential of these algae is largely understudied. Ultrasound-assisted (UAE) and microwave-assisted extraction (MAE) have been proposed as more sustainable and efficient methods to enhance bioactive compound extraction. In this regard, the present work suggests a bio-guided optimization of the extraction process: several extracts with varying extraction conditions, namely extraction time, solvent, and algae/solvent ratio, were prepared, and their antiaging activities were determined. Then, the activities selected for the Cystoseira abies-marina extracts obtained from different UAE and MAE conditions crossed with the yields of extraction guided towards the conditions that yield the extract with better antiaging potential.*

For the UAE, the conditions which yielded the best activities were ethyl acetate, 15 min. ultrasonication time and the 1:4 m/v ratio, whereas for MAE, the conditions were ethanol, 10 min. irradiation time and 1:4 m/v ratio. The procedures will be upscaled with the optimal conditions to obtain enough amount of extract for phytochemical studies.

Brewer's Spent Yeast Glucan Structural Diversity - The Role on Receptor Recognition

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Abstract. *Glucan recognition by the immune system is mediated by specific receptors, such as Dectin-1 and DC-SIGN. Dectin-1 is a mammalian trans-membrane protein expressed in macrophages responsible for (1 β 3)-glucan recognition. Its two isoforms Dectin-1 A and Dectin-1 B have shown large differences regarding β -glucan recognition. Alternatively, DC-SIGN, expressed mainly in dendritic cells, exhibits a broader range of recognised glucans including (1 β 4)-glucans. However, the structural recognition pattern details of both specific receptors are not fully known with atomic resolution.*

This PhD thesis aims to gather knowledge that enables the exploration of the structural diversity between glucans that leads to different recognition on both Dectin-1A and B, as well as DC-SIGN. This will enable future tailoring of ligands for Dectin-1 and/or DC-SIGN, aiding in the development of novel delivery systems for biomedical applications. To achieve this, membrane mimicking systems, coupled with innovative NMR techniques and other complementary techniques will be used to disclose key structural features responsible for glucan recognition with atomic resolution.

Work has been, so far, focused on the 1st task of the PhD plan, namely characterizing previously obtained glucans from brewer's spent yeast (BSY).

Lastly, the work that has been done so far, has been presented as a poster in an international conference, being awarded a best poster award.

Sustainable Chemistry

Carbon-based nanomaterials from renewable sources for water treatment applications

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Abstract. *This research project aims to develop porous carbon nanomaterials, derived from biopolymer/silica hybrids, as alternative sorbents for water treatment. Novel synthesis routes and comprehensive characterization of nanomaterials constitute the core components of the proposed research.*

Carrageenan based bio-silica hybrid nanomaterials have been prepared and used as sacrificial templates to prepare porous functionalized carbon nanomaterials using hydrothermal carbonization. The materials were fully characterized and preliminary adsorption tests of pharmaceuticals contaminants from aqueous solutions were performed. Of note is a porous carbon-silica hydrochar, with properties better suited for ciprofloxacin adsorption than a non-hybrid carrageenan hydrochar ? 20% vs 6%, respectively. On going optimizations include adjustments to the hydrothermal treatment to require lower temperatures and the use of microwaves as a more efficient alternative. Future work will include preparation of magnetic bio-hybrids aiming at facile separation from effluents, and porous separation membranes based on the best materials, with reusability being one of the relevant properties to optimize.

Chemically identical but smaller hybrid nanoparticles were obtained from the supernatant of the hydrothermal method, that were found to possess interesting photoluminescent properties. This has lead to a thorough characterization process to study their potential as fluorescent probes for the detection of aqueous contaminants. These hybrid nanoparticles were found to have a distinct and more sensitive excitation-dependent photoluminescence profile than counterparts prepared directly from carrageenan. On going work includes photoluminescence studies under different conditions (e.g. pH, concentration) and in contact with aqueous contaminants. The effects of silica presence in the composite's overall robustness and resistance to quenching effects will also be assessed.

Art, science, environment and society as a landscape-language and research-creation method applied to the the viability of living macroalgae-based technologies as a sustainable alternative supply for critical raw materials

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Abstract. *Reflecting on the words of R. Carson on Silent Spring ?man acquired significant power to alter the nature of his world? ? what does it mean to have the power to alter the nature of one?s world at the light of what is perceived as the current technological development and scientific progress? Sustainability is one of the flags that is being constantly proclaimed, raised and discussed among different key players and communities such as scientists, legislators, activists and the civil society. However, how deep is the knowledge of these different communities on how to achieve a more sustainable economic system? Do these communities share methodologies, approaches and solutions? How open is the science community perceiving sustainability as global and multidisciplinary urgency and field of research and creation?*

Through the process of starting to implement the scientific experimental design of this doctoral thesis, different research lines started to vascularize from the branch of sustainability. These are now three distinct research pathways that use different methodologies in order to fulfil specific research gaps: - the first research line is the scientific approach: - Although living macroalgae have been proposed as a more sustainable sorbent for the removal and recovery of Critical Raw Materials (CRMs), among them Rare Earth Elements (REEs), their application at an industrial level requires further knowledge about the sorption process under relevant close to industrial conditions. There is also the need to apply certified methodologies, such as Life Cycle Analysis (LCA) to measure the environmental burden that this technology would represent; - the second research line is the artistic approach: - how the artistic practices can give rise to scientific questions, how esthetic value is related with data perception and what is the space for creativity, subjectivity, language, error and experimental methods as alternative ways for exploring scientific concepts and data through visuals and sound, how creativity can be seen as an evolved cognitive mechanism for performing cutting-edge research; the third line of research encompasses questions of social dimensions of the scientific research - how the scientific community gives form to the knowledge it is generating and how science can contribute for inclusion and literacy.

*Early results showed the green seaweed *U. lactuca* stood out, reaching efficiencies of removal up to 90 % for some REE and therefore, it was chosen for a step of cultivation in a system of three open ponds. Comparisons between the application of dead and living biomass in the sorption process will further elucidate what would be the more sustainable and efficient way of exploring the potential of this biosorbent.*

Expanding indole and azaindole synthesis via metal-catalyzed and metal-free reactions

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Abstract. *Heterocyclic compounds are important key scaffolds that are present in a wide range of bioactive product. So, scientist have continuously search for new and more sustainable methodologies that allow easy access to these types of heterocyclic cores, as well as its proper functionalization. Structures like indole, azaindole and other nitrogenated derivatives are crucial components of medicinally relevant compounds. According to the FDA, 59% of most relevant drugs have within its structure, a N-heterocyclic ring. Following previous work from our group, novel methodologies for the preparation of indole, azaindole and bis-indole derivatives were developed based on the synthesis of crucial intermediates like imines. Metal-catalyzed reaction were used as a valuable tool for the efficient synthesis of azaindoles via C-H functionalization reaction, as well as imine synthesis through oxidative coupling of alcohols catalyzed by manganese. Furthermore, the synthesis of medicinally relevant bis-indole derivatives was explored via two distinct pathways: one based on the radical coupling of alcohols and indoles using potassium tert-butoxide; and another using metallic nanobiohybrids as useful catalysts.*

Prodrugs in Combination with Nanocarriers for Controlled Delivery of Carbon Monoxide

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Abstract. *The knowledge that carbon monoxide (CO) has tremendous therapeutic potential for many diseases has motivated the development of CO-releasing molecules (CORMs) for targeted CO delivery. Most existing CORMs are organometallic complexes and, despite their promising pharmacological effects, there are concerns about metal toxicity. The rich photochemistry of organic molecules, which includes photodecarbonylation, suggests that photoactivatable organic CORMs (oCORMs) could have a prolific future as metal-free CO prodrugs.*

A ketodiacid, 4,4'-dicarboxylate-dicumyl ketone, has been intercalated into a Zn-Al layered double hydroxide (LDH) by coprecipitation synthesis strategy. The resultant material (LDH-KDA3) was studied, in relation to the structure and chemical composition, by powder X-ray diffraction (PXRD), FT-IR, FT-Raman and solid-state ¹³C NMR spectroscopies, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), thermogravimetric analysis (TGA), and elemental analysis (CHN). Photochemical experiments were carried out to probe the photoreactivity of the ketoacid in the crystalline state, in solution, and as a guest embedded within the photochemically-inert LDH host. Solution studies employing the standard myoglobin (Mb) assay for quantification of released CO showed that the ketoacid could behave as a photoactivatable CO-releasing molecule for transfer of CO to heme proteins (Mb-CO formation), although the photoreactivity was low. No photo-induced release of CO was found for the LDH system, indicating that molecular confinement enhanced the photostability of the hexasubstituted ketone.

Supramolecular nanocarriers for the storage and delivery of carbon monoxide

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Abstract. *Exposure to high concentrations of gaseous carbon monoxide can be harmful and lethal to mammals. However, following the discovery that CO is produced endogenously in animals and humans, playing several physiological and biological roles, CO has gained recognition as a gasotransmitter molecule and a therapeutic agent if administered in small doses. CO-releasing molecules (CORMs) are prodrugs that exploit the multifaceted pharmacological effects exerted by CO. Metal carbonyl complexes (MCCs) are promising CORMs but most require irradiation with tissue-opaque and potentially damaging UV/visible light to release CO. Research on these CORMs has advanced in recent years to include CO-releasing materials (CORMAs) that combine the existing CORMs with biocompatible drug delivery vehicles, helping to overcome the barriers that prevent some CORMs from being administered as prodrugs. In this work the photoactivatable CORM (photo-CORM) [Mo(CO)₃(CNCH₂COOH)₃] (ALF795) has been incorporated into a layered double hydroxide (LDH), giving the first LDH-based photo-CORMA (LDH-ALF795). Another material was prepared by the inclusion of molybdenum hexacarbonyl in a hafnium-based MOF with the UiO-66 architecture (UiO-66-Mo(CO)₆). To test the capability of these materials to act as CORMAs, CO release was quantified by the standard myoglobin assay. Both complexes/materials did not release any CO in the dark, while photoactivation with low power UV light (365 nm) released controlled and small amounts of CO. Overall, these studies demonstrate that the LDH and MOF nanomaterials are promising hosts to formulate pharmacologically useful compounds hosting metal carbonyl prodrugs.*

Biopolymeric nanofibrous membranes for targeted wastewater treatment

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Abstract. Wastewaters from food industry represent a serious environmental threat due to high levels of suspended solids, nutrients and particularly reactive pollutants. Nutrient pollution generates eutrophication and several health hazards, as well as phenolic compounds, which show high toxicity even at low concentrations. This project aims to develop novel electrospun nanofiber membranes with improved adsorption capability for pollutants typically encountered in industry wastewaters. Yeast cell wall components (spent brewer yeast), keratins (chicken feathers), chitosan (shortfin squid pen), obtained from industry by-products will be the main biopolymers to be tested. With the purpose of obtaining novel nanofibrous materials with potential filtration capacity and improved adsorption properties, nylon 6 (N6), yeast extract (Y) and a mannoprotein extract (M) obtained from yeast cell walls were mixed (0.4 g/mL of N6 and 0.025 g/mL of Y or M) to prepare electrospun nanofibrous membranes. Nylon 6 was the base polymer for all membranes. Sequential extraction of raw yeast cell by-products with water and alkaline solutions enabled to obtain two main biopolymeric samples: a yeast rich extract and a mannoprotein-rich extract. Electrospinning conditions were optimized to obtain N6, N6/Y and N6/M hybrid fibrous membranes and they were characterized for their surface structure and mechanical properties. Scanning electronic microscopy (SEM) revealed an average fibre diameter of 235 nm for N6, 610 nm for N6/Y and 273 nm for N6/M membranes. Mechanical analysis performed by uniaxial tension tests showed a stress at breakpoint of 7.31 MPa for N6, 3.94 MPa for N6/Y and 5.56 MPa for N6/M membranes. Higher elongation and lower stiffness (Young's modulus) were observed for the N6/Y membranes compared with the other samples. N6/M membranes showed a significantly higher surface hydrophobicity compared to the other samples, as revealed by water contact angle measurements. It is hoped that these materials can complement bioremediation treatments and increase their efficiency, improve removal of contaminants and act as an effective recovery strategy for added-value compounds from the wastewaters.

Keywords: Electrospinning, Nanofibrous membranes, Biopolymers, Yeast cell wall Wastewater.

The quest for RISS catalysts: Can 5-(2-pyridyl)tetrazole be a compass?

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Abstract. *The use of vegetable biomass as a widespread renewable source of organic carbon to produce chemicals and fuel through sustainable processes is of great importance for chemical industries.*

The present PhD project focuses on the catalytic conversion of bio-olefins - obtainable from plant-based oils or industrial residues - to useful bioproducts, such as epoxides, polyols and alkoxyalcohols. These transformations will involve epoxidation and acid-catalyzed reactions, which will be coupled in a one-pot fashion to enhance overall efficiency, reduce the carbon footprint and energy consumption. Metal oxide-organic hybrid catalysts will be developed for these processes and tailored for reaction-induced self-separating (RISS) behavior to combine the advantages of homogeneous catalysis (high activity and selectivity) with those of heterogeneous catalysis (easy separation and recycling). The results from this work are expected to improve scientific knowledge concerning the rational design of RISS catalysts.

Structure-Activity Relationship (SAR) studies of 9-alkylamino-1,2,3,4-tetrahydroacridines against *L. infantum* promastigotes.

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Abstract. *Leishmaniasis is one of the most neglected diseases in modern times, affecting mainly people from developing countries of the tropics, subtropics, and the Mediterranean basin, with approximately 350 million people considered at risk of developing this disease.[1] The incidence of human leishmaniasis has increased over the past decades due to failing preventing and therapeutic measures - there are no vaccines and chemotherapy is problematic.[2] Acridine derivatives constitute an interesting group of nitrogen-containing heterocyclic compounds, with several derivatives being associated with numerous bioactivities.[3] In particular, there are reports on acridine derivatives exhibiting interesting antileishmanial activity, including derivatives with a vast variety of substituents, or even bis- and tetra-acridine complexes.[4,5] The present work builds on theoretical studies focusing on a specific enzyme of the parasite, S-adenosylmethionine decarboxylase (AdoMet DC), several 1,2,3,4-tetrahydro-acridines emerged as potential inhibitors, evidencing this scaffold as a promising building block for novel antileishmanial pharmaceuticals. Thus, several 9-alkylamino-1,2,3,4-tetrahydroacridine derivatives (3 and 4) have been synthesized, their activity against *Leishmania infantum* promastigotes evaluated, and a structure-activity relationship (SAR) study was developed based on the results obtained. The results demonstrated that the dimerization of 1,2,3,4-tetrahydroacridines may be optimal for the antileishmanial activity of this type of compounds, since 1,2,3,4-tetrahydroacridine dimers (3) present quite higher activities compared with acetylated derivatives (4). Finally, carbon chain length between the two 1,2,3,4-tetrahydroacridine fragments also plays a crucial role in the antileishmanial activity of these compounds, with some derivatives showing IC50 values below 1.0 μM.*

Development of an improved microextraction method coupled to high-resolution techniques for assessing the atmospheric variability of water-soluble organic matter composition

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Abstract. Water-soluble organic carbon (WSOC) in air particles is a complex mixture of compounds with great effects on climate and human health [1]. Although a major fraction of aerosol WSOC still often remains unknown, an increasing amount of literature has been published in the last few years dedicated to unravelling the WSOC structure and its components. Nonetheless, the restricted amount of APM samples usually collected presents some serious challenges, which makes untangling the structure of WSOC an exceedingly complex task. The extraction of WSOC from atmospheric aerosols is usually a straightforward process, typically relying on water-based extraction of filters assisted by ultrasound or mechanical agitation. A full extraction of the WSOC is assured by using a large volume of water which are further concentrated by solid-phase extraction (SPE) or lyophilization. However, some molecular information is usually lost when using these conventional methods. This methodological issue is solved in this work with the development of a Teflon® based device to extract aerosol WSOC from quartz fibre filter samples, using low volumes of ultrapure water and further concentration using magnetite modified nanoparticles (Fe₃O₄?SiO₂).

Two uniform experimental designs were employed to establish the optimum extraction conditions using the Teflon device and the magnetite modified nanoparticles. For this, a well-known standard reference urban air particulate matter (NIST SRM1648a) was used as a proxy for atmospheric particles [2]. The experimental conditions, for the Teflon device uniform design, in terms of time of extraction and volume of ultrapure water were investigated to allow an 80% recovery of the WSOC present in a sample. The range of NIST SRM1648a mass varied from 0.2 to 3.6 mg, the range of time of extraction was from 2 to 36 minutes, and the water volume range was 2.0 to 17.3 mL. The regression analysis of the data (in terms of recovered dissolved organic carbon) showed that, for samples with less than 2.6 mg, a 10 minutes extraction using a volume of water of 8.0 mL was adequate to achieve an 80% extraction of WSOC. Nonetheless, for higher sample masses, the extraction conditions required to achieve this yield largely increased. The regression analysis of the uniform design employed for the optimization of the extraction conditions using the magnetite nanoparticles predicts that under optimum conditions (volume of acceptor solution of 5 mL and 100 mg of nanoparticles), approximately 20 µg of WSOC are extracted. This method will be further improved by fixating these nanoparticles into a capillary column for subsequent chromatographic separation.

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A novel non-thermal technological food preservation approach to assure microbial food safety and extend the shelf-life of raw meat

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Abstract. *Raw meat is a highly perishable food, as its high a_w (water activity), neutral pH and rich nutritional composition create an ideal environment for microbial growth and therefore sets high safety concerns and potentially relevant economical losses.*

A lot of preservation techniques exist but none of them guarantee the complete safety of the product. Refrigeration can't assure the microbial safety like pasteurization, but this technique also uses high temperatures that affect the quality of the product. High-pressure pasteurization is the only technique that assure microbial safety without use of temperature, but the high pressure causes extensive colour changes.

Hyperbaric storage, defined as food storage under medium pressures at room temperature was recently reported as effective to extend raw meat shelf-life by inhibiting/slowing down microbial growth and allowing colour preservation. This approach is considered a green and improved preservation technology for raw meat, because it attempts to prolong its physicochemical/sensorial characteristics at room temperature with superior microbial safety. This advantages, besides reducing food waste, increase the feasibility of room temperature transportation of raw meat, inconceivable presently.

The main objective of this PhD proposal is to study a new and more sustainable food preservation methodology ? Hyperbaric inactivation (HI) using pressures between 125-300 MPa to maximize microbial inactivation on raw meat, and so assuring food safety, while avoiding meat colour detrimental effects. Besides that, other quality/sensorial parameters, and the estimation of the achievable shelf-life will be evaluated.

The results showed that pressure causes a decrease in the microbiological load, at 200 MPa there is an inhibition of Salmonella after four hours of pressure, and Staphylococcus aureus after 24 hours. In pressures below 200 MPa, it was achievable a decrease in the microbiological load with small alterations of pH, and without alterations in colour of the meat. The technique showed some promising first results, but more studies are required.

The hydroxamates' synthesis and application in membranes

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Abstract. Azaindole and indole are quite similar in their properties and these scaffolds have already been applied as therapeutic agents or in materials such as organic light-emitting diode (OLED). We have been investigating azaindole derivatives with thermally activated delayed fluorescence (TADF) properties, to be applied in OLED. That way, these molecules should present a donor-acceptor system, a small singlet-triplet energy splitting, and a small overlap between the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO). Currently, we have been dedicated to the design of a new synthetic strategy toward azaindoles starting from boron-based compounds. A family of azaindoles and indoles has been designed via computational modeling to present TADF properties, synthesized using a green strategy developed in our group, and their photophysical properties were studied. Some derivatives exhibit an interesting TADF, and could find application in OLED.

Design, synthesis and luminescence properties of azaindole

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Abstract. Azaindole and indole are quite similar in their properties and these scaffolds have already been applied as therapeutic agents or in materials such as organic light-emitting diode (OLED). We have been investigating azaindole derivatives with thermally activated delayed fluorescence (TADF) properties, to be applied in OLED. That way, these molecules should present a donor-acceptor system, a small singlet-triplet energy splitting, and a small overlap between the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO). Currently, we have been dedicated to the design of a new synthetic strategy toward azaindoles starting from boron-based compounds. A family of azaindoles and indoles has been designed via computational modeling to present TADF properties, synthesized using a green strategy developed in our group, and their photophysical properties were studied. Some derivatives exhibit an interesting TADF, and could find application in OLED.

Energy systems and climate change

An Integrated Assessment of Road Traffic Noise and Pollutants Critical Hotspots Through Advanced Models

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Abstract. Nowadays, Road Transport System represents a serious problem in Europe. In fact, besides the risks associated with accidents, it is also accountable for a quarter of the total Greenhouse Gas (GHG) emissions and 40% of total nitrogen oxides emissions (NOx). Moreover, in most part of the European cities, residents are exposed to harmful noise levels due to road traffic operations; particularly, 113 million people are subjected to day-evening-night noise levels above 55 dBA, and night noise levels exceeding 50 dBA.

As it is possible to understand, all of this has repercussions not only on the environment depletion but also on the human well-being, therefore, an integrated assessment of both road traffic noise and exhaust emissions is strongly required.

This Ph.D. plan aims to fulfill this need by developing: i) a Noise Emission Model (NEM) denominated Vehicle Noise Specific Power (VNSP) able to foresee the sound power level (L_w) of different typology of vehicles, taking into consideration their motorization (gasoline, diesel, hybrid), and using speed, acceleration, gear, and road grade as input variables; ii) a micro-Road Traffic Noise Model (RTNM) that couples the VNSP with a sound propagation model in order to predict the equivalent noise levels produced by the traffic flow at a certain receiver point, considering the kinematic information of each vehicle on-road; iii) a numerical platform in which both noise and exhaust emissions critical hotspots can be visualized.

The development of the VNSP model has been started and ad-hoc data collections for its calibration have been conducted. At this stage, the model is able to consider the influence of motorization, speed, and gear engaged on the noise emissions. Compared to other NEMs, VNSP takes into account the noise emission variability among the different motorization of vehicles, and thus, can be more precise in the estimations. Moreover, the mathematical formulation of the micro-RTNM has been established, and it has been tested by using pre-existing NEMs in the literature (since VNSP is still under development). Preliminary results showed that the microscopic approach provides better estimations compared to RTNMs which use just aggregate kinematic information. Future steps will involve the completion of VNSP with the integration of acceleration as an input variable and the development of the numerical platform.

Integrated Impact Assessment of Shared, Automated and Electric Mobility

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Abstract. *In the last century, private cars have been valued for offering a sense of autonomy and comfort as well as social status. In the last years, the increasing efforts for a sustainable society education have shifted this mindset. The impact that privately owned, human-driven, fossil fuel-powered cars lead on climate change and space occupancy is undeniable. For this reason, Shared Automated and Electric Vehicles (SAEVs) are expected to be a crucial part of future transportation systems and play an increasing role in the upcoming years. Despite the great potential, SAEVs real impact is still unknown and will likely vary greatly across regions. It is therefore particularly important to understand and quantify the potential impacts of this mobility service. This Ph.D. research plan proposes an integrated research framework including a life cycle assessment approach and agent-based modeling to address energy and environmental challenges within SAEVs. Transformative mobility challenges such as system optimum traffic distribution, location and access to charging stations, and performance characteristics of shared mobility fleets will be considered. Attention will be given to the application of shared, automated, and electric mobility at regional scales. It is expected that the future patterns of inter-city trips will differ greatly from those of urban mobility due to differences in population socio-economic development and consequent transport options, private car ownership, and passenger behavior. Moreover, this application also attempts of making transport systems more inclusive. The results of this research plan intend to foster a better understanding of energy and the environmental-related impact of emergent mobility systems and provide valuable outputs to assist decision-makers with forward-thinking strategies and policies.*

Essays on the wind farms decommissioning

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Abstract. *The increase of the Society's perception of environmental problems, namely the effects of climate change on the environment and on human beings, has led to recurrent discussions and search for solutions to minimize or mitigate such effects. In this context, the key challenge is reduce greenhouse gas (GHG) emissions derived from human economic activities, which leads to the search for climate neutrality. To this end, one of the strategies to achieve this goal is through the energy transition through the decarbonization of energy matrices. Thus, increasing the share of renewable sources in national matrices and reducing dependence on fossil sources becomes vital for this transition process.*

Therefore, there is a large space in decarbonization that can be filled by wind energy, continuing its constant registered in recent years. However, while the number of new wind farms grows year after year, so does the number of parks that reach the end of their life cycle.

And once the first wind turbines began to reach their end of commercial operation, uncertainties and challenges for project promoters, investors, government agencies and society increased. In this scenario, challenges identified as critical for the energy sector are: the reduced technical solutions on a commercial scale for the treatment and disposal of waste (namely wind blades); the lack of standardization of technical procedures for dismantling and disposal of structures and of applicable legislation (in the context of environmental licensing, impact assessment and waste management) that lead to the discretion of regulatory bodies; and the absence of a policy of fiscal and governmental incentives for the development of a secondary market for the treatment of obsolete wind farm equipment.

This work aims to evaluate and discuss the main challenges identified at the end of the operation of wind farms with a focus on environmental aspects and public policies associated with environmental licensing procedures. Being a pioneer in addressing these challenges from the perspective of environmental licensing, sustainability and the circular economy, in order to encourage the development of public policy, in addition to proposing impact matrices based on the EIA concept.

Hybrid Fuel Cell aimed at the use of CO₂

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Abstract. *We intend to develop and improve the properties of a solid-state electrolyte and build a prototype Molten Carbonate Fuel Cell (MCFC) that operates below 700°C, being that currently there are not many solid-state electrolytes that can be used in MCFCs below 700°C. Our first attempt was based on the disordered hexagonal perovskite-like Ba₇Nb₄MoO₂₀, that was reported to be able to support pure ionic conduction with high proton and oxide ion conductivity at 510°C?, but upon testing we observed that this material reacts with the eutectic mixture of Molten Carbonates. Our next step will be to study a porous Gadolinium Doped Ceria (CGO) electrolyte.*

Evaluation of Impacts on Intercity Corridors for Efficient and Sustainable Mobility ? Innovative Ways to Address Corridors Pricing

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Abstract. *Intercity corridors movements receive less attention from the scientific and political community when compared to urban transport. Road transport has high socioeconomic negative impacts such as emissions, road accidents, noise, and congestion. The infrastructure is not taxed in an integrated and effective way. Road tolls, taxes and public transport tickets, are never examined from an intermodal perspective and there are a lack of integration between the various traffic-related externalities.*

The main objective of the thesis is to develop methodologies and tools for smart and dynamic pricing schemes to improve the traffic assignment, passenger flows distribution and mitigate negatives externalities.

The preliminary results which includes, external costs (emissions, noise, road crashes and congestion) and private costs (fuel, taxes, tickets, travel time costs) will allow an optimization of the traffic flows through the development of dynamic pricing schemes to improve traffic assignment, passenger flows distribution and mitigate negative externalities.

TREATMENT AND CONDITIONING OF BIOMASS GASIFICATION GAS IN COUNTERCURRENT FIXED BED GASIFIER WITH INTERNAL COMBUSTION ENGINE AND FLUIDIZED BED GASIFIER FOR INDUSTRIAL APPLICATIONS

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Abstract. *The objective of this work is to compare the gas produced in biomass gasification in an integrated fixed bed with an internal combustion engine and an integrated fluidized bed with a gas turbine. The experimental evaluation will be carried out through the development of tests on the prototypes of the University of Aveiro and the gas treatment system will be developed. In order to identify the best treatment and conditioning strategy for the gas produced.*

GreenBE: Green Roofs for sustainable cities: energy and environmental assessment

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Abstract. *The European Green Deal establishes how to make Europe the first climate-neutral continent by 2050, in particular, by building and renovating in an energy and resource efficient way. In this framework, the European Union aims to improve the buildings energy performance, since they account for 40% of energy consumption and 36% of energy-related direct and indirect greenhouse gas emissions.*

Nature-Based Solutions (NBS), e.g. green parks, green roofs (GR) and walls, blue areas, supports the ambitious goals of European Green Deal, since NBS bring more diverse and natural features into cities, through locally adapted, resource-efficient and systemic interventions.

GR are defined as vegetated surfaces over roofs, which can be installed in new or existing buildings. They can be classified, according to structural complexity and environmental impacts, in three types: extensive, intensive and semi-intensive. When compared to conventional roofs (which are flat or low slope roofs), GR have multiple benefits for the urban environment, including the improvement of building thermal performance related to energy savings at the building scale, which is the micro scale, and the increase of climate-resilience and climate-neutrality at the city scale, being the macro scale.

However, GR are not being studied in an integrated approach, which means that the energy savings identified by the researchers are not being considered in the environmental indicators. And there is still no consensus on the benefits that green roofs bring to the adaptation and the mitigation of cities in terms of climate change effects. It implies that the urban area scale analysis is required to accomplish the Sustainable Development Goals (SDG) 11, to the challenge of greener sustainable and resilient cities and 13 to contribute to pursuit climate-resilient and climate-neutral cities.

The objective of this work is to measure the potential environmental impacts of green roofs, throughout their life cycle, from the extraction of raw materials, transport, construction, lifespan and disposal using the Life Cycle Assessment (LCA) methodology. Moreover, the dynamic simulation of the energy balance of the green roof is also a goal of this project and aims to quantify the energy performance of a building in which a green roof system is built. The combination of these two methodologies will help to understand the trade-offs of implementing green roofs at the micro (building level) scale and macro (city level) scale. This work addresses the following questions:

- i. What is the green roof with the best environmental performance (i.e. the most effective) compared to a conventional roof through the adoption of a life cycle perspective using Life Cycle Assessment (LCA)?*
- ii. What is the building? energy savings and environmental benefits of the most effective green roof compared to a conventional roof, using LCA and energy modelling?*
- iii. What will be the city benefits if green roofs are been widely adopted?*

Keywords:

Green roof; Life Cycle Assessment; Energy modelling; Sustainable cities

Valorichar: Valorization of biochar for industrial scale production

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Abstract. *The increase in world energy production has intensified major environmental problems, particularly in relation to climate change. The main reason is that almost 85% of the primary energy comes from fossil sources. To mitigate this problem, one of the alternatives, that many countries are investing, is the use of renewable energies. Even with the increase in the production and consumption of the renewable energies, the atmospheric CO₂ level keeps rising evidencing that the increase of renewable energies in the energy mix is not enough to tackle the problem.*

One of the possibilities to mitigate climate change is to increase the atmospheric carbon dioxide (CO₂) sequestration, and biochar may be an important tool to achieve this objective. Biochar is a carbonaceous structure produced from the thermochemical pyrolysis processing of biomass. Biochar has attractive properties which include: carbon fixation in soil, promotion of water retention, improvement of soil quality. However, nowadays, it is only obtained as a co-product of the pyrolysis process, that has the main objective the production of energy (fuel, heat or electricity).

Currently, there isn't a consensus about the environmental impacts of the production and usage of biochar. Neither if the conversion of biomass into biochar would be a better use of the residue, from an environmental point of view, than the conversion of biomass into energy.

There is also a particular problem that Portugal is facing. Due to the increase of the production of the olive sector, the producers don't have an answer to how they could manage the residues from the production of olive oil. Conversion into biochar could be a potential alternative of valorization of these residues.

For this reason, this project aims to determine the potential environmental impacts associated with the production and use of biochar on an industrial scale, and to evaluate its techno-economic feasibility.

Decarbonising Portugal: Impact of climate change on renewable energy resources

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Abstract. *Increasing renewable energy production is one of the most effective answers to decarbonisation. In the context of 2050 energy targets and a step towards net-zero greenhouse gas emissions, the EU aims to achieve a renewable energy share between 80% and 95%. However, renewable energy projections are hampered in part by our lack of knowledge regarding the impacts of climate change on renewable resource availability. This thesis aims to fill the knowledge gap regarding the technical impacts and costs of climate change on renewable energy resource variability. The main objective of this work is to quantify these impacts using high-resolution weather prediction modelling at a national scale in Portugal. A multi-criteria decision analysis will be applied to choose the optimal balance between energy supply decarbonisation and costs. This work will support the decision-making process and achieve national and EU energy goals.*

Platooning optimization with mixed vehicle arrangements based on performance and environmental indicators

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Abstract. *In the future, connected systems need to work together to achieve sustainable mobility. The proposed work aims to optimise platooning formations that encompass light and heavy-duty vehicles that travel the highways. This optimisation will be based on road externalities, including environmental indicators and different platooning characteristics. These platooning characteristics will involve vehicle order in the platoon and the overall speed of the vehicles. Numerical and physical modelling will be used to support the development of an autonomous control system for platoons. This system, defined as "Platune", will communicate with highways' information signs. The system will be supported by a machine learning technique that will estimate vehicle consumption, traffic emissions, and local air quality in near real-time. In this regard, the "Platune" system will automatically advise the formation of platoons with specific data (order, speed and number of vehicles) to minimise road traffic externalities and to improve people's quality of life.*

Assessing environmental trade-offs of pyrolysis processes for valorization of residual forest biomass into biochar

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Abstract. *Nowadays, one of the main concerns in forestry management is wildfires occurrence. Climate changes together with long dry weather conditions and high fuel loads (invasive plant species) have led to an increased recurrence of wildfires, resulting in the well-known socioeconomic and environmental damages. In turn, the rising global demand for food and energy creates the need to develop strategies that improve soil quality and productivity while reducing environmental impacts.*

Management of residual forest biomass (RFB) from forestry cleaning through thermochemical valorization of local and invasive species may become an effective strategy to prevent wildfires. However, the current state-of-the-art in valorization of RFB is associated to combustion, which results in GHG emissions, wasting of carbon resources, and off-site impacts in air, soil, and groundwater. In addition, RFB is not suitable for energy production through combustion or gasification, due to its inorganic contents and resulting ash that pose operating problems. As such, pyrolysis (low-temperature, anoxic carbonization) emerges as an alternative to add value to the RFB.

Biochar is the solid product resulting from pyrolysis, which retains most of the inorganics of the feedstock. This carbon-rich product has been studied as a soil amendment and a carbon sink over the last 20 years. As a soil amendment, biochar enhances soil physicochemical properties, such as bulk density, porosity, cation exchange capacity, hydraulic conductivity, nutrient retention, and pH correction. It also increases the long-term water holding capacity due to the feedstock cellular structures with high specific surface area, which is of most relevance in dry climate scenarios.

Although most literature focuses on the improvement of soil fertility upon biochar application, there are still uncertainties about the risks associated with the use of biochar in agriculture, such as negative impacts on soil biota and leaching of pollutants. Furthermore, the energetic burden of the pyrolysis processes needs to be evaluated prior to upscaling approaches, to provide sustainable routes for RFB valorization into truly environmentally friendly biochar.

In this way, the main objective of this study is to promote valorization of RFB in pyrolysis processes to produce biochar with economic and environmental added-value. By demonstrating the most favorable operating conditions that yield high-value and environmentally sustainable biochar, it is intended to make the trading of RFB feasible and profitable to withdrawal it from locations prone to forest wildfires, besides generating positive social, economic, and environmental effects for forestry stakeholders and communities. The ultimate goal of this research work is to transfer the key scientific findings into scaled solutions that will be useful to rural communities.

Factors underlying clean vehicles adoption: an assessment of climate change perception influence

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Abstract. *It would be reasonable to think that environmental concerns, in particular, those related to greenhouse gas (GHG) emissions and climate change, would be per se a critical factor in determining the adoption of more sustainable technologies. The studies carried out so far do not suggest this correlation. The reason for this fact could lie in citizens' real perception of climate issues and the need to adopt mitigating behaviour. This perception is eventually being influenced by inadequate and even misleading*

information. Public and private players are showing a dissonance between speeches and actions, and this may lead citizens to believe that there are less transparent interests, unrelated to environmental concerns and climate change. This global discredence is possibly discouraging any citizens' willing to achieve efforts.

Given this context, understanding which role citizens will play in the transition to a new energy paradigm and a low carbon economy requires further study of individuals' perception and behaviours concerning climate change. It also requires a broader understanding of the intangible and tangible drivers of "green" technologies as well as the relative relevance and influence of each of these drivers when choosing between several green technology options aiming at reducing the environmental footprint.

Intangible factors include raising awareness of the environmental footprint (about production and usage), sensitiveness to climate change rhetoric, accessibility to credible and elucidative information, risk and safety perception, snuggness, fashion and imitation aspects, status, etc. As for tangible factors, we can mention technology costs, technical performance, fuel costs, distribution facilities, financial incentives or advantages, tax benefits, environmental regulatory framework and policies, among others.

These considerations, based on studies carried out by several authors, will provide the starting point for an academic research to determine the adoption factors of new "clean" solutions, namely alternative fuel vehicles (AFVs), as well as corresponding implications for the acceleration of the energy paradigm shift. The project aims at developing a predictive model for AFVs adoption combining tangible and intangible factors and assessing the influence of each component, namely the climate change perception. This model will also help to understand the AFVs purchase decision making process. The study will focus on individual passenger mobility across three typologies of urban areas in Portugal: a large coastline city, a medium-sized city located the centre of the territory, a medium-sized inland cities.

Telecommunications MAP-tele

Photonic beamforming as scalability enabler in communication satellites

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Abstract. *While communication satellites provide the only one true ubiquitous system for internet access, they have struggled to offer competitive services compared with land-based access, especially in the banding/cost ratio. A key element in making satellite services more competitive is the use of spatial multiplexing, so that the available bandwidth can be multiplied in space, rather than divided. High density spatial multiplexing in the context of communication satellites is challenging, as the size, weight, and power consumption (SWaP) constraints are very tight. Photonics-based signal processing has been identified as a potential solution to tackle the SWaP constraints in introducing large-scale beamforming in very-high throughput communication satellites (VHTS). In this context, we present the Microwave Photonic Signal Processor (MPSP), a photonic beamformer designed specifically for this kind of application. Experimental results show that the MPSP can separate multiple, spatially multiplexed, beams on a receiving experimental setup.*

Visible Light Communication Systems Architectures for the Internet of Things

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Abstract. *During the last decade, everyday objects have been including Internet connectivity, improving life comfort and system's performance. Current IoT systems have been adopting RF technologies, which may present performance issues concerning lack of spectrum, network collisions, high power consumption and security issues. Visible Light Communications (VLC) uses visible light to communicate and offers some advantages over RF, such as unregulated spectrum, wide available bandwidth, spatial confinement, electromagnetic interference free, among others. In the context of IoT systems, VLC has the potential to improve power consumption, spectrum reuse and security when used in small network cells such as individual rooms within a building. This work aims at the development of a VLC based IoT system exploiting m-CAP modulation, implementing a multi-band modulation, and IoT devices in analog domain, which results in low-cost, low-power consumption and low-complexity devices. An experimental testbed was developed for the proposed system to evaluate its performance in terms of eye patterns, constellations, error vector magnitude, and bit error rate (BER) for two line-of-sight scenarios. The results show that the system is tolerant up to 2.5 m, achieving a BER lower than the forward error correction (FEC) limit. Moreover, it allows the device to be tilted up to 45° and still achieve a BER below the FEC limit, for distances below 1.7 m.*

Signal processing for sampled LiDAR pulses

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Abstract. *New signal processing methods for application to sampled pulses of light detection and ranging (LiDAR) systems were developed. Such methods show great estimation performance under different signal conditions and are compatible with signals captured using lower-end analog-to-digital converters (ADCs). Thus allowing simpler and cheaper LiDAR implementations, while maintaining the required performance levels.*

Smart Beamforming Metasurfaces for Future Telecommunications

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Abstract. *The future development in wireless communications meets with new challenges and use cases posed by the requirements of the 5G and the future 6G mobile networks and systems. So far, when dealing with the propagation scenarios in mobile networks, the medium between the transmitter and the receiver has been perceived as an unpredictably behaving entity that degrades the quality of the received signal.*

In the recent years, metasurfaces (versions of metamaterials) attracted a great deal of attention due to unprecedented abilities in manipulating the wavefronts of transmitted and reflected electromagnetic waves.

In this work, a reconfigurable reflectarray metasurface for beamforming applications is investigated. The proposed metasurface comprises a chess-board-like array of metallic patches placed over a dielectric slab with metallic vias connecting the patches to the controlling lines. The tunability is achieved with nonlinear capacitive (varactor) loads placed at the corners of the metallic patches. With the suitable applied control voltage on metasurface elements, reshaping the radiation pattern has been observed in wide frequency ranges.

The initial testing and evaluation of this interesting architectural concept performed well at microwave frequencies using components and microwave laboratory techniques that are readily available in the IT and UA facilities. It is shown that the first prototype of MS-based reflectarray with 3-by-10 elements is sufficient to redirect the beam in different directions. The experimental results are verified analytically and with a number of numerical simulations.

Extending MQTT with Real-Time Communication Services Based on SDN

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Abstract. *MQTT is one of the most popular application-layer protocols used in the scope of the Internet-of-Things (IoT) and Industrial-Internet-of-Things (IIoT), given its suitability for resource-constrained embedded systems. However, MQTT Quality-of-Service policies do not support timeliness requirements, which is common in IIoT. The literature reports several research works that address this limitation, but they are limited in scope (e.g., improvements in the broker's internal operation, control of the publisher's data rate, and path optimizations). Conversely, this paper presents a comprehensive architectural approach, proposing a set of extensions to the MQTT protocol that allow applications to explicitly specify real-time requirements and instantiate corresponding network reservations to enforce the desired temporal behavior. Such reservations are enforced via Software Defined Networking, specifically the OpenFlow protocol, but other protocols that allow bandwidth reservations, e.g., TSN, can also be used. This paper presents the proposed system architecture together with extensive emulation and implementation results that validate the feasibility of the approach, showing that time-sensitive MQTT traffic can be effectively segregated and prioritized to meet application-defined real-time requirements. {Using several combinations of network topologies and load levels and comparing to the absence of the proposed real-time mechanisms, both average and worst-case latencies of the time-sensitive traffic decreased to approximately half, while for the normal traffic, they increased by approximately 10%.*

Artificial Intelligence for Radio Resource Management in Physical-Layer Network Coding-Aided 6G Mobile Networks

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Abstract. *Aiming at constructing datasets for RRM, a conventional framework and algorithms for RRM in 6G scenarios needs to be implemented at the beginning. Using relay-aided and PNC-based communications, different machine learning frameworks and algorithms will be examined for RRM in 6G scenarios using optimization of different KPIs (SE, EE, SE & EE trade-off). Final step will be the implementing, training and testing developed algorithms for RRM Integrating and evaluating the developed RRM algorithms using a system-level simulator.*

Territory, risk and public policies

RELEASE - An integRated opERationalL systEm to identify the risks of Air pollution and hazardouS gases accidEntal releases

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Abstract. *In the last years Europe witnessed a marked increase in the number and severity of industrial disasters. Single chemical accident releases involving hazardous gases in chemical installations, continue to happen frequently enough, demonstrating the need for better and more efficient risk management.*

It is therefore important to adopt a proactive approach and to put effective, proportional safeguards in place, including prevention, preparedness and response measures. The health protection of the population and its quality of life are some of the major challenges to be addressed by the scientific and technical community, along with the social, environmental and territorial sustainability goals. Furthermore, the growing awareness of society and environmental deterioration conditions associated with high air pollution levels led the scientific community to rethink its atmospheric monitoring policies. To meet this challenge, it is necessary for a microsensors network, to enhance urban/industrial air quality monitoring that exploits advanced machine-learning and air quality dispersion modelling for improved performance as well as improved awareness of civil protection first responders.

These requirements can be obtained with small microsensors, by using alternative techniques, rather than conventional ones, and using machine learning algorithms to make them more reliable. Air quality microsensors are a recent technology with a huge potential for use applicability as has been shown by several studies worldwide.

The microsensors have the capacity to integrate the detection technologies to provides functionalities based on dispersion modelling, applying the data fusion algorithms that combine outputs of various microsensors to classify a threat, identify the substance, estimate its concentration, and can pre-procced choose scenarios of the threat source estimation and hazard prediction.

The use of an air quality model that will be validated according to the characteristics of the hazardous materials to create scenarios. The forecast scenarios will be represented graphically, in the form of colour patches that allow the civil protection agents to be informed in real-time of the evolution of the gas cloud and the foreseeable effects on people, goods and the environment.

In this context, the RELEASE aims to develop a scalable integrated operational system tool to support civil protection agents to answer an industrial hazardous gas accidental release.

The developed integrated system will be a support tool for decision-making in emergencies in case of an accidental release of hazardous gases in Estarreja, an industrialized urban area, with an important chemical complex, where there is a real Technological Risk.

The prerequisite for producing reliable input to emergency response is to provide the decision-maker with the relevant exposure-related parameters (concentration, dose, contamination area) not only in terms of their mean values but also in terms of the associated uncertainties of those values.

It will be possible to give quick and targeted responses to the management of air quality, avoiding the exposure of the population to harmful levels of pollution and, at the same time, allow the development of innovative tools to support operational decision-making. The creation of a given accident scenario that can provide decision-making support risk analysis and emergency planning will be the biggest goal to achieve.

Mapping forest stakeholders: a tool for improving the integrated management of rural fires in Portugal

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Abstract. *Finding strategies and measures to prevent and mitigate rural fires is at the top of the socio-political agendas in Portugal. This is due to the recurrence and intensity of rural wildfires, but also failures in the system for management of rural fires, based upon multiple organizations, structures, and stakeholders, probably enhancing tensions and conflicts and narrowing a successful operationalization of fire management policies.*

The main aim of this research is to assess and map the complex stakeholder network involved in the integrated management of rural fires (GIFR), understanding stakeholders' practices and their role in policy design and implementation. The focus will be to understand the networking and patterns of interactions of diverse actors and institutions and to unpack drivers, strengths, and weaknesses. A three-step methodology will be used for stakeholder analysis expecting to contribute to a better understanding of the stakeholders involved, and ultimately to an improvement of GIFR.

Translation and terminology

Manuais de Utilizador de Eletrodomésticos Português/Chinês Linguagem Controlada e a Construção de um Modelo Integral

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Abstract. *Os eletrodomésticos são um dos mais importantes produtos de importação e exportação em Portugal e na China. Os manuais de utilizador dos eletrodomésticos (MUEs) têm as características de precisão e concisão, género específico, e são representantes típicos dos textos de comunicação técnico, que vale a pena estudar. A tese toma os MUEs PT/CN como objeto de investigação, constituindo os corpora comparáveis. O enquadramento teórico é baseado na teoria linguística sistêmico-funcional, tendo como objetivo básico a linguagem controlada e a construção de modelos, utilizando as metodologias de investigação qualitativa e quantitativa, aplicada à investigação por meio de corpora, a metodologia de análise linguística comparativa e métodos de análise do discurso (principalmente na perspetiva da análise de género, da análise de registo e da análise do discurso multimodal). Visa-se fazer análises discursivas comparativas dos MUEs em PT e CN destas perspetivas macroestruturais e microestruturais. O trabalho pode contribuir para o desenvolvimento de um modelo completo de manuais de eletrodomésticos PT/CN, para o controlo da língua portuguesa/chinesa neste género textual, assim dando apoio à comunicação técnica.*

Probing the Social Effects of Translations and Interpretations on the Target Society

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Abstract. *There has been considerable research, after the many turns in Translation Studies recommending them, geared to addressing the effects of translation(s) and interpretations on various extra-linguistic and macro issues, including social, cultural, technological or political ones; however, there has not been much work attending to the effects of translations and interpretations on target societies. Motivated by the need for such insights, this research aimed to analyze a sample of translations with their accompanying intentional or unintentional effects that they exerted on the target society. Censorships and modifications in the translated texts or the mistakes cropping up during the process were, for instance, seen to result in some of these effects. This research was in the mould of a qualitative and descriptive one with the data collection procedure accomplished through text and content analysis. An interpretive method was used for the data analysis procedure. The results showed that the translations and interpretations could have many different social, political, economic, cultural or even financial effects on the target society. This brings to light the fact that translation as a social act can have many different positive or negative effects, both on intentional and unintentional levels.*

Translation as variation: the VARTRA-PT parallel/comparable EN-DE-PT corpus

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Abstract. *This project aims at developing a parallel and comparable English-German-Portuguese translation corpus to investigate phenomena of translation variation in terms of contrasts between languages (EN, DE and PT), text types/registers, and translation types (machine - MT - vs. computer-aided - unexperienced vs. professional) and PT originals. Such phenomena are reflected in the linguistic features of translated texts belonging to different registers and produced with different types of translation. For its analysis, we combine methods derived from translation studies, variation analysis and different machine translation systems, focusing especially on textual and lexicogrammatical variations. To our knowledge, there are currently almost no PT corpora with the necessary characteristics to constitute comparable resources for a comprehensive analysis of variation between text types and translation types. Thus, the corpus resources created, as well as the results of the analysis, will have applicability in different research areas, such as translation studies, crosslinguistic studies and natural language processing.*

Turism

A criatividade para a sustentabilidade do turismo urbano: Estudos de caso de várias cidades portuguesas

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Abstract. *A criatividade dos espaços urbanos pode promover a sustentabilidade de várias formas destes mesmos territórios. O presente estudo busca entender o papel e a interligação destes dois paradigmas em espaços urbanos escolhidos de antemão (Porto, Lisboa,*

Análise de experiências turísticas com cacau e chocolate, no sul da Bahia

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Abstract. *O estudo visa identificar que dimensões da experiência turística associada ao cacau e ao chocolate mais contribuem para a satisfação dos visitantes. Além de analisar o impacto de alguns fatores como moderadores da influência das dimensões dessa experiência na satisfação. Será adotada a metodologia quantitativa para identificar que experiências turísticas com o cacau e o chocolate geram mais satisfação para os visitantes.*

Psychophysiological Signatures of Sensory Experiences in Food Tourism

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Abstract. *Some agree that in the progression of economic value, experience has become more than just a value-added feature of products and services. It has evolved into a distinct economic offering. This understanding is especially true in tourism, an experiential activity by nature. In this context, traditional local foods have become a vital asset to attract and engage tourists, demanding from destination managers and tourism service providers a better understanding of the consumer behaviour of tourists concerning the local food experience. However, experience is a subjective and multifaceted phenomenon influenced by context, culture, and personal traits. It also has a cognitive (rational) and an affective (emotional) dimension, requiring, in its measurement, methods that consider this multidimensionality. An initial literature review has shown that most methods applied to assess tourist experiences do not incorporate this emotional dimension. Based on this, the current research proposes a methodological strategy that incorporates the affective dimension of experiences by examining emotions and cognitions that define tourists' attitudes regarding traditional local foods. The study investigates the relationship between conscious, cognitive, and affective dimensions of tourists' experiences. For this, reported experience and arousal, a significant part of the affective dimension, will be measured by applying self-reported methods and analysing participants' peripheral psychophysiological measures. In other words, the study aims to investigate experiences by incorporating psychophysiological data collected in real-time using biometric sensors. Based on an explanatory design, it looks at the link between biometric measures and the nature of food tourism experiences reported by tourists. As a contribution, this study expects to provide insights into the role of momentary experiences in food tourism. Additionally, the use of a new methodological design in tourism research is suggested, seeking to help destination management organisations and tourism providers design and promote more appealing and memorable experiences integrating traditional local foods.*

As tendências do mercado de Turismo de Eventos

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Abstract. *Os eventos movimentam uma extensa cadeia, que afeta diretamente e podem ter um efeito positivo na imagem do destino, para além de fomentarem o desenvolvimento do turismo e diminuírem a sazonalidade, através do prolongamento da estadia do turista. Com o crescimento exponencial e buscando apontar que o turismo desempenha um papel de extrema importância económica, social e política, o mercado de eventos busca cada vez mais, inovação e as tecnologias de informação tem aparecido como uma ferramenta imprescindível para o desenvolvimento dos destinos. Este estudo tem como objetivo desenvolver um olhar sobre como a indústria de eventos tem se desenvolvido através das tecnologias e como são capazes de atrair turistas para um destino. O trabalho busca analisar as tendências do mercado de turismo de eventos e responder quais os elementos que o destino tem para atrair eventos (2 destinos ou mais), quais elementos impactam ? situação económica, inovações, iniciativas, etc.*

Interpretação e valorização dos produtos endógenos da região da serra da Estrela - Sustentabilidade na forma de comunicar a oferta Turística com o Queijo Serra da Estrela.

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Abstract. *Interpretação e valorização dos produtos endógenos da região da serra da Estrela - Sustentabilidade na forma de comunicar a oferta Turística com o Queijo Serra da Estrela.*

Palavras-chave: Produtos endógenos; Turismo gastronómico; Oferta turística em rede; Sustentabilidade territorial.

Os produtos endógenos acompanham uma história vivencial muito importante em várias gerações de pessoas por terras rurais e que ao mesmo tempo transmitem uma identidade muito própria. Movimentos de emoções e procura de uma regeneração de experiências faz com que oportunidades sejam vivenciadas em sabores e tradições que jamais serão esquecidas.

Quem procura um determinado produto procura uma experiência de sabores e ser surpreendido com uma transmissão de conhecimentos que lhe possa ser comunicado e por isso o Turismo gastronómico será caracterizado por alguns produtos desta região, este consumidor vai por norma ao encontro de uma expectativa /oferta que lhe foi comunicada e que por norma não deve ser espoliada, mas sim acrescentada de valor.

Movimentos de emoções e procura de uma regeneração de experiências faz com que oportunidades sejam vivenciadas em sabores e tradições que jamais serão esquecidas. Mediante proposta de trabalho iremos focar as nossas respostas em temáticas que segundo a sua fundamentação possam proporcionar uma linha de conhecimento base para que se possam ter respostas em uma forma assertiva de comunicar uma oferta bem delineada entre todos os intervenientes para que a marca ?Queijo Serra da Estrela?.

O turismo como um setor preponderante para o desenvolvimento territorial e por isso é fundamental um trabalho em rede de valorização e de um trabalho comum para que o visitante tenha os seus padrões de satisfação bastante positivos. O queijo em si é um produto que pode ser muito mais do que um simples queijo, há outros produtos associados a este que acompanham uma evolução temática e de importante vertente exploratória.

Gastronomy as a differentiating factor of the tourist destination: Model for evaluating destinations in terms of gastronomic potential

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Abstract. *This paper attempts to determine to what extent gastronomic tourism can be considered a differentiating factor to a tourist destination and how to evaluate their gastronomic potential in order to help the competitiveness of destinations.*

Over the past decades, there has been an increase in interest in gastronomy and food tourism, which has led to several attempts to define gastronomic tourism destination, without success. Despite this, research into gastronomic tourism has brought development and innovation to the sector contributing to the social and economic integration of gastronomy.

The relationship between gastronomy and tourist destinations has been seen as a tool to enhance the characteristics of a destination. Food and wine, therefore gastronomy represents an integral part of a destination's pull-factor once it reveals part of a destination's history and identity. Research in gastronomy has brought multiple research papers in areas such as agriculture, tourism, environment, land, culture, heritage, development, innovation, marketing, economy, etc.

Research has shown that gastronomic tourism as any other type of tourism is ever more based on the interaction between the tourist and the destination, generating unique experiences. Research has yet to investigate empirically gastronomic-related travel behavior.

The intent of applying a mixed methodology, where quantitative and qualitative analysis will be performed to investigate the supply side, with the objective of producing an accurate understanding of the research problem.

There have been various tourism models related to tourism development and innovation, however, there hasn't been any attempt to create a model to verify the competitiveness of a food tourism destination. The creation of a model that verifies the competitiveness of a food tourism destination will aid in the definition of new market segments as well as in the attempt to capture new tourists and investments.

Keywords: Gastronomy; Gastronomic tourism destinations; Differentiating factor; Competitiveness development model.

Adventure Travel Transformational Experiences

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Abstract. *Adventure travel is a type of tourism characterized by involving physical engagement in places that are either wild or less accessible. On the one hand, the extent of the participation of the tourist varies from passive to active. On the other hand, the emotional mode and extent of involvement in the experience are deeper. It seems clear that adventure travel certainly amplifies the participation and involvement levels. The travellers that choose it are generally experience seekers that pretend to collect unique experiences that impact them, helping build their own identity narratives. And indeed, the economic progression of our society involves the transition from an economic activity that delivers services and products to one that delivers engaging experiences, a distinct economic offering. Nevertheless, experiences are a complex phenomenon encompassing subjective and personal factors, from context to culture, or personal traits. The subjectivity of experiences makes it imperative that companies are able to design experiences that allow for maximum engagement, following specific criteria to maximize the personal meaning to the traveller. There is a gap in scientific knowledge in the relationship between experience design and adventure travel on island destinations. The objective of this work is to identify the critical factors in the design of experiences, to allow personal transformation, in adventure travel on island destinations. The current research proposes a methodological strategy that includes interviews with leading personalities in the industry, as well as questionnaires to both buyers and suppliers of the value chain. As a contribution, this study expects to provide insights into the importance of designing experiences in a way that maximises their impact on travellers, aiming at personal transformation. Additionally, the creation of a design framework for such experiences will be attempted, seeking to help adventure travel companies to design and promote experiences that are more profitable for them, and, at the same, more unique for the travellers.*

Keywords: adventure travel; experience; transformational tourism;

Tourism and coastal & maritime cultural heritage: new approaches and opportunities in the Ria de Aveiro region

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Abstract. *This research proposal draws attention to a relatively neglected field within tourism research, the duality between the risks coastal and maritime cultural heritage (CMCH) face in the new tourism context and its relevance for destination image. The proposal addresses the 11th and 17th Sustainable Development Goals (SDGs) and aims to develop a sustainable destination image model by assessing the risks and opportunities that CMCH is facing in the new tourism context and by examining CMCH in-situ experience influence on destination image (DI) and loyalty. The study adopted a pragmatic methodological approach, using qualitative and quantitative methods and the data collection was in 2019. In the first stage 41 semi-structured interviews with key stakeholders were carried out in three coastal case regions Marsaxlokk (Malta), Ria de Aveiro (Portugal) and Small Isles (Scotland, UK). In the second stage a questionnaire survey was applied to visitors in Aveiro (Portugal) city centre, which includes 720 useable questionnaires (i.e., 377 from domestic and 343 from international visitors). The interviews were analysed using a thematic analysis approach and the questionnaires using market segmentation, confirmatory factorial analysis, and structural equation modelling. The qualitative component of the study is already published in a WOS paper (May 2022) and the results from the quantitative component presented in this communication are part of a paper to be submitted this year.*

The affective dimension of the perceived image of island destinations

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Abstract. *This research addresses the affective dimension of the perceived image of island destinations. The importance of this research topic is widely recognised in the literature as destination image significantly affects the perceptions of tourists in their decision-making process. Destination image is defined as a set of impressions that individuals form based on the attributes of a particular destination. The overall image encompasses two interrelated components: the cognitive and the affective dimensions. The former concerns tourists' knowledge and beliefs regarding the attributes of a particular destination, whereas the latter encompasses tourists' emotions and feelings towards the destination. The literature on the measurement of destination image reports that researchers have relied on methodologies that do not allow them to capture the more holistic and unique components of a destination's image. Furthermore, most of the studies conducted in this field analyse cognitive perceptions, focusing on tangible aspects, to the detriment of intangible attributes and affective perceptions. Therefore, this proposal aims to fill this gap, by analysing the affective dimension of the perceived image of island destinations, from the demand perspective.*

Keywords: affective dimension, destination image, island destinations, perceived image.

O papel da Arquitetura Vernacular na Reengenharia das zonas costeiras

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Abstract. *A pretensão da presente proposta de investigação, visa indagar qual o papel que a Arquitetura Vernacular pode assumir, considerando o território, a sustentabilidade, o património natural e cultural, e o turismo, na Reengenharia das Zonas Costeiras.*

O território é um instrumento de identidade, de um património paisagístico singular de acordo com a sua posição estratégica no espaço, onde se encontra construído.

Cada lugar e região têm um carácter único, sendo o reflexo da disponibilidade de recursos materiais e imateriais e da própria integração em sistemas e redes, aos níveis global e local. A estratégia conservadora do património paisagístico e edificado na Ria de Aveiro, desenvolve-se ao longo de séculos de resiliência dos povos que decidiram aqui prevalecer e, deixar o seu rasto nas tradições e no património edificado.

Tendo como ponto de partida os objetivos de desenvolvimento sustentável para 2030, é pretendido promover políticas orientadas para o desenvolvimento sustentável da região, bem como o turismo com a promoção do património, da cultural e dos seus produtos locais. Também é projetando, com uma reengenharia estruturada, propor o melhoramento das infraestruturas locais, fomentando a qualidade, de forma a torná-las sustentáveis e resilientes para o futuro próximo. Assim é pensado para apoiar um desenvolvimento económico e bem-estar humano no acesso equitativo para todos. Para isso é necessário proteger e salvaguardar o património vernacular cultural e natural da região em estudo, através de uma reengenharia planeada sustentável.

TURISMO E PATRIMÓNIO DE MONTANHA: HERANÇAS ANTIGAS E DINÂMICAS MODERNAS DA TRANSUMÂNCIA

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Abstract. *O turismo apresenta-se como promotor de desenvolvimento e transformação das economias, pelo que maximizar os benefícios sociais, ambientais e económicos deve nortear todo o setor, conjugando esforços para levar a cabo a Agenda 2030 para o Desenvolvimento Sustentável.*

Esta tese pretende contribuir eficazmente para a trajetória de desenvolvimento sustentável das regiões de baixa densidade, assumindo os Objetivos de Desenvolvimento Sustentável (ODS) como uma estrutura para a mudança necessária, estando relacionado de forma mais direta com ODS 3 - Boa saúde e bem-estar; ODS 8 - Trabalho decente e crescimento económico; ODS 11 - Cidades e comunidades sustentáveis; ODS 12 - Consumo e produção responsáveis; ODS 13 - Ação climática; ODS 17 - Parcerias para as metas.

Considerando a atividade turística como uma força regeneradora de territórios rurais e de montanha, este estudo tem como objetivo geral a valorização do património de montanha da Serra da Estrela, especificamente o património gastronómico da fileira da pastorícia e o fenómeno da Transumância. Pretende-se contribuir para preservar este importante conhecimento, que progressivamente se perde, e identificar propostas de desenvolvimento para estes territórios, nomeadamente do ponto de vista das experiências turísticas.

A integração da herança cultural e suas dinâmicas atuais, nas estratégias do Turismo, permite um desenvolvimento regional que valoriza os destinos. Por se tratar de um estudo que valoriza o património e processos atrelados às especificidades locais, origina produtos diferenciadores, propícios à sustentabilidade e preservação do território.

Perante uma economia em transformação, iremos investigar os desafios que se impõem aos territórios rurais e de montanha e o contributo da atividade turística em termos de novas abordagens, especificamente na fileira da pastorícia e do fenómeno da Transumância na Serra da Estrela.

Palavras-chave: Património; Pastorícia; Sustentabilidade; Serra da Estrela; Turismo; Territórios de Baixa Densidade; Transumância.

Circular economy in the hospitality sector - measurement and analysis

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Abstract. *Keywords: circular economy, tourism, hotel, measurement, Life Cycle Assessment*

The circular economy (CE) is one of the axes for implementing sustainable development in various sectors of activity, including Tourism, and is defined as an economic system, based on business models which replace the end-of-life concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity to the benefit of current and future generations. The CE offers tremendous potentials for tourism businesses in reaching higher sustainability and profitability, not least related to the provision of accommodation, food and spa services and the related material flows of energy, foodstuffs, water, etc. On the other hand, tourism has great potential to be an engine for the dissemination of CE. If the tourism industry wants to prosper within this new economic paradigm where nothing is waste, it is important that the whole tourism value chain adapts to this disruption by jointly collaborating with the different stakeholders of the industry and other industries. One of the biggest challenges to the implementation of CE in tourism is the evaluation of the resulting benefits (environmental, social, economic), which will allow a better management of the circularity options and engagement of the various stakeholders involved. To respond to this challenge at the micro level and with regard to environmental benefits, tools from the scope of Industrial Ecology such as Life Cycle Assessment (LCA) can be used, however there are some difficulties related to methodological aspects that should be investigated, such as, for example, the issues of defining boundaries and functional unit, allocation of impacts and end-of-life phase. Thus, this work has as main objective to develop a model to evaluate the implementation of the Circular Economy in the tourism sector at the micro level (companies, products, services), based on LCA and Circularity Indicators (CI).

The methodology to be followed involves adapting the LCA methods to measure circularity and integrating it with CI, focusing on the current limitations of i) determination of system boundaries and functional unit; ii) data limitation, quality and reliability; iii) multifunctionality and impact allocation; iv) temporal factors; v) end-of-life phase. The model will be developed and validated by applying it to a case study of the hotel sector. As a result of this work, a contribution is expected to the implementation of innovative business models and differentiating value creation proposals for the tourism sector.

By facilitating the implementation of CE in the tourism sector, this work also contributes to the progress of some sustainable development goals (SDG) formulated by the UN, namely for SDG 8: ?Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all? and mainly for SDG 12: ?Ensure sustainable consumption and production patterns? with a special focus on target 12.b. which aims to ?develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products?.

Turismo Gastronómico e Desenvolvimento Económico dos Territórios

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Abstract. *Esta investigação tem como objetivo ?avaliar o papel do turismo gastronómico no desenvolvimento económico dos territórios?. O turismo gastronómico está associado com a deslocação de visitantes para fora do seu ambiente habitual para envolver-se em experiências alimentares, principalmente produtos alimentares locais, através, por exemplo, da participação em sessões de degustação, visitas a produtores locais e a participação em eventos gastronómicos (Hall & Sharples, 2003). Relativamente à metodologia optou-se por uma abordagem mista, recorrendo a métodos quantitativos e qualitativos. Do lado da procura, foram aplicados 533 questionários com o objetivo de quantificar as despesas turísticas e de identificar os fatores que poderão influenciar a importância do turismo gastronómico no desenvolvimento económico dos territórios. Do lado da oferta, realizaram-se 18 entrevistas semiestruturadas aos agentes da oferta do turismo gastronómico para analisar como o comportamento destes agentes poderão influenciar o consumo dos visitantes e o multiplicador do turismo gastronómico. Este estudo tem como contributos fornecer importantes inputs relacionados com os fatores que poderão influenciar o impacto económico do turismo gastronómico, além de permitir definir ações estratégicas que poderão ser implementadas na gestão dos destinos turísticos para aumentar o impacte económico do turismo gastronómico.*

Turismo Acessível e a Atratividade dos Destinos Turísticos: Estudo Comparativo entre Portugal e Moçambique

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Abstract. *O conceito de turismo acessível evidencia o processo colaborativo estabelecido entre os mais diversos atores do sistema turístico, com o objetivo de promover a adaptação da oferta turística a todos os segmentos da procura, de acordo com as suas necessidades de acesso, permanentes ou temporárias, visíveis ou invisíveis, mais ou menos severas, de forma que possam dela usufruir em autonomia, igualdade e dignidade, sem barreiras físicas ou relacionadas aos serviços, produtos e ambientes. O desenvolvimento do turismo acessível implica que os diferentes agentes da oferta turística devem adotar medidas relacionadas ao design universal e que contribuam para que os produtos turísticos sejam alcançáveis por todos. Desta forma, quando a atratividade de um destino é planeada de forma integrada, a acessibilidade pode conferir singularidade aos destinos, tornando-os mais atrativos e conseqüentemente mais competitivos. Diante deste contexto, esta investigação, procura analisar a oferta turística acessível como um mecanismo de atratividade e competitividade dos destinos turísticos. Para concretizar este objetivo, é desenvolvido um modelo de competitividade dos destinos turísticos em que a acessibilidade constitui um dos elementos centrais. O modelo é testado recorrendo a uma abordagem metodológica mista (qualitativa ? entrevistas - e quantitativa - questionários) e em dois países com características e níveis de desenvolvimento turístico diferentes (Portugal e Moçambique).*

Sustainable Tourism and Regional Development Networks: the case of Oporto and North Portugal

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Abstract. *Tourism is an economic sector of high importance in the development of tourist destinations, either by creating new jobs or by encouraging new investment. The intervention of the public sector, through the development networks, becomes a determining factor in the development of articulated and feasible policies and strategies for the implementation of the economic sustainability of destinations.*

Regional development networks are incredibly important, due to their proximity, with the different stakeholders, public and private, in the adoption, implementation and monitoring of sustainable economic development strategies. In addition to this territorial and cultural complexity, it is necessary to consider the new consumer, his needs concerns, and expectations in relation to the destination, all these new variables must be taken into account for the new planning and development instruments of the territory.

The aim is to analyse the articulation of policies created for the development of economic sustainability in the territory and how development networks can contribute to economic sustainability.

In methodological terms, a mixed methodology will be adopted for data collection and triangulation for analysis and interpretation of results. This research aims to identify a network-based economic model that contributes to the development of economic sustainability of tourist destinations.

Keywords: Development, Sustainable Economy; Sustainable Tourism, Tourist Destinations

PARTNERSHIPS NETWORKS: DYNAMICS AND CONTRIBUTIONS TOWARDS A MEDICAL TOURISM DESTINATION SYSTEM

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Abstract. *With globalization, the economic and technological interdependence between countries and the increase in tourism over the years, there has been a greater demand for the combination of tourism and healthcare (Beladi, 2019).*

Medical tourism (MT) is shaped by the complex combination of medical, economic, social, and political forces, that are interrelated and setting up new cluster arrangements, nurturing competitiveness in a medical tourism destination (Horowitz, 2007; Alberti, 2014).

Achieving existing synergies between medical and tourism sectors highly dependent on a cooperative approach amongst all stakeholders: government, medical industry, healthcare providers and facilitators, and tourism industry (Medhekar, 2014; Machnik & Lubowiecki-Vikuk, 2019).

This research aims to address the role of the major stakeholders at a medical tourism developing destination based on their participation in MT services and their support for medical tourism destination development.

Applying an exploratory multiple case study approach to understand a medical tourism ecosystem from a multi-stakeholder perspective, highlighting the dynamics and complexities experienced in different destination contexts and offering a novel comparative perspective on regional MT governance.

Festival Expenses: Systematic Literature Review

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Abstract. *Ao longo dos últimos anos, os festivais vêm crescendo e se adaptando à diversidade cultural evidente de um mundo globalizado e com isso, trazendo impactos diversos. Mais recentemente, há um aumento de atenção dada pelos pesquisadores às despesas geradas por esses eventos e suas implicações na área do turismo. O objetivo deste artigo é traçar o estado da arte sobre o tema das despesas em festivais, analisando as metodologias que têm sido utilizadas, os fatores que poderão influenciar essas despesas e novas temáticas de investigação. Para dar resposta a este objetivo, é realizada uma revisão sistemática da literatura de 49 estudos identificados na base de dados Scopus. Como principais resultados, a maioria dos estudos foi realizada nos Estados Unidos e África do Sul. Observa-se que têm sido realizados estudos em diferentes tipos de festivais, como por exemplo festivais de música, gastronómicos e culturais, a partir de 2016 o número de artigos sobre esta temática registou uma certa estagnação. As metodologias quantitativas são as mais utilizadas, na recolha e análise de dados, sendo os questionários aplicados durante o festival aos seus participantes, o método mais utilizado em termos de recolha de dados. Em termos de fatores que influenciam as despesas dos participantes em festivais, os resultados sugerem que o perfil dos participantes e o seu comportamento durante o festival têm sido os determinantes mais analisados nos estudos identificados. O artigo termina com uma discussão sobre as lacunas de pesquisa identificadas sobre as despesas em festivais e sugere caminhos de investigação futura.*

The contribution of cooperation networks to the built heritage offer of urban tourist destinations: the University of Porto

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Abstract. *A convergência de um conjunto de fatores económicos, sociais e culturais gerou o incremento de interesse pelos elementos do património representativos dos lugares e do passado de uma sociedade.*

À medida que a competitividade aumenta, os destinos turísticos urbanos procuram proporcionar uma oferta que esteja ao nível ou exceda as experiências proporcionadas por destinos alternativos.

Tendo em conta a relevância dos edifícios de muitas das centenárias universidades de cidades europeias, numa dimensão histórica, arquitetónica, estética e simbólica, visa-se com a presente tese ilustrar o potencial desse património para a diversificação e diferenciação das respetivas ofertas turísticas. Releva-se, neste contexto, o papel do networking entre atores com responsabilidades sobre a competitividade e sustentabilidade dos destinos turísticos.

A referida questão é perspetivada no âmbito de um estudo de caso, elegendo-se para o efeito a centenária Universidade do Porto. A triangulação de técnicas qualitativas adotadas: análise documental, com base em fontes oficiais públicas e reservadas, realização de entrevistas com interlocutores diversos relacionados com a DMO e com a Universidade do Porto, bem como a sessão de focus group promovida com interlocutores privilegiados das três entidades envolvidas no estudo, vem confirmar o relevante valor, particularmente imaterial, do referido legado, bem como o sentido estratégico da respetiva integração na oferta cultural da cidade.

Destaca-se, entre os contributos proporcionados pela presente tese, o carácter determinante que a reversão de fenómenos de rigidez e de falta de permeabilidade ao exterior (espaço extra semiótico e alo-semiótico) assumem para a ocorrência de diálogo entre os sistemas, para o estabelecimento de interações entre si e para a constituição de redes de trabalho, mobilizadas pelo empenho e confiança recíproca entre os atores que as integram.

INOVAÇÃO ABERTA NOS PEQUENOS E MÉDIOS NEGÓCIOS DO SETOR HOSPITALIDADE

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Abstract. *O presente estudo tem como objetivo analisar e identificar as práticas de inovação aberta aplicadas nas PME's de hospitalidade que podem melhorar os níveis de competitividade das empresas. Como objetivos secundários busca-se identificar a dinâmica da inovação aberta no contexto das pequenas e médias empresas; compreender o papel da inovação aberta na competitividade das empresas; caracterizar a inovação aberta na indústria hoteleira; analisar o potencial de aplicação da inovação aberta nas PME's do sector de hospitalidade visando o aumento dos níveis de competitividade. A fim de obter o conhecimento científico definiu-se como objeto de estudo empresas de pequeno e médio porte do setor de hospitalidade ? empresas de eventos, empresas de restauração e meios de hospedagem. Para dar embasamento a investigação será realizada ampla revisão de literatura envolvendo temas de competitividade, empreendedorismo, hospitalidade, inovação aberta e pequenas empresas. A pesquisa quantitativa será realizada através de um inquérito por questionário on line com representantes de empresas do setor de hospitalidade ? empresas de eventos, empresas de restauração e meios de hospedagem. Adicionalmente a pesquisa quantitativa serão analisados conhecimentos ligados a tecnologia e inovação; empreendedorismo; tecnologias sociais; prospecção mercadológica e marketing; tecnologias de comunicação e informação e gestão da qualidade. Também, como fonte de informação e de referenciamento, das empresas, busca-se analisar as empresas com relação as relações humanas, diferentes espaços geográficos e dimensões socio culturais, econômicas e ambientais no contexto de integração onde estão inseridas. Dentre os achados desta pesquisa busca-se identificar métodos, práticas e ferramentas de inovação que estão sendo utilizadas por empresas do segmento de hospitalidade para gerar soluções que permitam ampliar a competitividade diante do cenário de hiperconcorrência no mercado de turismo na atualidade. Palavras chave ? Competitividade, Empreendedorismo, Hospitalidade, Inovação Aberta, Pequenas empresas*

Rede interorganizacional e ecoeficiência na produção do ecoturismo: estudo de caso Rotas das Emoções

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Abstract. *Esta tese analisa a ecoeficiência do ecoturismo na perspectiva de uma rede ecoturística entre os atores empresariais de 14 municípios que integram a Rota das Emoções, no Nordeste Brasileiro. Com o paradigma da plataforma do conhecimento, o ecoturismo deixa o paradigma de atividade econômica sem impactos negativos e passa a atuar cientificamente no processo de desenvolvimento dos produtos ecoturísticos com foco na minimização dos impactos negativos. O conceito de desenvolvimento sustentável foi colocado como uma possível solução para o mundo assegurar às futuras gerações, pelo menos, iguais condições de obter recursos como se tem atualmente e o ecoturismo foi apresentado como uma solução para se alcançar a sustentabilidade na indústria do turismo. No entanto, ainda estamos engatinhando nesse processo. As pesquisas trazem mais casos de fracasso do que de sucesso. Neste processo, principalmente no turismo, onde o produto final é o somatório de dezenas de empresas atuando em conjunto, ainda se tem muito o que compreender sobre a produção do ecoturismo na estrutura de rede para que se possa ter destinos sustentáveis e não apenas parte das empresas sustentáveis. A atuação de atores interessados na preservação ambiental dentro de uma dimensão espacial maior requer mais do que ações individuais. É um trabalho coletivo onde o resultado final é mais importante do que apenas um selo empresarial de boa conduta ambiental. Uma empresa certificada ambientalmente em um destino com fortes impactos ambientais negativos perde competitividade frente a destinos certificados ambientalmente. Poucos trabalhos foram realizados sobre a ecoeficiência no turismo dentro de uma estrutura em rede nas perspectivas longitudinal e sistêmica. Maioria dos indicadores de desempenho ambiental foi pontual e limitado às fronteiras da empresa e dos destinos, sem muita contribuição para uma região como um todo, principalmente quando se trata de uma rota mais ampla. Poucos trabalhos na literatura sobre ecoeficiência em rede foram encontrados e com limitações de fatores de influência, principalmente temporal e espacial. Quando se trata de uma rota estensa como destino, entender as relações entre os stakeholders, as motivações da integração, a importância e o uso da natureza como recurso, a consciência de que o ecoturismo produz resíduos e o contexto sociocultural de cada localidade pode resultar em um grande funil de conflitos, deixando o sucesso do ecoturismo cada vez mais distante da realidade. A literatura é clara ao demonstrar que a maioria das pesquisas focou os impactos ambientais ou econômicos, mas raramente os dois simultaneamente. E mesmo nos impactos ambientais, os indicadores foram mais direcionados para biológicos e visuais na paisagem, com medições pontuais no tempo e no espaço, não se estendendo ao longo de um período para se ter a dinâmica da evolução dos impactos e as variáveis intervenientes. Há uma tendência, no âmbito global, de avaliar os impactos ambientais para além do destino, uma vez que os impactos negativos como emissões de gases que afetam a camada de ozônio e provocam o aquecimento da terra não estão restritas aos limites territoriais dos destinos, principalmente quando decorrentes do transporte aéreo, cujas emissões são transnacionais, mas provocadas pelo desejo de ter experiências ecoturísticas em áreas naturais em outros países. O Protocolo de Kioto estabeleceu o princípio territorial das emissões como responsabilidade dos destinos, colocando no limbo as emissões provocadas em áreas internacionais. O novo paradigma no turismo se constrói sobre a 'plataforma do conhecimento' e da razão. Quanto mais as empresas turísticas estiverem engajadas nas causas ambientais e sociais, principalmente as que oferecem ao mercado produtos ecoturísticos, mais próximos os destinos estarão de alcançar a ecoeficiência e a sustentabilidade, assegurando às gerações futuras, à comunidade local e aos turistas, destinos com a mesma qualidade.*
