MIT PORTUGAL
2023 Annual Report

MIT Portugal

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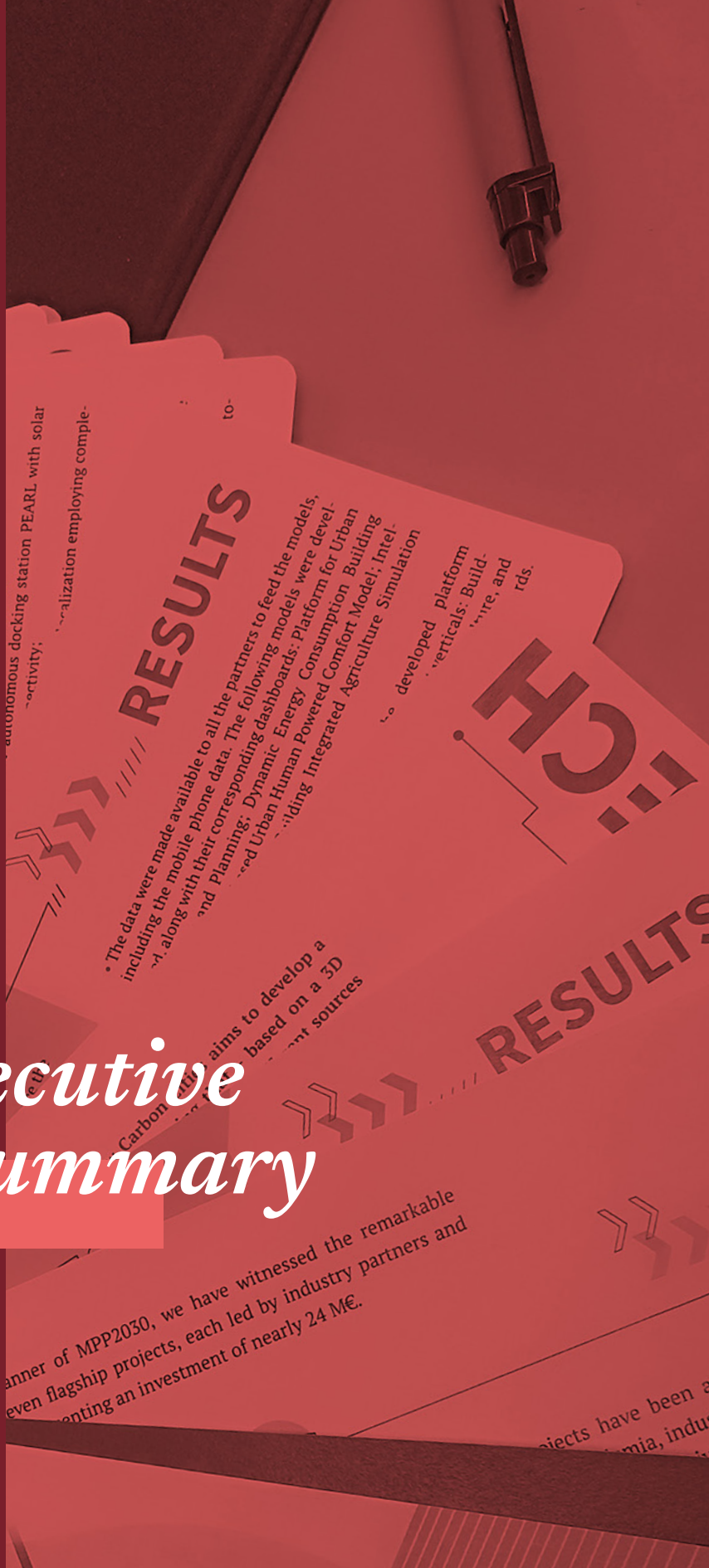
Executive Summary



MIT Portugal Program

The MIT Portugal Program (MPP) is a multi-phase strategic international collaboration between the Massachusetts Institute of Technology (MIT), Portuguese universities, research institutions, and industry, promoted by the Portuguese Foundation for Science and Technology (Fundação para a Ciência e Tecnologia - FCT), and the Portuguese Ministry of Science, Technology, and Higher Education. Launched by the Portuguese government in 2006, renewed in 2013, and again in 2018, MPP has strengthened Portugal's knowledge base and international competitiveness through strategic investments in research, education, innovative ideas, and entrepreneurial training and activities.

The current phase, the MIT Portugal Partnership 2030 (MPP2030), launched in June 2018 as a novel strategic partnership between MIT and FCT, focused on high-quality research collaborations. It was designed to strengthen Portugal's knowledge base and international competitiveness in these areas of global relevance:

- Climate Science & Climate Change;
- Earth Systems: Oceans to Near Space;
- Digital Transformation in Manufacturing;
- Sustainable Cities; and
- Data Science.

In accordance with the MPP2030 agreement, a midterm review of the Program took place in 2023. The MPP 2023 Annual Conference — "Research that impacts society" —served as a platform to showcase the main achievements of MPP2030 research.

A key element in MPP2030 research strategy was the funding of seven large-scale collaborative flagship research projects, each one led by an industry partner, with a total investment of nearly 24 million euros (for the Portuguese and MIT partners of the consortia combined). These projects have been instrumental in connecting the Portuguese research community, industry partners, and MIT. The flagship projects having ended in 2023, the main accomplishments and challenges of these projects were presented and discussed in a scientific meeting targeting the projects' stakeholders and at the MPP Annual Conference.

In addition, under MPP2030, smaller innovative research projects have been funded with one-year grants. Each of these projects includes collaboration with Portuguese and MIT researchers, thus reinforcing the collaborative nature of the Program. Since 2018, a total of 103 projects (79 seed projects at MIT and 24 exploratory projects for Portuguese principal investigators) have been funded.

In 2023, a call was opened for seed proposals at MIT. The call received 31 proposals from MIT researchers from across the institute, and 16 new projects were funded. In addition, three existing seed projects were renewed with additional funding to help finish the research. There was no call opened in 2023 to fund new Portuguese exploratory grants. The list of the awarded exploratory grants from the 2022 call

> ***"A key element in MPP2030 research strategy was the funding of seven large-scale collaborative flagship research projects, each one led by an industry partner."***

was announced October 2023 by FCT. Among the 32 proposals under consideration, funding has been allocated to eight projects — three projects in the realm of Digital Transformation in Manufacturing, two projects within the domain of Climate Science & Climate Change, and one project each in the areas of Earth Systems: Oceans to Near Space, Sustainable Cities, and Data Science.

In a world that is constantly changing and facing complex societal challenges it is fundamental to invest in talent development. MPP2030 fosters advanced education, networking, and idea sharing through a series of initiatives. Four MPP2030-FCT calls for PhD grants (set up outside of the MPP2030 agreement) were opened in the current phase of the Program, allowing the training of 120 PhD candidates in MPP2030 strategic research areas . The 2023 call for MPP2030-FCT PhD grants was different from the previous calls, funding only PhD candidates with research plans in Climate Sciences & Climate Change. The call received 75 applications from 14 different nationalities, with most candidates being from Portugal, Brazil, and Iran, and awarded 10 PhD research grants.

In 2023 the Program continued to facilitate and host inspiring meetings, workshops, and opportunities to promote community networking. Highlighted events in 2023 included the sponsorship of three Portuguese students to attend MIT Space Week; the third edition of the Marine Robotics Summer School, held in the Azores; and the Annual Conference, held in Braga.

The present document reports on the MPP activity during 2023 and presents a brief overview of the main achievements of MPP2030 for the period of 2018-23.

Figure 1. Photos of the 2023 Annual Conference, held in Braga; Next page: activities during the Marine Robotics Summer School, in the Azores.

“These [flagship] projects have been instrumental in connecting the Portuguese research community, industry partners, and MIT.”

02

Governance & Coordination

"MPP has been working well, productivity has been good, and the future looks exciting."

– the ERC

The MPP collaboration is based on a contractual agreement between MIT and FCT. These institutions, in their respective countries, have the responsibility of appointing the **Directors of the Program** to oversee, direct, and coordinate the activities of all entities participating in the collaboration.

The governance structure of the Program is grounded in the Program Governing Committee (PGC), which is responsible for policy oversight with respect to the overall objectives of the relationship, as well as approving the annual plan and budget allocation for the proposed activities.

An independent **External Review Committee (ERC)**, formed by members from the international scientific community, shall review the research program and make recommendations to the Program Directors and the PGC.

The **Coordination Team**, a collaboration in both countries, oversees the day-to-day operations of the Program, manages the calls for proposals and distribution of grants, and reports on all collaboration activities of the Program to ensure its effective development.

The Program is assisted by **Area Leaders**. Their role is critical in serving as review panel coordinators for calls for PhD grants and calls for research proposals, advising on the scope of their respective research area, and promoting MPP2030 in their home institutions. The Area Leaders have been chosen based on their recognized expertise in their area of research.

2.1 2023 updates

In March 2023, Zita Martins stepped down from her role as National Co-Director of MPP. The composition of MPP's various boards and Coordination Team is illustrated in the next pages.

Program Governing Committee

Madalena Alves

President of Fundação para a Ciência e a Tecnologia
Representative of Fundação para a Ciência e Tecnologia

Richard K. Lester

MIT Vice Provost for International Activities
MIT Senior Administration Representative

Maria Zuber

Vice President for Research at MIT
MIT Senior Administration Representative

António M. Cunha

President of Norte Portugal Regional Coordination and Development Commission
Representative of the Portuguese participating entities

Dava Newman

Director of MIT Media Lab
Apollo Program Professor of Astronautics at MIT and Harvard–MIT Health, Sciences, and Technology faculty member. MIT senior administration representative

Paulo Ferrão

Professor at Instituto Superior Técnico (IST)
Representative of the Portuguese participating entities

Isabel Furtado

CEO of TMG Automotive
Portuguese Industry Representative

External Review Committee

John Beddington

Former UK Government Chief Scientific Adviser

Pascale Ehrenfreund

Research Professor of Space Policy and International Affairs at the Space Policy Institute/George Washington University

Mohan Munasinghe

Former vice-chair, UN Intergovernmental Panel on Climate Change that shared the 2007 Nobel Peace Prize

Melany Hunt

Dotty and Dick Hayman Professor of Mechanical Engineering, Caltech

Program Directors

Pedro Arezes

Full Professor in Human Factors Engineering at UMinho
National Director of MIT Portugal Program

Zita Martins

Associate Professor at Técnico Lisbon
National Co-Director of MIT Portugal Program (until March 2023)

R. John Hansman

T. Wilson Professor of Aeronautics & Astronautics MIT
Co-Director of MIT Portugal Program at MIT

Doug Hart

Professor of Mechanical Engineering at MIT
Co-Director of MIT Portugal Program at MIT

Coordination Team

Ana Mena

Innovation & Education
Coordinator – Portugal

Catarina Silva

Advisor and Financial
Coordinator – Portugal

Deliana Ernst

Administrative Lead – MIT

Joana Soares

Communications & Events
Coordinator – Portugal

Susana Costa

Industrial Liaison & Research Coordinator – Portugal

Chrissy Mullin

Financial Administrator II – MIT

Natalie Billings

Program Coordinator – MIT

Lília Rocha

Project Officer – Portugal (since September 2023)

Area Leaders

Júlia Seixas

Associate Professor with Habilitation at NOVA University
Lead Faculty of Climate Science & Climate Change

Alexandra Moutinho

Assistant Professor at Técnico Lisbon
Lead Faculty of Earth Systems: Oceans to Near Space

Miguel Nóbrega

Associate Professor at University of Minho
Lead Faculty of Digital Transformation in Manufacturing

Manuel Gameiro da Silva

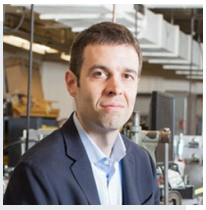
Full Professor at University of Coimbra
Lead Faculty of Sustainable Cities

Ana Camanho

Associate Professor at University of Porto
Lead Faculty of Data Science

John J. Leonard

Samuel C. Collins Professor of Mechanical and Ocean Engineering at MIT
Lead Faculty of Earth Systems: Oceans to Near Space



John Hart

Professor of Mechanical Engineering at MIT
Lead Faculty of Digital Transformation in Manufacturing

Christoph Reinhart

Professor in Building Technology at MIT
Lead Faculty of Sustainable Cities

Doug Hart

Professor of Mechanical Engineering
Lead Faculty of Climate Science & Climate Change

2.2
Governance meetings

On March 3, 2023, the ERC met at Instituto Superior Técnico in Lisbon, Portugal, to analyze the progress of activities of the Program during the last year (Figure 2). The meeting consisted of a presentation of the program by the MPP Directors, followed by a discussion with the ERC. Afterwards, Portuguese and MIT researchers and PhD students funded with an MPP2030-FCT PhD grant, or part of an MPP-funded project, presented on their research. Following this session, the ERC met internally to discuss the progress of the Program, and afterwards discussed their views on its status and recommendations for the near future with the Program management and President of FCT.

Figure 2. MPP Directors and ERC members after the ERC meeting. From left to right: Pedro Arezes, John Hansman, Douglas Hart, Pascale Ehrenfreund, Melany Hunt, Zita Martins and Mohan Munasinghe.

On March 23, the PGC met to review the progress achieved by MPP in 2022 and discuss strategic directions for 2023 (Figure 3). The Directors of the Program were invited to attend the meeting. The MPP Directors reported the activities carried out in 2022, their financial execution, and presented the plans for 2023. The PGC approved the 2023 work plan and budget provided by FCT.

On May 22, FCT invited the American Partnerships (including CMU Portugal, MIT Portugal, and the University of Texas Austin Portugal) to a meeting to provide an overview of their program. This meeting included the participation of the Minister of Science, Technology and Higher Education; the FCT president; the Scientific Council for Arts, Humanities and Social Sciences; the Scientific Council for Exact Sciences and Engineering; the Scientific Council for Life; and the Health Sciences Council. The meeting also included other groups from the scientific community, such as the Council of Rectors of the Portuguese Universities, the Council of Associated Laboratories, and the National Innovation Agency.

During this meeting, the program prepared and shared detailed information regarding the 17 years of activity bridging research, education, and innovation with a focus on the current phase of the program (2018-23).

The ERC congratulated the Program for its high productivity, stating that they "were impressed with the way the MIT Portugal Program has been evolving with regular calls for projects and PhD grants, and many outreach activities and meetings organized".

Throughout 2023 several requests regarding program outputs were made by FCT and provided by the program.

Figure 3. *PGC meeting in March 2023. From top left photo (left to right): Paulo Ferrão; António Cunha; Madalena Alves; Ana Reis; Ricardo Araújo; Pedro Arezes and Zita Martins; Isabel Furtado; Richard K. Lester; John Hansman; Maria Zuber; Doug Hart and Dava Newman.*

03

Walk through the year 2023

JAN_

Flagship meeting with ANI

FEB_

Open PhD call

Open call for Seed Grants Proposals

MAR_

Flagship projects' meeting

Space week @MIT

PGC meeting

ERC meeting

Information session on PhD call

APR_

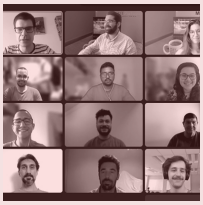
Oral Communication courses (2 sessions)

General meeting with PhD students

MAY_

Meeting of the American Partnerships with FCT; MCTES; FCT Scientific Council and entities of scientific community

JUNE_



Speed meeting by PhD students

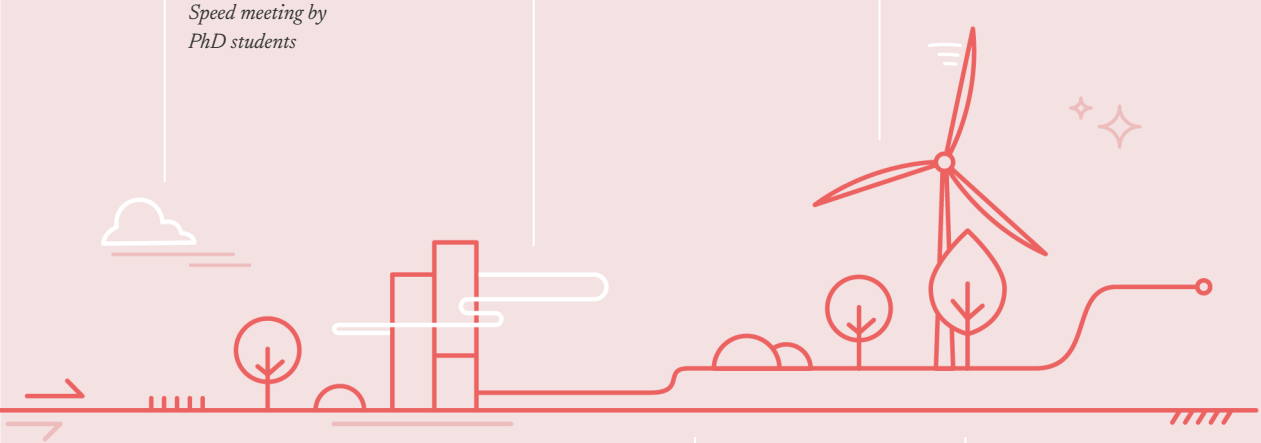
SEPT_

MIT Portugal Annual Conference

NOV_

Workshop: Writing effective impact statements

Webinar – Funding calls: everything that is not your research project



JULY_

Marine Robotics Summer School

Participation in "Encontro Ciência 2023"

OCT_

MPP Coordination Office meeting

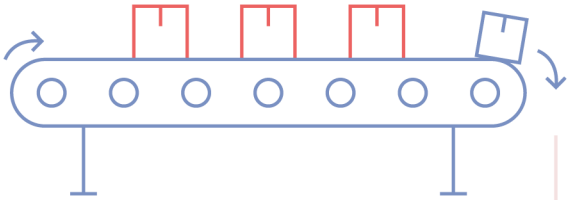
DEC_

Blue Origin Payload Competition – MiFire payload launched to space

04

Facts & Figures 2023

54 Ongoing projects



20
Seed projects 2022
(from 2022 call, most ended in Aug 31, 2023)

19
Seed projects
(from 2023 call)

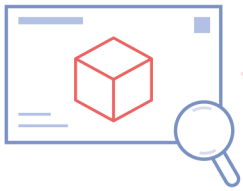
8
Exploratory projects

7
Flagship projects

97
Peer-reviewed articles

14
Books and book chapters

42
Proceedings/ conference papers



10
PhD Grants

1 *Call*

75 *Applications*

52
News articles in the press

Social media followers

23,240

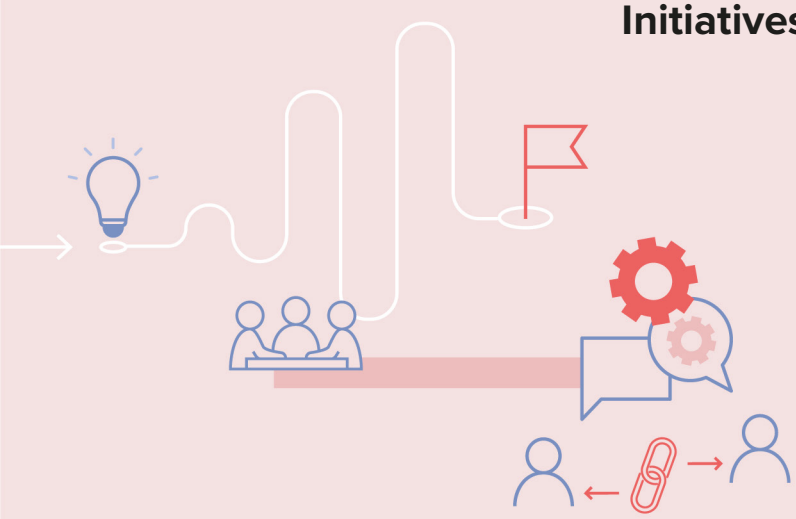
316
Social media posts

11
Newsletters

17
Website news

20
Initiatives

- **1** *Annual Conference*
- **2** *High-level meetings*
- **2** *Idea sprints*
- **2** *Educational courses*
- **12** *Networking activities*



05

Research

Cultivating collaborative research is central to the Program's mission. Under the aegis of MPP2030, the Program underwent a dynamic evolution, directing its focus to the five critical domains: Climate Science & Climate Change, Earth Systems: Ocean to Near Space, Digital Transformation in Manufacturing, Sustainable Cities, and Data Science.

Climate Science & Climate Change

Earth Systems: Ocean to Near Space

Digital Transformation in Manufacturing

Sustainable Cities

Data Science

The Program has devoted particular attention to augmenting research initiatives, with a strong focus on advancing Climate Science & Climate Change.

For more comprehensive insights into the projects supported by MPP, please refer to the forthcoming sections.

5.1 Overview of the Flagship Projects

Flagship projects have contributed to the scientific community by publishing papers in various scientific journals and conferences. Additionally, they have disseminated their findings through diverse platforms by delivering numerous oral presentations in seminars and conferences. A comprehensive list of these scientific outputs is presented in section 9 of this report.

An overview of the main information regarding the flagship projects is provided below, per scientific area.

AEROS Constellation

FLAGSHIP PROJECTS_

The AEROS mission is a 3U (10x10x30 cm^3) CubeSat that is seen as a precursor for a constellation of satellites dedicated to monitoring the Atlantic.

The mission aims to advance Portuguese capacity to deliver technologies that bridge the interactions between ocean and space.

Consortium Entities

Edisoft Software Development Services

CEiiA
Centre of Engineering and Product Development

Spin.Works S.A.

DSTELECOM, S.A.

UMinho
University of Minho

FCUP
Faculty of Sciences, University of Porto

University of Algarve

Instituto Superior Técnico

CoLAB +Atlantic

IMAR
Institute of Marine Research

AIR Centre
Atlantic International Research Centre

MIT

Principal Investigators

Hélder Silva
EDISOFT

Kerri Cahoy
MIT Department of Aeronautics and Astronautics (AeroAstro)

Co-Principal Investigators

Richard Linares
MIT Department of Aeronautics and Astronautics (AeroAstro)

Dava Newman
MIT Department of Aeronautics and Astronautics (AeroAstro) and Harvard-MIT Health Sciences and Technology

Objectives

- Develop and launch a novel CubeSat platform for ocean monitoring.
- Demonstrate miniaturized and efficient hyperspectral imaging.
- Implement data science techniques for monitoring and forecasting oceanic evolution and generating value-added data.
- Develop flexible software-defined communication modules to support connectivity and network operations of autonomous vehicles and biologging tagging technology (e.g., tagged migratory marine organisms).
- Establish a Data Analysis Centre (DAC) to collect, process, and analyze data acquired by the AEROS payload.

Main Results

The AEROS project designed, developed, and tested a 3U Cubesat for ocean monitoring containing three payloads: a hyperspectral camera, a software-defined radio to receive ARGOS and LoRa tags information, and an RGB camera to better geo-locate the images taken with the hyperspectral camera. The satellite was fully tested and ready to be launched into space in the SpaceX Transporter 10 in February 2024. A Data Analysis Center was also developed to display the AEROS data to the users. A Command Center, in the ground segment, was also developed and ready to communicate with the AEROS from the Portuguese Santa Maria ground station.

Future Goals

The future goals will be launching the satellite into space; commissioning and operating the satellite; receiving the data in the Command Center and displaying the information, with the algorithms developed, in the DAC.

Earth Systems: Ocean to Near Space

8
Master students

10
PhD candidates

1
Peer-reviewed article

12
Proceedings/ Conference papers

K2D: Knowledge and Data from the Deep to Space

FLAGSHIP PROJECTS_

K2D proposes the development of a global-scale and disruptive monitoring system for oceans, able to tackle all depths, from the deep-sea bottoms and abyssal platforms to the surface. This system is based on the use of smart submarine cables with sensors connected to the optical repeaters.

Below the water, and particularly at extreme depths, environmental exposure characteristics are excessively hostile for conventional sensing approaches, posing additional challenges to overcome.

Consortium Entities

DSTELECOM

University of Minho

INESC TEC
Institute for Systems and Computer Engineering Technology and Science

ASN
Alcatel Submarine Cables

AIR Centre
Atlantic International Research Centre

University of Azores

Cintal
Algarve Technological Research Center

MIT

Principal Investigators

Eduardo Pereira
University of Minho

Douglas Hart
MIT Department of Mechanical Engineering (MechE)

Co-Principal Investigators

Dava Newman
MIT Department of Aeronautics and Astronautics (AeroAstro) and Harvard-MIT Health Sciences and Technology

John Leonard
MIT Department of Mechanical Engineering (MechE)

Pierre Lermusiaux
MIT Department of Mechanical Engineering (MechE)

Olivier de Weck
MIT Department of Aeronautics and Astronautics (AeroAstro)

Objectives

- Install a network of sensors supported by subsea cables.
- Develop a signal repeater for submarine communications cables capable of monitoring its surroundings.
- Translate marine noise into actionable information.
- Identify and assess deep-sea animal and microbial communities using DNA barcoding techniques.
- Develop autonomous underwater vehicle (AUV) docking stations to recharge batteries and offload data.
- Develop piezoelectric transducers for sensing and wireless communications.
- Assess the ocean indicators using geostatistical and AI algorithms.

Main Results

- Prototypes of acoustic transducers and hydrophones.
- Funnel docking station for AUV charging.
- Prototype of AUV autonomous docking station PEARL with solar-powered and satellite connectivity.
- Short-range and long-range underwater localization employing complementary technologies.
- Short-range and long-range communication prototypes.
- Underwater acoustic data acquired in the Algarve region.
- Prototype of Science Monitoring And Reliable Telecommunications (SMART) Subsea Cables signal repeater able to connect multiple sensors and a docking station to AUVs.
- SMART Cable installation in Troia, during summer 2022 (version 1 prototype).
- SMART Cable installation in Sesimbra, during summer 2023 (version 2 prototype).

Future Goals

Although the project officially ended on June 30, the consortium is still actively meeting periodically to ensure the continuity of the project. In the short term, the main goal is to remain fully committed to the installation and operation of the SMART Cable in the free technological zone Infante D. Henrique, near the port of Sesimbra. In the long term, the consortium is looking at different available grants to proceed with technological advancement required for larger deployments and addressing new use cases.

Earth Systems: Ocean to Near Space

7

PhD candidates

5

Peer-reviewed articles

10

Proceedings/ Conference papers

NEWSAT: Development of a Compact Integrated Sensor and Satellite for Earth Observation

FLAGSHIP PROJECTS_

The project's mission is centered on advancing an additive manufacturing-enabled, compact, integrated sensor and satellite for observing Earth's upper atmosphere, to develop advanced nanosatellite payloads to quantitatively characterize Earth's upper atmosphere, providing real-time data for weather studies (e.g., to investigate how global warming affects the thermosphere). The project's focus is to create a new understanding of computational tools using a hybrid design approach to create complex engineering systems and digital twin technologies.

Consortium Entities

Stratosphere SA

INEGI
Institute of Science and Innovation in Mechanical and Industrial Engineering

INESC TEC
Institute for Systems and Computer Engineering Technology and Science

MIT

Principal Investigators

Gustavo Dias
Stratosphere S.A.

Luis Fernando Velásquez-García
MIT Microsystems Technology Laboratories (MTL)

Co-Principal Investigators

Wojciech Matusik
MIT Department of Electrical Engineering and Computer Science (EECS)

Maria Yang
MIT Department of Aeronautics and Astronautics (AeroAstro)

Objectives

- Develop novel 3D-printed (3DP) electric rockets that, using the same propellant, can provide a very wide range of Isp and thrust.
- Develop compact ion and neutral mass spectrometers based on 3DP quadrupole.
- Implement additively manufactured Langmuir probes and retarding potential analyzers (RPAs).
- Model and evaluate the collaboration between human designers and hybrid computational methods to transform the early-stage design process and significantly enhance performance outcomes for complex engineered systems.
- Develop digital twin technologies for small satellites.

Main Results

- Engineering models of 3DP electric rocket systems equipped with compact ion and neutral mass spectrometers based on quadrupole 3D-printing technology.
- Additively manufactured Langmuir probes and RPAs.
- Digital twin technologies for small satellites.
- 3D-printed optimized structure for small satellites.

Future Goals

Develop flight models of 3DP electric rockets equipped with compact ion and neutral mass spectrometers based on 3DP quadrupole technology, and real context implementation of additively manufactured Langmuir probes and RPAs, integration of digital twin technologies for small satellites, and creation of 3D printed optimized structures for small satellites.

Earth Systems: Ocean to Near Space

4

Master students

4

PhD candidates

8

Peer-reviewed articles

4

Proceedings/ Conference papers

OPERATOR: Digital Transformation in Industry with a Focus on the Operator 4.0

FLAGSHIP PROJECTS_

Operator-developed tools for risk exposure data analysis in the industrial workplace, building on the concepts of positive ergonomics, Operator 4.0, and the job quality indices by the European Foundation for the Improvement of Living and Working Conditions, by collecting and visualizing data on the physical environment, work intensity, and self-perceived well-being.

Consortium Entities

Zenithwings

Associação Fraunhofer Portugal

FCT NOVA
NOVA School of Science and Technology

Volkswagen Autoeuropa

NST Apparel (Europe) Lda.

Faculty of Psychology and Education Science, University of Porto

Controlconsul
Consultoria, Serviços e Representações Lda.

University of Minho

MIT IMES

Principal Investigators

Miguel Carvalho
University of Minho

Elazer Edelman
MIT Institute for Medical Engineering and Science (IMES)

Objectives

- To approach the digitalization of the industrial workplace holistically, but from the workers' point of view, using participatory design and gathering and crossing quantitative and qualitative data to build a richer picture of the workers' well-being and enable better predictive models toward assisting in creating high-quality jobs.

Main Results

- Engaged in participatory design with industrial workers for the design of workplace technology.
- Developed a bespoke sensorization kit for individual workplaces to collect real-time data on environmental risk exposure, an inertial sensor coupled with algorithms to analyze human movement, including ergonomic risk, and a device for ecological momentary assessment to collect workers' self-perceived moments of pain, pressure, and social support.
- Developed a new questionnaire for digital job quality assessment.
- Developed a web-based application for data visualization, protective of workers' privacy.

Future Goals

The feasibility of the kit has been assessed in pilot trials. Future large-scale trials are needed to assess the robustness and appropriateness of the technology in different contexts.

Digital Transformation in Manufacturing

3

Master students

6

PhD candidates

6

Peer-reviewed articles

13

Proceedings/ Conference papers

TRANSFORMER 4.0: Digital Revolution of Power Transformers

FLAGSHIP PROJECTS_

The Transformer 4.0 project seeks to introduce the digital transformation in power transformers (PT) to the complex challenges and opportunities of a fast-evolving Energy 4.0 sector. Aiming for this transformation, a comprehensive research plan focused on the digital twin (DT) concept was implemented. This project joins complementary research competencies: EFACEC (manufacturer of power transformers), INESCTEC (computer science, industry, and innovation), INEGI (mechanical and industrial engineering), and MIT (Sociotechnical Systems Research Center).

Consortium Entities

EFACEC
Energia, Máquinas e Equipamentos Eléctricos, S.A.

INESC TEC
Institute for Systems and Computer Engineering Technology and Science

INEGI
Institute of Science and Innovation in Mechanical and Industrial Engineering

MIT SSRC

Principal Investigators

Helena Lopes
EFACEC

Donna H. Rhodes
MIT Sociotechnical Systems Research Center (SSRC)

Objectives

The overall objective is to accelerate the digital transformation of the electrical power transmission system in its several dimensions; in particular, the power transformer product life cycle. Four specific objectives were defined:

- Digitalize the PT product life cycle through developing its digital twin concept;
- Exploit knowledge-based engineering processes and techniques supported by the PT digital twin;
- Support the creation and evolution of new product-service systems;
- Exploit additive manufacturing techniques applicable to the energy industry.

Main Results

- Developed a set of recommendations for implementing the DT-based platform.
- Created and developed an ontology-based PT information model for DT platform.
- Mapped PT development processes inside EFACEC's organization in detail.
- Created and explored new techniques and tools to support PT design and operation.
- Identified customer needs and defined requirements for new product service systems. Identified new materials and evaluated additive manufacturing techniques for the production of PT components; and assessed DT concept and platform prototype.

Future Goals

All knowledge generated in Transformer 4.0 allows the incorporation of methodologies and technical solutions developed in several activities inside EFACEC, namely the ones related to manufacturing traceability and the improvement of automatic calculation tools to support engineering design. In the future, the focus will be to promote further development and expansion of the ontology-based PT information model, articulate with different stakeholders the functionalities of the DT-based platform, and investigate sensorization and monitoring solutions and their integration in the DT.

Digital Transformation in Manufacturing

7

Master students

2

PhD candidates

2

Peer-reviewed articles

16

Proceedings/ Conference papers

SNOB-5G: Scalable and Self-Optimized Wireless Network Backhauling for 5G

FLAGSHIP PROJECTS_

SNOB-5G researched and developed a self-optimized, intelligent, and fault-tolerant wireless backhaul solution for 5G networks that will empower cities, as neutral hosts, by promoting total connectivity with high-bandwidth, capacity, and latency requirements, capable of accommodating new urban services.

The new robust technological solution for 5G deployment uses existing urban infrastructure to overcome the current limitations related to the availability and installation costs of wired connections that support backhaul communication.

Consortium Entities

Ubiwhere, Lda.

IT
Instituto de Telecomunicações

University of Coimbra

MIT

Principal Investigators

André Duarte
Ubiwhere, Lda.

Muriel Medard
MIT Department of Electrical Engineering and Computer Science (EECS)

Objectives

The overall objective of SNOB-5G is to solve the need for efficient, scalable, and cost-effective network backhauling, targeting 5G networks and beyond, in dense and urban environments like cities. For such, SNOB-5G intended to:

- Leverage existing urban infrastructure to deliver high-bandwidth 5G networks and unlock new 5G-based innovative services.
- Design highly resilient and self-aware backhaul nodes capable of adjusting their configurations, with a focus on helping cities build resilient infrastructure by increasing access to information and communications technology.

Main Results

Throughout the project's development, it was found that the use of mmWave in 5G backhauls reduces the capital expenses associated with 5G deployment. This brings several advantages: first, when thinking about deployments in historic towns, large tourist areas, and cities with complex topologies: and second, when considering a need for fast deployment with lower costs.

Future Goals

The research conducted within the SNOB-5G project has demonstrated the potential for extending its findings beyond urban environments, into various other domains and technologies. This includes challenging environments such as maritime and satellite operations. The techniques conceived for network-level management, as well as the use of network coding techniques, can also find application in non-terrestrial networks within the 5G ecosystem and in future network generations, to provide better quality of service, with reduced latency and higher reliability.

Sustainable Cities

4

Master students

15

Peer-reviewed articles

17

Proceedings/ Conference papers

C-TECH: Climate-Driven Technologies for Low-Carbon Cities

FLAGSHIP PROJECTS_

C-Tech aims to develop a smart city platform for urban modeling and planning that — based on a 3D representation of the city and its combination with data from different sources (climate, energy, mobility, mobile phone data) — will make it possible to simulate different scenarios for the energy efficiency of buildings, the creation of green structures, and the energy efficiency of urban mobility, among others, enabling local authorities to effectively address specific environmental issues to reduce their carbon footprint.

Consortium Entities

NOS Comunicações, S.A.

Instituto Superior Técnico

IST-ID
Association of Instituto Superior Técnico for Research and Development

Lisboa E-Nova
Energy and Environment Agency of Lisbon

CEiiA
Centre of Engineering and Product Development

NOVA IMS
NOVA Information Management School | MIT

Principal Investigators

Ricardo Gomes
Técnico Lisboa

Christopher Reinhart
MIT Department of Architecture

Co-Principal Investigators

Jessika Trancik
MIT Institute for Data, Systems, and Society (IDSS)

Objectives

› The main scientific objective of this project is to advance the science of urban systems modeling, supported by urban data collection and big data processing, to enable and demonstrate a range of new services/products that explore the economic opportunities associated with the transition to sustainable net-zero urban ecosystems. Specifically, C-Tech intends to develop various data models covering climate, energy, agriculture, and mobility and integrate them into a single smart city platform.

Main Results

The data was made available to all the partners to feed the models, including the mobile phone data. The following models were developed, along with their corresponding dashboards: Platform for Urban Modeling and Planning; Dynamic Energy Consumption Building Model; Climate-based Urban Human-Powered Comfort Model; Intelligent Mobility Model; and Building Integrated Agriculture Simulation Model. The models were integrated into the developed platform (learn more about it at https://ctechplatform.com/), which displays four verticals: Building Energy Consumption, Urban Comfort, Building Agriculture, and Intelligent Mobility. Each vertical features its respective dashboards.

Future Goals

The goal is to refine the C-Tech platform until it reaches full market readiness. This will involve testing the platform in various settings to gauge its effectiveness and pinpoint areas for improvement. To carry out this project, the platform/models were developed based on data solely derived from the city of Lisbon, in close collaboration with the City Council. To further enhance the platform's value, we will gather feedback from additional local councils. This approach ensures full implementation of the platform in every city, without location bias.

Sustainable Cities

13

Master students

2

PhD candidates

13

Peer-reviewed articles

12

Proceedings/ Conference papers

5.2
Overview of the Exploratory Projects

The third call for exploratory projects as part of MPP2030 resulted in funding eight projects, whose leading Portuguese entities' locations are shown in Figure 4, identified by color of the primary scientific area.

As the projects are currently in their incipient stages, there have not been any outputs or significant developments to report. A concise overview of each project within its respective scientific area is provided below.

Figure 4. Location of the Portuguese leading entities of the exploratory projects. The primary scientific area of these projects is coded by the color of the location pins:
Climate Science & Climate Change – orange;
Digital Transformation in Manufacturing – yellow;
Earth Systems: Oceans to Near Space – blue;
Sustainable Cities – green; and
Data Science - gray.
The autonomous regions are not presented on the map due to simplification, as no exploratory projects have been assigned to these regions. This decision was made to streamline the visual representation and does not reflect a lack of importance or consideration for the Azores and Madeira.

GNSS Atmospheric Tomography: Probing storms in a warming climate (GATO)

Objectives

Deploy a continuously operating dense GNSS network in a key climatic region, with a high frequency of storms, capable of near real-time atmospheric monitoring;

Explore the advantages of tomographic data assimilation to improve the understanding of processes in developing storms, and the skill of weather forecasts.

Climate Science and Climate Change

49 428,64 €

Recommended Funding

Main Contractor

FCiências.ID – Associação para a Investigação e Desenvolvimento de Ciências

Principal Investigator

Pedro Mateus

FCiências.ID – Associação para a Investigação e Desenvolvimento de Ciências

MIT Principal Investigator

Dhiman Mondal

Research Scientist, MIT Haystack Observatory

Co-Principal Investigator

Pedro Miranda

FCiências.ID – Associação para a Investigação e Desenvolvimento de Ciências

EXPLORATORY PROJECTS_

PEATMAP: A prototype model for the study of peatland distribution, ecology, and carbon dynamics in the Iberian Peninsula (IP) landscape mosaic

Objectives

Improve knowledge about the distribution of peatlands and swobs in the IP and its accurate mapping;

Assess the ecological status of the ecosystems and the existing peat types;

Develop a ground-truth peat-depth model across the peninsula;

Present a peatland classification that mirrors the real diversity and uniqueness of Iberian peatlands as a key nature-based solution to combat climate change.

Climate Science and Climate Change

32 055,08 €

Recommended Funding

Main Contractor

Instituto de Geografia e Ordenamento do Território da Universidade de Lisboa

Principal Investigator

César Dinis Capinha

Instituto de Geografia e Ordenamento do Território da Universidade de Lisboa

MIT Principal Investigator

Charles Harvey

Professor, MIT Department of Electrical Engineering and Computer Science (EECS)

Co-Principal Investigator

Johannes Hendricus Josephus Joosten

Institute of Botany and Landscape Ecology, University of Greifswald (Germany)

Accurate federated learning with uncertainty quantification for DER forecasting applied to power grid planning and operation

Objectives

Develop technologies to facilitate the planning and operation of electric grids with high penetration of distributed energy resources (DERs), while ensuring consumer privacy, and addressing previously unexplored topics related to developing prediction algorithms based on federated learning (FL), such as solar production forecasting.

Tackle challenges related to uncertainty quantification, considering the calibration of epistemic and random uncertainty.

The models developed will then be integrated into planning and operation tools to be used by distribution system operators (DSO).

Data Science

50 000,00 €

Recommended Funding

Main Contractor

Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento

Principal Investigator

Amâncio Lucas de Sousa Pereira

Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento

MIT Principal Investigator

Anuradha Annaswamy

Senior Research Scientist, MIT Department of Mechanical Engineering (MechE)

Co-Principal Investigator

Hugo Gabriel Valente Morais

Universidade de Lisboa (UL) - Instituto Superior Técnico - Instituto de Engenharia de Sistemas e Computadores

EXPLORATORY PROJECTS_

Next Generation of Digital "Concrete": Performance mix design and assessment of sustainable and circular cementitious composites

Objectives

Develop environmentally friendly cement-based materials that can satisfy the requirements for 3D printing. Pursue sustainability by partially replacing a significant fraction of the cement with locally available waste materials with no added value — namely glass powder, marble powder, and quartz powder, which already show promised results in previous works.

Digital Transformation in Manufacturing

49 945,00 €

Recommended Funding

Main Contractor

Faculdade de Engenharia da Universidade do Porto

MIT Principal Investigators

Randolph Kirchain
Principal Research Scientist, MIT Materials Research Laboratory (MTL) and Director, MIT Concrete Sustainability Hub

Hassam Azarijafari
Deputy Director, MIT Concrete Sustainability Hub

Principal Investigator

Ana Mafalda Matos
Faculdade de Engenharia da Universidade do Porto

Co-Principal Investigator

Mário Pimentel
Faculdade de Engenharia da Universidade do Porto

Pain and physical limitations perception for human-sensitive intelligent collaborative robotics

Objectives

Fill the knowledge gap on how to develop a human-robot collaboration (HRC) framework to assist both healthy and workers with musculoskeletal disorders (MSDs). Achieving truly adaptive HRC that autonomously adapts to different workers and tasks requires beyond state-of-the-art advances in perception and cognition, integrated with robot motion and control.

Digital Transformation in Manufacturing

49 999,97 €

Recommended Funding

Main Contractor

Universidade do Minho

Principal Investigator

Cristina Manuela Peixoto dos Santos
Universidade do Minho

MIT Principal Investigator

Mercedes Balcells-Camps
Principal Research Scientist, MIT Institute of Medical Engineering and Science (IMES)

Co-Principal Investigator

Alexandre Silva
Universidade do Minho

EXPLORATORY PROJECTS_

Machine learning-aided polymer metallization for the automotive industry

Objectives

Develop thin films of copper and chromium for the development of metallic surfaces on PLA and polycarbonate polymers, in a more sustainable and non-electrolytic way, through a good correlation between the experimental and machine learning outputs, using the magnetron sputtering (physical vapor deposition technique).

Digital Transformation in Manufacturing

49 990,49 €

Recommended Funding

Main Contractor

Universidade do Minho

MIT Principal Investigators

Rafael Gomez-Bombarelli
Assistant Professor, MIT Department of Materials Science and Engineering (DMSE)

Jeffrey Cheah
Career Development Chair, MIT School of Engineering

Principal Investigator

Sandra Mariana da Silva Marques
Universidade do Minho

Co-Principal Investigator

Maria José Bastos Pires de Lima
Universidade do Minho

Space operations, monitoring, and mapping explorer: a smart Orb-system

Objectives

Miniaturize and develop a robotic system based on UX-1Neo for Space;

Integrate sensors and give the ability to fly and navigate;

Test space maneuvers in a microgravity environment.

Earth Systems: Oceans to Near Space

49 830,68 €

Recommended Funding

Main Contractor

INESC TEC

Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência

MIT Principal Investigator

Rohit Karnik

Tata Professor and Associate Department Head in Education, MIT Department of Mechanical Engineering (MechE)

Principal Investigator

Ana Cristina Pires de Oliveira

INESC TEC – Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência

Co-Principal Investigator

André Miguel Pinheiro Dias

INESC TEC – Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência

EXPLORATORY PROJECTS_

A digital framework to merge durability data, maintenance models, and energy retrofitting decisions

Objectives

Create a modeling framework for cities that supports the maintenance of the buildings' envelopes (roofs, façades, and window frames) to meet occupants' needs while further ensuring that a city meets its building-related carbon emission reduction target for 2035 and beyond.

Sustainable Cities

49 786,07 €

Recommended Funding

Main Contractor

Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento

Principal Investigator

Ana Filipa Ferreira da Silva Cigarro Matos
Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento

MIT Principal Investigators

Christoph Reinhart
Professor, MIT Department of Architecture

Co-Principal Investigator

José Dinis Silvestre
Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento

5.3
Overview of the Seed Projects

In February 2023, a call for innovative seed projects that involved collaborative research with Portuguese researchers was announced to the MIT community. The call for seed grant proposals yielded 31 proposals. All submitted proposals have been reviewed by MPP Area Leaders and other members of the MIT community with relevant expertise, and the Program Directors selected those to receive awards. The 2023 seed grants have been awarded to 16 projects (Figure 5) for one year to researchers from 10 MIT departments and programs, representing four schools, the MIT Stephen A. Schwarzman College of Computing, and the MIT Haystack Observatory. In addition, three existing seed projects were extended with additional funding to help finish the research.

An overview of the main information regarding the seed projects is provided below.

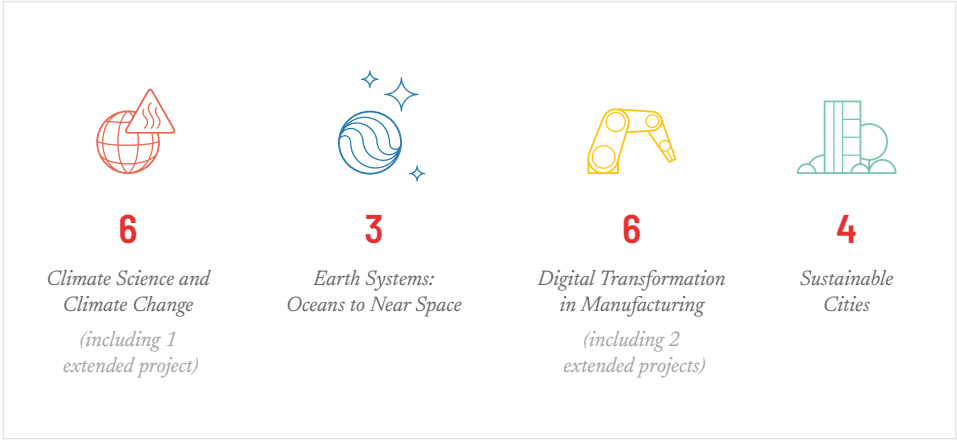


Figure 5. Number of projects awarded 2023 seed grants, by research area.

SEED PROJECTS_

Unlocking carbon sequestration in abandoned croplands with satellites and AI

This research proposal aims to address uncertainties surrounding the carbon sequestration potential of abandoned croplands, a strategic focus for climate change mitigation that avoids conflicts with food security and offers co-benefits such as enhanced biodiversity and climate preparedness. We propose to map cropland abandonment globally and quantify aboveground biomass and soil carbon accumulation under different restoration scenarios (active vs. passive restoration). Using a combination of remote sensing, Geographical Information System (GIS) mapping, and meta-analysis techniques, we will identify regions with the highest carbon sequestration potential and assess the impacts of various factors on carbon accumulation rates. The outcomes of this research will contribute to the development of evidence-based policies and strategies for climate change mitigation and land management, highlighting the most effective restoration approaches to maximize carbon sequestration, biodiversity enhancement, and climate preparedness.

Climate Science and Climate Change

MIT Principal Investigator

Cesar Terrer
Assistant Professor, MIT Department of Electrical Engineering and Computer Science (EECS)

Portuguese Collaborator

Cristina Cruz
Assistant Professor, Universidade de Lisboa & cE3c – Center for Ecology, Evolution, and Environmental Change

Climate change adaptation in response to wildfires

Wildfire smoke causes substantial negative environmental and public health consequences and bears high social and economic costs. This research project is aimed to fill a major gap in the literature by investigating the effect of wildfire smoke on migration. Thus, we analyze how humans adapt to the increased frequency and severity of wildfires due to climate change by choosing to change their location of residence. Using annual county-to-county migration flow data from the United States Internal Revenue Service combined with satellite data on wildfire smoke, we estimate how persistently high particulate matter concentrations cause people to move within and out of California. Understanding how wildfire smoke impacts migratory patterns entails important lessons concerning labor and housing markets, fiscal policy, and environmental justice.

Climate Science and Climate Change

MIT Principal Investigator

Christopher Knittel
Professor, MIT Sloan School of Management

MIT Co-Principal Investigator

Benjamin Krebs
Postdoctoral Associate, MIT Energy Initiative (MITEI)

Portuguese Collaborators

Maria A. Cunha e Sá
Full Professor, NOVA School of Business and Economics (NOVA SBE), Lisbon

Renato Rosa
Assistant Professor, Centre for Business and Economics Research (CeBER), University of Coimbra

Joana Silva
Associate Professor, Católica Lisbon School of Business & Economics

SEED PROJECTS_

Quantifying toxic air pollution and exposure from wildfires

Wildfires that degrade air quality are increasing in intensity worldwide, and in Portugal in particular. However, the human exposure implications of the specific toxic pollutants that can be produced or mobilized by wildfire smoke is uncertain. The objective of this work is to estimate the relative impact of large wildfire emissions to overall exposure-related metrics for two toxic substances emitted by wildfires: polycyclic aromatic hydrocarbons (PAHs) and mercury (Hg). To do so, we will use global-toregional atmospheric modeling and data analysis to simulate the emission and dispersion of these two pollutants from large wildfires, focusing on southwestern Europe. We will use improved emission inventories and model-measurement comparisons to improve the ability of models to accurately represent these substances and their impact from wildfires. We will then calculate wildfire contributions to exposure-relevant metrics, and explore modeling of future climate impacts.

Climate Science and Climate Change

MIT Principal Investigator

Noelle Selin

Professor, MIT Institute for Data, Systems, and Society (IDSS), and MIT Department of Earth, Atmospheric & Planetary Sciences (EAPS)

Portuguese Collaborator

Alexandra Monteiro

Principal Researcher, University of Aveiro

Probing extreme weather events in a warming climate with GNSS and atmospheric reanalysis in the Azores Islands

Wildfire smoke causes substantial negative environmental and public health consequences and bears high social and economic costs. This research project is aimed to fill a major gap in the literature by investigating the effect of wildfire smoke on migration. Thus, we analyze how humans adapt to the increased frequency and severity of wildfires due to climate change by choosing to change their location of residence. Using annual county-to-county migration flow data from the United States Internal Revenue Service combined with satellite data on wildfire smoke, we estimate how persistently high particulate matter concentrations cause people to move within and out of California. Understanding how wildfire smoke impacts migratory patterns entails important lessons concerning labor and housing markets, fiscal policy, and environmental justice.

Climate Science and Climate Change

MIT Principal Investigator

Dhiman Mondal
Research Scientist, MIT Haystack Observatory

MIT Co-Principal Investigators

Pedro Elosegui
Research Scientist, MIT Haystack Observatory

Lucy Brock
Undergraduate Student, MIT Department of Earth, Atmospheric & Planetary Sciences (EAPS)

Portuguese Collaborators

Pedro Mateus
Professor, Faculty of Science, University of Lisbon

Virgilio Mendes
Professor, Faculty of Science, University of Lisbon

Additional Collaboration

Scott Paine
Research Scientist, Center for Astrophysics, Harvard University and Smithsonian Institution

SEED PROJECTS_

Analytics for climate-resilient multi-energy systems via DER integration and demand response

This collaborative project develops a new predictive and prescriptive analytics framework for building climate-resilient multi-energy systems. Our work integrates the planning of distributed energy resources (DERs) and demand response (DR) programs for improving the resiliency of renewables-dominant power systems in the face of extreme events. First, we develop a two-stage stochastic optimization approach to allocate DERs and grid hardening resources in the pre-disaster phase, and trigger DR and restoration operations in the post-disaster phase. Second, we consider resiliency and low-carbon operations as design requirements for DR programs and comparatively evaluate aggregator-coordinated and automatic response mechanisms for various disruption scenarios. Third, we refine our allocation and response strategies to include endogenous uncertainty representation, which captures the impact of planning decisions on the key parameters governing energy demand and renewable supply. Our research will contribute to a decision-support system and practical strategies for climate-resilient energy systems in Portugal and New England.

Climate Science and Climate Change

MIT Principal Investigator

Saurabh Amin
Professor, MIT Department of Civil and Environmental Engineering (CEE)

Portuguese Collaborator

Filipe Joel Soares
Centre for Power and Energy Systems (CPES) of INESC-TEC (University of Porto), Senior Researcher, Doctor

Intelligent seaweed farming management system based on microbiome data

Seaweed aquaculture has the potential to feed the world, fight climate change, and restore our ocean. However, the rapid growth of seaweed production is accelerating the spread of infectious diseases that harm the seaweed and lead to socioeconomic instability due to the loss of the farming income. With the funding from this proposal, we will develop a machine learning-based aquaculture monitoring and response system that uses microbiome data to predict and prevent disease. Our system will reduce livestock losses, lead to cost savings, and promote sustainable food production. We will build our system based on microbiome data. Microbiome population and diversity are indicators of the health and resilience of the seaweed ecosystem because the microbiome changes and adapts swiftly to the earliest indication of harmful pathogens. This enables our sensor system to predict disease outbreaks before they occur and warn seaweed farmers to take timely preventative actions.

Climate Science and Climate Change

MIT Principal Investigator

Stefanie Mueller
Associate Professor, MIT Department of Computer Science and Artificial Intelligence Laboratory (CSAIL) and MIT Department of Engineering and Computer Science & Mechanical Engineering

MIT Co-Principal Investigator

David Wallace
Professor, MIT Department of Mechanical Engineering (MechE)

Portuguese Collaborator

Rodrigo Costa
Assistant Professor at the Department of Bioengineering, Técnico

Industry Collaborators

GreenWave *(USA)*

Aqualvor *(Portugal)*

AlgaPlus *(Portugal)*

SEED PROJECTS_

Continuous commissioning for energy-efficient buildings

A key component for tackling climate change is ensuring that buildings are energy efficient and sustainable. A significant portion of building energy consumption is wasted due to improper operation and control. For instance, in commercial buildings and university campuses, energy is often wasted in heating or cooling unoccupied spaces. Furthermore, even an initially "optimal" system will not operate according to design specifications indefinitely as equipment degrades and building usage evolves over time. This project will develop a new approach for "continuous commissioning" of building facilities to ensure that buildings operate at peak efficiency with a minimum expense in sensors and computation. This project will develop a real-time building monitoring and control framework that provides actionable information to operators. The solution aims to be low-cost and scalable, while helping operators better maintain existing equipment and make well-informed decisions for building equipment and control retrofits.

Sustainable Cities

MIT Principal Investigator

Steven Leeb
Professor, MIT Department of Electrical Engineering and Computer Science (EECS)

MIT Co-Principal Investigators

Les K. Norford
Professor, MIT Department of Architecture

Daisy H. Green
Post-Doctoral Associate, MIT Department of Architecture

Portuguese Collaborator

Ricardo Gomes
IST RC, Instituto Superior Tecnico, Lisboa

Demand-responsive transit: why do they fail, and how (and if) can they succeed?

With the fast development of information and communication technologies, demand-responsive transit (DRT) is considered salvation for failed and expensive traditional fixed-route public transport services, especially in low-density areas. However, evidence shows that in many cases these services failed to stand up to the promise and saw ridership that was not substantially higher than the system they replaced without any reduction in operational costs. However, future technological development of automated vehicles should bring a massive cost reduction that might change the course of DRT.

In this project, we analyze both the operational side of automated DRT through optimization methodologies and the economic regulation and incentives through game theory and bi-level programming to optimize accessibility for transit-deprived areas. An agent-based simulation is used to validate the results. We intend to introduce a systematic approach for evaluating real-time incentives, such as tolling and subsidies, to achieve desirable user and system-level performance.

Sustainable Cities

MIT Principal Investigator

Moshe Ben-Akiva
Professor, MIT Department of Civil and Environmental Engineering (CEE)

MIT Co-Principal Investigator

Amir Brudner
Postdoctoral Researcher, MIT Department of Electrical Engineering and Computer Science (EECS)

Portuguese Collaborators

António P. Antunes
Professor, CITTA, Department of Civil Engineering, University of Coimbra, Portugal

Gonçalo Santos, Dr.
Postdoctoral researcher at CITTA, Dept. of Civil Engineering, University of Coimbra, Portugal

Anne Patricio
Ph.D. student at CITTA, Dept. of Civil Engineering, University of Coimbra, Portugal

SEED PROJECTS_

Large-scale drone delivery for future sustainable cities

The goal of this project is to develop a computational framework to advance the fundamental science of safely routing and planning the motions of a large fleet of unmanned autonomous vehicles (UAVs) in complex urban environments. The approach consists of three major components: 1) high-fidelity computational fluid dynamics (CFD) to obtain realistic wind conditions in urban scenarios, 2) a novel routing algorithm that allows the UAVs to temporarily ride public ground transit vehicles to conserve energy, and 3) a rigorous mathematical motion planning framework to navigate UAVs safely and effectively in realistic urban windy environments given a set of user constraints. The outcome of the work will facilitate the adoption of delivery of goods by UAVs, which has the potential to revolutionize logistics by shortening last-mile delivery times and improving reliability. The technical approaches explore the use of machine learning combined with rigorous mathematics to provide provable correctness guarantees.

Sustainable Cities

MIT Principal Investigator

Chuchu Fan
Assistant Professor, MIT Department of Aeronautics and Astronautics (AeroAstro)

MIT Co-Principal Investigator

Adrián Lozano-Durán
Draper Assistant Professor, MIT Department of Aeronautics and Astronautics (AeroAstro)

Portuguese Collaborator

António Pedro Aguiar
Full Professor at the Dept. of Electrical and Computer Engineering; Head of Research Center for Systems and Technologies (SYSTEC); Faculty of Engineering, University of Porto

A new workflow and approach to HVAC system design and education

In order to reach a carbon neutral building stock, building heating systems have to be electrified. However, system selection often happens later in the design process when key decisions have already been locked in. To address this issue, this research aims to develop new workflows to effectively integrate the selection of heating ventilation and air- conditioning (HVAC) systems earlier into the design process. We will design and test a series of tools that enable architects to compare a variety of commercial HVAC systems and implement them into their projects during that phase. These new workflows will be tested in architectural education and practice alike.

Sustainable Cities

MIT Principal Investigator

Christoph Reinhart
Professor, MIT Department of Architecture

Portuguese Collaborator

Paulo Ferrão
Professor of Instituto Superior Técnico, University of Lisbon; President of IN+, Center for Innovation, Technology and Policy Research.

SEED PROJECTS_

Space weather modeling: a coupled ionosphere-thermosphere physics-based approach

This project aims to develop an open-source physics-based model of the ionosphere-thermosphere system to enable real-time forecasting of neutral and charged particle densities, which is critical for predicting atmospheric drag and modeling radio signal propagation for low-Earth orbit satellite operations. The proposed model builds upon MIT's physics-based model of the neutral thermosphere by incorporating charged particles and complex chemical reactions of various species.

The Instituto de Astrofísica e Ciências do Espaço will collaborate on this project to provide valuable validation data and complementary expertise in space physics. The approach will be validated using observational data as well as experimental data from satellite measurements and global navigation satellite system receivers under different space weather conditions. The project's objective is to provide a reliable and efficient solution to the challenges faced by low-Earth orbit satellite operators, particularly the unpredictability of solar activity that drives highly variable space weather.

Earth Systems: Oceans to Near Space

MIT Principal Investigator

Jaime Peraire
Assistant Professor, MIT Department of Aeronautics and Astronautics (AeroAstro)

MIT Co-Principal Investigators

Jordi Vila-Perez
Postdoctoral Associate, MIT Department of Aeronautics and Astronautics (AeroAstro)

Ngoc-Cuong Nguyen
Principal Research Scientist, MIT Department of Aeronautics and Astronautics (AeroAstro)

Portuguese Collaborators

Anna Morozova
Researcher, Inst. de Astrofísica, U. of Coimbra

Teresa Barata
Researcher, Inst. de Astrofísica, U. of Coimbra

Development and integration of a new sensor for *in situ* marine sediment characterization

Proposed activities to extract vast critical mineral resources from the deep seabed, mostly in international waters, will generate sediment plumes whose impact on the marine environment is currently unclear. The size and settling velocity distributions of the suspended sediment are crucial parameters that govern the plume dynamics and extent, and in situ measurements of these parameters is essential due to the fragile and cohesive nature of marine sediment. The ENDLab research group at MIT has recently developed and tested a Real-Time Size and Settling Velocity (RTSSV) sensor for in situ measurements of sediment morphology and settling velocity distribution at abyssal depths. For this project, the MIT team will collaborate with the newly formed EU-funded TRIDENT program, which is being coordinated by INESC TEC. The objective is to develop and integrate the RTSSV with novel sensing platforms being developed by TRIDENT for real-time environmental monitoring.

Earth Systems: Oceans to Near Space

MIT Principal Investigator

Thomas Peacock
Professor, MIT Department of Mechanical Engineering (MechE)

Portuguese Collaborator

Eduardo Silva
Professor, INESC TEC

SEED PROJECTS_

Semantic simultaneous localization and mapping for underwater vehicles

Semantic simultaneous localization and mapping (SLAM) refers to the ability of a robot to build object-based models of the environment, accounting for uncertainty. To do so, a robot must combine continuous geometric information about its trajectory and object locations with discrete semantic information about object classes. We are investigating several gaps in existing capabilities, including: (1) the ability to robustly estimate both the shape and the pose of objects, (2) the ability to transfer vision techniques from terrestrial scenes to underwater scenes, and (3) the ability to create self-improving perception system for robots using semi-supervised machine learning, with location information from SLAM as a supervisory signal.

Earth Systems: Oceans to Near Space

MIT Principal Investigator

John Leonard

Professor, MIT Department of Mechanical Engineering (MechE)

Portuguese Collaborator

Nuno Alexandre Cruz

Senior researcher at the Ocean Systems Group, Lecturer at the Dept. of Electrical and Computer Engineering, FEUP, Porto

Generative factory modeling for improved productivity, quality, and sustainability

Designing factories that efficiently deploy digitally controlled equipment, such as robotics and 3D printing, is essential to making manufacturing more efficient, sustainable, and locally-oriented. However, current design tools are not accessible to small and medium-sized manufacturers — which comprise over 95% of the supply chain in most developed nations, including the United States and Portugal — and therefore many manufacturers lack the ability to make data-driven decisions to invest in automation.

The goal of this project is to create a more capable and affordable factory simulation approach, integrating automated generation of simulation models with machine learning methods for generative design of factories, and so enable more resilient, distributed production networks. To properly incorporate principles of quality management, both at the factory and supply chain levels, we will collaborate with colleagues from U. Minho. We plan to apply this tool with companies in Portugal, as well as in Massachusetts, and share the outcomes across the collaboration. The results will help guide manufacturers to make investments in advanced equipment that improves productivity and reduces their carbon footprint, and the tool will be further extensible to simulate highly distributed production systems within future cities, or even in space.

Digital Transformation in Manufacturing

MIT Principal Investigator

John Hart
Professor, MIT Department of Mechanical Engineering (MechE)

Portuguese Collaborators

Paulo Sampaio
Professor de Qualidade e Excelência Organizacional, University of Minho

Bárbara Rangel Carvalho
Assistant Professor, University of Porto

Integrating modern tools for materials simulations into solidification models for additive manufacturing and welding

SEED PROJECTS_

Predictive models of solidification require atomic-scale resolution of the material structure and chemistry. It is surprising, then, that none of the methodologies for computer-aided engineering employed in industry account for the underlying atomistic nature of the solidification process. Here we propose to develop a rigorous approach to integrate this atomic-scale information into practical solidification models that can be used for additive manufacturing and welding-related applications. Our goal is to elevate the predictive capabilities of these models such that the time-consuming process of experimental trial and error employed in the development of new metallic alloys can be greatly reduced.

Digital Transformation in Manufacturing

MIT Principal Investigator

Rodrigo Freitas
Assistant Professor, MIT Department of Materials Science and Engineering (DMSE)

Portuguese Collaborator

João Pedro Oliveira
Assistant Professor, Department of Materials Science Faculdade de Ciências e Tecnologia Universidade NOVA de Lisboa

Modernizing photovoltaic textiles for scalability and wearable applications

Thanks to photovoltaic (PV) textiles, solar power can be harnessed in new ways, such as in bags, cloths, curtains, tents, sails, or construction tarps. However, the existing options for PV cells are either too expensive or not scalable. Using inkjet printing, an affordable and widely used technique in the textile industry, we can fabricate PV cells on large textile surfaces. It would contribute to modernizing Portuguese textile manufacturing and promote sustainability, or even eco-tourism.

In this proposal, we outline the steps involved in our solution and how we plan to collaborate with academia and industry in Portugal to make this a reality. Ultimately, this project can participate in making Portugal a hub for high-tech innovation and revolutionize human-computer interfaces such as self-powered smart sensing gloves for augmented/virtual reality.

Digital Transformation in Manufacturing

MIT Principal Investigator

Joseph Paradiso
Professor, MIT MediaLab, Program in Media Arts and Sciences

Portuguese Collaborator

Ana Baptista
FCT NOVA

SEED PROJECTS_

Computational tools and new materials for industrialization of additive manufacturing

Professor John Hart's research, supported by the MIT-Portugal Program, focuses on new computational tools and experimental techniques to explore the coupled design-material-economic capabilities of additive manufacturing (AM). In the past two years, his team has developed a physics-based throughput and cost modeling framework for AM, with application to laser-based techniques used widely in industry. Also, the team has invented a high-throughput workflow to predict the mechanical properties and processability of aluminum alloys for use in laser-based AM, and has demonstrated a new alloy composition that leverages metastable phases to retain superior strength than established aluminum alloys. In addition to these topics, the team has formed collaborations with researchers in Portugal focused on quality management in digital manufacturing, applications of AM to architecture and construction, and high-speed extrusion AM of polymer materials.

Digital Transformation in Manufacturing

MIT Principal Investigator

John Hart
Professor, MIT Department of Mechanical Engineering (MechE)

Portuguese Collaborator

Paulo Sampaio
Professor, University of Minho

Improving voxel-based 3D printing for robotic applications

We will investigate how we can manipulate 3D printed objects at the voxel level to produce 3D prints with accuracies unachievable in any other way. Our focus will be on the creation of novel 3D printable robotic actuators, such as the fingers of a robotic hand, and showing increased grasping precision, but our technique can also be used in a wide range of other applications. In the traditional workflow, when 3D printing a model, the model geometry is first translated into layers and voxels using software called a slicer, and then 3D printed. Inaccuracies occur as the slicer software tries to match the 3D geometry to a grid-like voxel pattern (for Polyjet 3D Printing), which leads to wrong material properties in the 3D print. We address this issue by instead assigning materials to the 3D printed voxels during the modeling stage.

Digital Transformation in Manufacturing

MIT Principal Investigator

Stefanie Mueller
Associate Professor, MIT Department of Computer Science and Artificial Intelligence Laboratory (CSAIL) and MIT Department of Engineering and Computer Science & Mechanical Engineering

Portuguese Collaborator

Pedro Neto
Assistant Professor, Department of Mechanical Engineering, University of Coimbra

SEED PROJECTS_

Geometric deep learning-enhanced multi-physics digital twins for complex product design

Designing better wind turbines is critical to improving sustainable renewable energy generation. A key challenge is the time-consuming multi-physics simulations of the turbine that limit exploration of many design options. We propose a geometric deep learning approach to generate surface and volumetric meshes for fluid and structural simulations. By accelerating computational fluid dynamics and finite element analysis simulations, our proposed methods will improve the accuracy and time taken to complete wind turbine design analysis by orders of magnitude. The methods developed will be broadly applicable to applications with solid mechanics and fluid dynamics problems. These fundamental contributions to machine learning-driven meshing will also help accelerate innovation for our multiple industry partners in Portugal.

Digital Transformation in Manufacturing

MIT Principal Investigator

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Polytechnic of Porto

Sérgio Tavares
University of Aveiro

5.4
Scientific meetings

The MPP Coordination Office has been instrumental in facilitating a series of events that not only monitor the progress of MPP's sponsored projects but also actively contribute to their long-term sustainability. The emphasis on community-building, collaboration, and forward-thinking strategies underscores the MPP community's commitment to innovation and enduring impact. The MPP Coordination Office has remained dedicated to fostering an environment where MPP projects not only thrive during their active phases, but also pave the way for a resilient and collaborative future.

In this pursuit, the MPP Coordination Office organized a series of crucial events and meetings. These activities aimed to provide valuable insights, updates, and a collaborative platform for MPP's projects.

Meeting with Nuno Alves from ANI and Flagship Forum

The year kicked off with a pivotal forum between Nuno Alves from the National Innovation Agency (ANI) and the flagship projects. This exclusive session provided MPP's researchers with a direct line of communication to an ANI representative deeply embedded in these consortia. The agenda covered procedural queries on ongoing flagship projects and introduced potential candidates to the new 2023-24 Work Program. Notably, key changes in funding mechanisms were highlighted, setting the stage for informed decision-making among the MPP community.

Figure 6. Flagship projects follow-up meeting at DSTelecom, where the community of MPP participated.

Flagship projects follow-up meeting at DSTelecom

Continuing the momentum, March witnessed a follow-up meeting at DSTelecom (Figure 6), focusing on the progress of ongoing flagship projects. This engagement served as a platform for project leaders to discuss advancements, challenges, and strategic approaches. The entire community of MPP was invited to attend, and MPP's PhD students participated as well. The collaborative environment promoted by the MPP Coordination Office ensured that the projects were not only on track, but also aligned with sustainability goals beyond the MPP funding period.

Final workshop for Transformer flagship

The final workshop for the Transformer project took place on June 28. This event, driven by the Transformer project itself, marked the conclusion of their efforts. It

wasn't just a review of achievements but also an opportunity to strategize for the project's sustainability post-MPP funding.

Final workshop for K2D flagship at DSTelecom

In parallel, the K2D flagship project organized its final workshop at DSTelecom on June 30. Like the Transformer workshop, this event aimed not only to showcase the project's outcomes but also to stimulate discussions around sustainability and future opportunities. Fostering a sense of community, networking, and identifying future synergies among participants were emphasized. The MPP Coordination Office acknowledges the importance of these workshops in nurturing a community spirit and promoting collaboration beyond project timelines.

Encontro Ciência

July 5 witnessed the MPP community coming together at Encontro Ciência. This encounter provided a unique space for flagship projects' researchers, collaborators, and stakeholders to exchange ideas, share insights, and explore potential synergies in an environment that encouraged interdisciplinary discussions, reinforcing the interconnectedness of the MPP projects.

Final workshop for C-Tech

As summer ended, the C-Tech flagship project held its final workshop on Sept. 21. Like previous flagship workshops, the emphasis was on project accomplishments and the development of strategies for sustained growth.

Annual MPP Conference – commemorating flagship achievements

Reflecting the MPP2030 strategic shift, the conference highlighted the commendable achievements of the seven flagship projects, each under the leadership of industry partners, collectively representing an investment of nearly 24 million euros. The zenith of the projects' activity period manifested during the Annual MPP Conference on Sept. 22, a gathering focused on celebrating the achievements of the MPP's flagship projects. This year, 2023, stood as a significant milestone in the MPP journey, marking the successful culmination of these pioneering endeavors. The conference, singularly focused on collaborative research, expounded on its role in fortifying Portugal's research core and contributing substantively to its competitiveness and innovative prowess. Recognizing the essential contributions of the Portuguese Foundation for Science and Technology and the Portuguese Ministry of Science, Technology, and Higher Education, the event underscored the innovative collaboration between MIT and Portuguese academic institutions, research entities, and industry. This collaboration, a transformative force, has decisively influenced Portugal's research, innovation, and educational landscape. The flagship projects — Aeros Constellation, C-Tech, K2D, NewSat, Operator 4.0, SNOB 5G, and Transformer 4.0 — played an instrumental role in fostering connectivity between academia, industry, and MIT. They exemplify the transformative potential inherent in science, technology, and higher education, significantly shaping Portugal's research landscape. Their collaborative ethos, innovation, and enduring impact on the MPP community and beyond remain pivotal aspects of this historical chapter in the Program's narrative.


GYRO
064.1 °
ROT
7.0 °/min
WIND
True
6.7 m/s
DEPTH
20.3 m
HDG - MAG 1 064.1°
STW - DLOG 1 1.9 kn
COG - DGPS 1 077.5°
SOG - DGPS 1 1.9 kn
POSN - DGPS 1
38° 41.255 N
009° 11.788 W
TIME (UTC)
13:14:18
NAV SLAVE
ECDIS MASTER
CCRP: CONNING
CURSOR POSITION
38° 43.186 N R BRG: 278.6°
RNG
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GROUND STAB
MASTER S1
TX
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06

Education

To tackle the most complex challenges that society faces it is crucial to nurture human talent by expanding knowledge with state-of-the-art science and technology, and to promote critical thinking. Since its creation, MPP has been investing in the advanced training of PhD candidates by offering education initiatives that enhance their minds and knowledge.

Historically, MPP has offered trans-disciplinary education curricula in seven graduate education programs — four PhD and three executive master's — across four focus areas: Bioengineering Systems, Engineering Design and Advanced Manufacturing, Sustainable Energy Systems, and Transportation Systems. The current phase of the Program brought a significant shift in the education programs. A collaboration protocol established with FCT enabled awarding PhD research grants under MPP, promoting the development of critical mass in the strategic areas relevant to MPP2030: Climate Science & Climate Change; Earth Systems: from Oceans to Near Space; Digital Transformation in Manufacturing; and Sustainable Cities, with a strong link to Data Science. Another important difference with the MPP's previous educational programs is that the recipients of an MPP2030-FCT fellowship may enroll in any doctoral program offered at Portuguese universities that best suits their research interests to obtain a doctoral degree at those universities.

In 2023, several initiatives were implemented to recruit new PhD candidates, promote networking with MPP PhD candidates, and improve their transversal skills.

6.1 Call for MPP2030-FCT PhD grants

From February to March 2022, a new call for MPP2030-FCT PhD grants was opened to award 10 PhD grants. Due to the limited number of fellowships available, the Program's management decided to dedicate the 2023 call to reinforce research in Climate Science & Climate Change.

The call received 75 applications from 14 different nationalities. With respect to gender balance, 60% of the applications were from male candidates, following the general gender imbalance in favor of men that still exists in engineering fields. Figure 7 shows a summary of the applicants' profiles in terms of gender and nationality.

To better disseminate the call and inform potential candidates of the call's requirements, the MPP Coordination Team organized an online information session. The session joined 35 prospective PhD students from different countries.

The proposals were reviewed by an evaluation panel (Table 1) specifically set up for this call. The panel consisted of experts with acknowledged experience and scientific merit, and followed the criteria announced on the opening notice of the call.

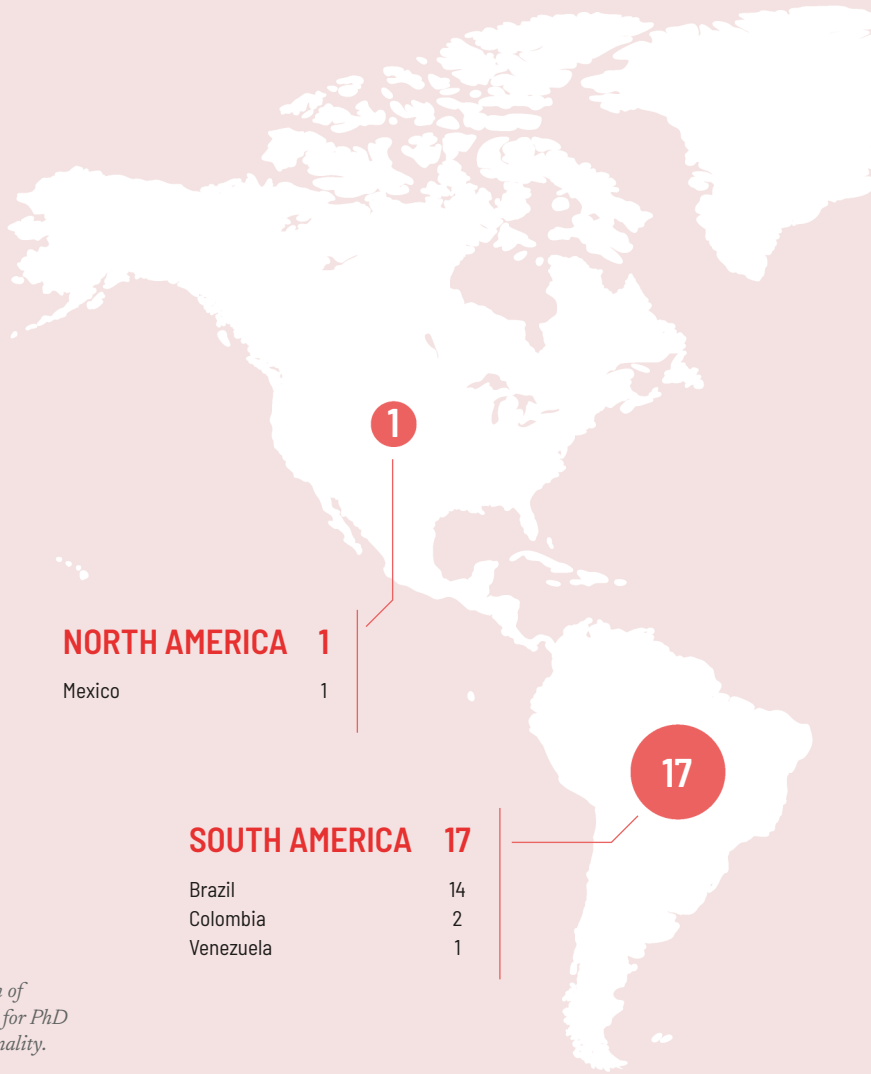
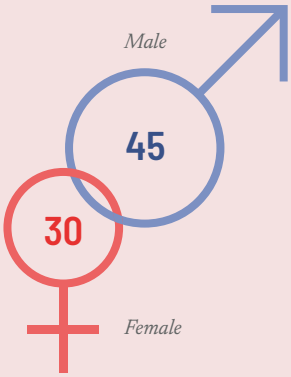
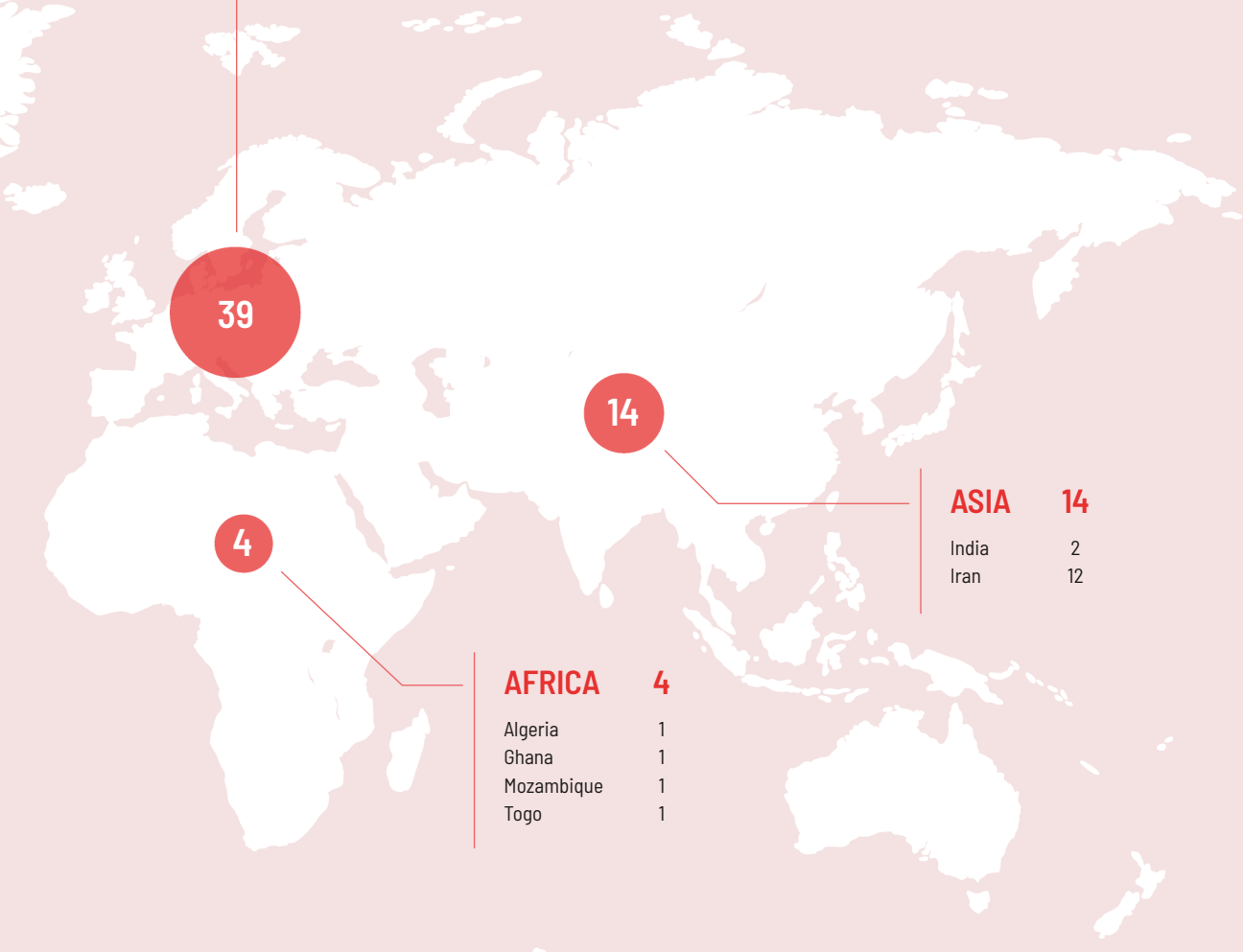


Figure 7. Characterization of applicants to the 2023 call for PhD grants by gender and nationality.



EUROPE 39

Denmark	1
Luxembourg	1
Portugal	35
Turkey	2



ASIA 14

India	2
Iran	12

AFRICA 4

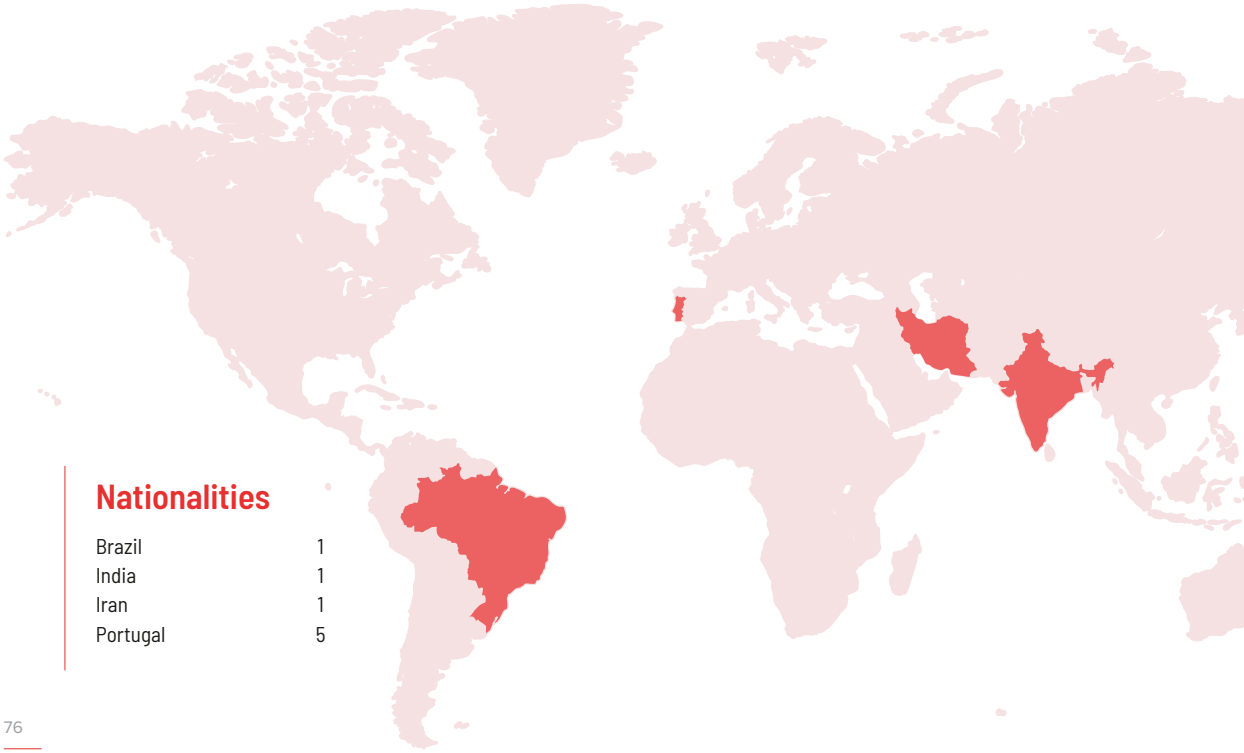
Algeria	1
Ghana	1
Mozambique	1
Togo	1

Table 1. Review panel for the 2023 call for MPP2030-FCT PhD Grants.

PANEL	COMPOSITION
Climate Science and Climate Change	**Júlia Seixas** */Chair* *School of Science and Technology, NOVA University Lisbon* **António Gomes Martins** *Institute for Systems Engineering and Computers, University of Coimbra* **João Carvalho Nunes** *University of Wageningen* **Rafaela Matos** *Laboratório Nacional de Engenharia Civil* **Rita Cardoso** *Faculty of Sciences, University of Lisbon*

Eight out of ten selected candidates accepeted the MPP2030 PhD grant. The awardees came from four different countries and were composed by 50% men and 50% women. Figure 8 shows a characterization of the students awarded with PhD grant in the 2023 call.

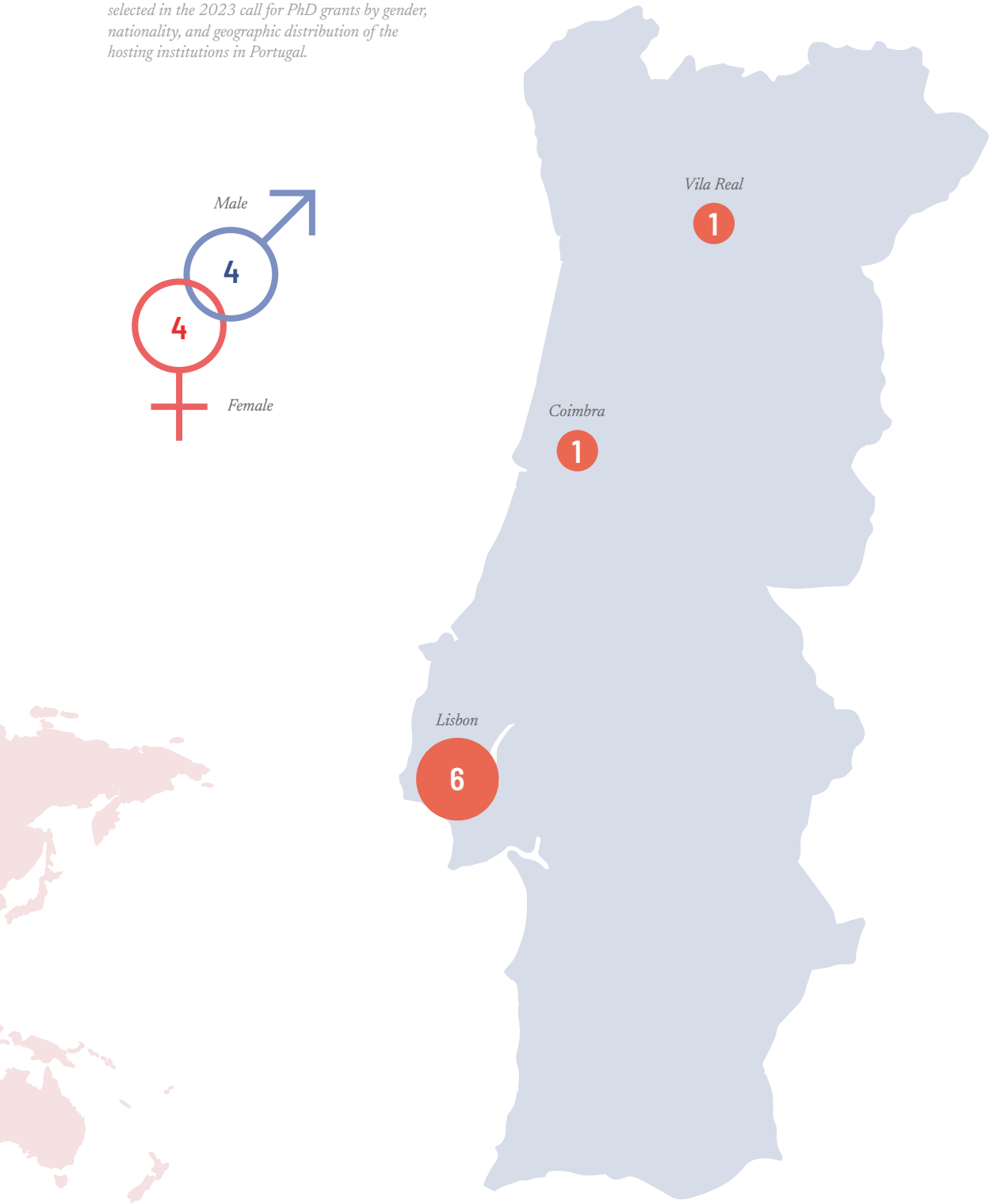
These students are now joining the community of 110 PhD students selected in the previous calls for PhD grants, opened under the framework of MPP2030.



Nationalities

Brazil	1
India	1
Iran	1
Portugal	5

Figure 8. Characterization of the PhD candidates selected in the 2023 call for PhD grants by gender, nationality, and geographic distribution of the hosting institutions in Portugal.



6.2
MIT Portugal PhD candidates

Detailed information of the MPP PhD candidates can be found here (cohorts 2020, 2021, 2022, and 2023). Research areas are represented by their respective icons, as shown in Figure 9.

Climate Science & Climate Change

Sustainable Cities

Earth Systems: Ocean to Near Space

Data Science

Digital Transformation in Manufacturing

Figure 9. Research areas of the program.

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Development of optimized compressed earth blocks

Currently, with growing concern about adopting more sustainable technical solutions, interest in earth as a building material has been renewed. This project's main objective is to develop compressed earth blocks (CEBs) capable of meeting the safety and durability requirements commensurate with the expectations of the modern world, contributing to the circular economy. Thus, it is expected to optimize the thermal and mechanical behavior of CEBs by incorporating industrial waste and by-products, especially construction and demolition waste. Preliminary results demonstrated the potential of replacing soil with concrete waste, as well as ceramic tile waste, in improving the mechanical strength of the CEB, without neglecting its thermal performance. The completion of the entire experimental campaign, including the assessment of the life cycle of the products developed, are scheduled for 2024.

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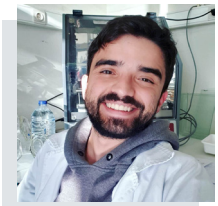
Energy, materials and health in regenerative processes of common architecture for sustainable cities

The Intergovernmental Panel on Climate Change urges industries to disrupt with changes. From design to build takes years, and decades to operate, making it a long-lasting machine that has a large impact on the climate and biodiversity and could be thought to regenerate the environment. The International Style, developed at the beginning of the 20th-century, paid no interest to climate or past knowledge. The digital turn in architectural design — computer simulation and performance optimization allows not only creating ideas and processes but also revisiting vernacular, historical, early-modern and counter-culture architecture and with accurate tools in the search for solutions for better daylight conditions, energy consumption or ventilation. This proposal looks for regenerative architecture schemes in three domains (Energy, Materials and Health) for rapidly changing: retrofitting and urbanizing, regions and those researching borders concepts like tradition/innovation, local/innovation to create a sustainable built environment. Finally, the proposal is in line with the New European Bauhaus and its local version the NEB Goes South that has been developed at the University of Porto and partners recently .

Optimization of municipal solid waste management systems towards sustainability

The project aims to develop (i) route optimization strategies using the northeast of Portugal as a model region and (ii) innovative technological solutions to valorize solid waste streams into carbon nanostructured materials (CNMs). So far, there has been a significant advance in the waste collection optimization. The best optimization algorithm, guided local search metaheuristic, was compared with other metaheuristic and heuristic algorithms and evaluated in terms of waste collection optimization. In addition, a project was submitted and approved, asking for financial support from Sociedade Ponto Verde to develop and explore a wireless sensors network to measure waste levels in dumpsters from Bragança. Regarding technological solutions for plastic recycling, real carbon nanotubes have already been synthesized using real solid plastic wastes as feedstock.



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2020_

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Bioclimatic design in urban context through the recovery of vernacular solutions

The contributions of this project are important in that they help all those involved in urban design and the renovation of outdoor public spaces to raise awareness and to search for technological solutions and processes that lead to sustainable construction, with the aim of adapting the built environment to climate conditions. These construction solutions must take into account urban bioclimatic aspects, naturally using sustainable materials. Vernacular solutions can also be included, as long as they are applicable in an urban context and can optimise the quality of a given outdoor public space.

Sludge treatment by earthworm-enhanced reed beds towards smart-cities

This study innovated a sustainable sewage sludge management system using a sludge treatment reed bed incorporating Eisenia fetida (W-STRB) and Arundo donax in smart city planning. Research spanned two sites: Beirolas WWTP and Horto greenhouse. Over a year, Beirolas underwent 24 sludge cycles at a consistent rate of 43 kg dry solid/m^2/year. Horto pilot compared Phragmites australis and Arundo donax across three sludge loading rates. Findings, published in peer-reviewed papers, encompassed meta-analysis reviews, water balance, drained water quality, and residual sludge assessments. Notably, W-STRB excelled in dewatering and enhancing drained water quality. The residual sludge, enriched in nutrients from the worm-plant synergy, holds promise for agricultural applications. This study marks a pivotal shift towards sustainable solutions with far-reaching environmental implications.

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Integrating the water-energy nexus in water supply systems optimization

Water supply systems are energy-intensive infrastructures that rely on water storage tanks and pumping systems to deliver water to consumers. The combination of three complementary trends offers water utilities opportunities for a novel positioning in the energy sector: the flexibility in scheduling pumping operations leading to implementing demand response strategies with benefits to water and energy utilities, current investments in renewable energy sources, new dynamic energy pricing in smart grids. Therefore, the main goal of this research is the development of novel mathematical programming models to cope with the increased complexity of real-time optimization of energy resources in WSS. One article has been published (10.1016/j.rser.2022.113140) and another is submitted. The model that has been developed has also been presented at prestigious research conferences.

2020_

Bio-inspired gyroid foams by machine learning optimization and meshless methods

An optimal multi-variable design can be achieved using machine learning (ML) by means of artificial neural networks, a core architecture of deep learning. A ML design will allow to estimate (based on geometric characteristics) the mechanical properties of gyroid foams. The ML framework will be combined with a bio-inspired tissue remodelling algorithm using meshless and will permit to propose optimized bone scaffold foams, aiming to design lighter and structurally optimized prosthesis.

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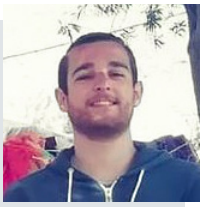
Framework for ergonomic assessment in collaborative robotic systems

Human-robot collaboration (HRC) has the potential to vastly improve the well-being of workers. The key lies in robots' understanding and adeptly responding to human cognitive and physical states, helping without overwhelming them. Thus, my focus revolves around creating a real-time ergonomic assessment framework. This innovative framework aims to foster HRC that proactively caters to human needs while being aware of their limitations and capabilities. Within the aim of this work, a human-centered methodology for selecting suitable industrial tasks for HRC was devised. This enabled the development of a test-bed prototype workstation to validate the proposed idea. Ergonomic thresholds for the physical aspects encompassed within this framework were already established. This entails creating cutting-edge technology and shaping a responsive system to enhance worker well-being in real-time.

iBiogeography: harnessing and measuring the power of big, unstructured data for biogeographical monitoring

The use of 'Big' unstructured data to assess and monitor the distribution of the world's species (i.e., 'iBiogeography') is in its infancy. This project aims to expand this field of research to improve existing knowledge about the geographical patterns and trends of the 'Culicidae' family (i.e., mosquitoes), a taxonomic group of particular concern for disease transmission. Firstly, I have already identified the current practices and drivers of the geographical reporting of non-native species in the unstructured sources (checklists). Secondly, I will develop an artificial intelligence-based metodology that will allow us to overcome the challenges of big unstructured data in ecology, taking advantage of recent developments in this field (new large language models like GPT). Finally, I will test how the distribution of culicids has already reshaped their distributions in response to global climate change, using unsctrutured data sources.



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The sustainability of portuguese cities for tourism

This work has as a main objective to identify the role that information and communication technologies can play in promoting sociocultural sustainability in creative tourism destinations. The main research topics are creative tourism and sociocultural sustainability, with ICT as a key promoter. Creative tourism as niche tourism offers a set of benefits in the territories where it is felt and this study highlights the sociocultural benefits that define sociocultural sustainability. ICT, fashion technologies, play a significant role in promoting various types of sustainability and this study highlights the social and cultural benefits. This investigation developed a mixed methodology with a study based on interviews with artisans and creative companies in Barcelos and Óbidos, just as this study implemented questionnaire surveys with visitors and residents of these two portuguese locations.

2020_

Intrusion detection system based on deep learning techniques for the internet of vehicles in smart cities

Modern vehicles are capable of sharing information (traffic conditions, entertainment services, and more) between other vehicles on the road. Because of this possibility, there are safety breaches that can put the vehicle and drivers/passengers at risk. Our work is focused on developing an intrusion detection system to increase security levels.

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2020_

Real time activation of ancillary services in the transmission network: enabling providers from the distribution system using a linear Model Predictive Control

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It is well known that the large-scale integration of demand side resources such as hydrogen electrolysers may provide useful to power grids' balancing. This thesis aims at analyzing the role of electrolysers on several ancillary services. Three distinct fields of knowledge are used in the thesis: (1) power systems dynamics, (2) energy markets and regulation and (3) control theory. Regarding (1) it was concluded that the existing ancillary services improve if provided by electrolysers, while results suggest that novel ancillary services provide may provide additional benefits in this regard. On (2) the economic analysis of integrating electrolysers in an existing international market is assessed. On (3) the goal is to provide novel control mechanisms to support the load frequency control problem.

The city "walking" to 2050. Braga as a Laboratory for a resilient and sustainable system

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The Mobility concept, as an objective to achieve the Goals defined for 2050, is the catalyst pretext to explore matters intrinsic to the domain of Architecture. The central research laboratory is Braga. However, in order to incorporate the current best practices in Sustainable Urban Mobility (SUM), five cities have been selected – Bielefeld, Oxford, Pontevedra, Barcelona and Copenhagen – which will serve as a reference to the proposed research strategy. This approach aims to explore the role of Architecture in the paradigm shift in Mobility and to evaluate the level of commitment to the goals set for 2050 and its resilience in the face of calamity situations, such as COVID-19. The potentialities to combine theory and practice are underlying the methodological principles and imbued with urban acupuncture strategies and projects (SoláMorales, 2008), that have a greater influence on changing social behaviors for SUM and on the replication capacity.

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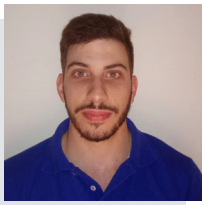
Promoting circular economy in buildings refurbishment – a methodological framework for design sustainability assessment

The lack of standardized practices for refurbishment design assessment in the context of Circular Economy (CE) is a challenge for decarbonizing existing building stock. To tackle this issue, this research develops a platform for practitioners, to facilitate standardized practices by assessing CE in building refurbishment design and global warming impact. It incorporates feedback from practitioners from early design stages, fostering a dynamic, multi-criteria process from a life-cycle perspective. A Circular Refurbishment Framework, already developed, employs an approach at building, neighborhood, and Urban Metabolism scales. A BIM-based plugin will automate quantitative CE assessment and the digital platform will characterize existing building stock and design refurbishment strategies, contributing to promoting CE practices for global warming mitigation.

2020_

AI based market model for renewable energy communities with storage sharing

This work proposes an innovative Market Model suited to the concept of a renewable energy community, in which its members can interact through Energy Sharing and share, among themselves, the storage capacity of their stationary batteries or electric vehicles, Storage Sharing. In order to obtain an optimum energy planning for the community, the proposed multi-agent Market Model will be based on Artificial Intelligence (AI), with a hierarchical control structure, which will base their decisions on technical and economic aspects, considering the community load and renewable production forecasts and the restrictions, imposed by each member, for the community participation. To ensure the applicability of the proposed Market Model, a long-range wireless communication module will be developed, based on the Internet of Things (IoT), which will allow the monitoring and control, in real time, of the parameters of each member of the community.



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2020_

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The role of synthetic data in improving supervised learning methods: the case of land use/land cover classification

In remote sensing, producing accurate Land Use/Land Cover (LULC) maps is challenging due to factors like data preprocessing complexities and limited labeled training data. This thesis addresses these challenges, focusing on automatic LULC classification tasks, particularly in data preprocessing. Novel techniques, including Active Learning (AL) and imbalanced learning, are developed to enhance machine learning (ML) performance in scenarios with sparse training data or rare classes. The contributions extend beyond remote sensing, proving effective in multidisciplinary classification problems. Open access datasets were utilized for testing, and all data pulling, preprocessing, and experiments are open sourced, emphasizing transparency and accessibility.

Neurostruct: machine learning in structural design

Scientific Machine Learning (SML) is a recent trend involving the application of physically or mathematically-informed Machine Learning (ML) techniques to speedup classical numerical computations that are central to many fields of engineering and science. The application of SML techniques to Structural Design (SD) allows designers to explore and assess different solutions quickly, avoiding the need to use traditional Finite Element Models, which, despite being very precise, are computationally expensive and quickly become the bottleneck for experimentation. My Ph.D. project will contribute to real-time 3D simulations in SD, which will facilitate the exploration of new designs and find optimal solutions without the need to have an expensive computational infrastructure. Furthermore, with this project, we will contribute to the connection of the Mechanical Engineering and ML community. These future cooperations will allow accelerating the digital transformation in manufacturing.

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InverseESA: inverse catalytic optimization for sustainable epoxide manufacture

This project aims to develop an inverse Machine Learning (ML) model to optimize industrial catalytic epoxidation of small alcohols and alkenes (ESA) towards sustainable manufacturig solutions. The project intends to embolden chemists and industries with a predictive model that eases reaction optimization, generating blueprints for optimal catalysts using biomass-based feedstock, avoiding fossil-fuel based raw materials. Thus far, we have developed an in-house ESA database, cataloging known ESA reactions with commercial and scientific value. We have built the first version of the ML model for predicting ESA reactions, validated by two proof-of-concept studies. The influence of various chemical features was studied and we are currently building the inverse generation tool based on the best chemical descriptors to design new catalysts.

2020_

Climatecollab: a collaborative graph for reproducible evidence of climate change

Reproducibility is paramount to science, and therefore it is crucial that the research community can reproduce the same results achieved by previous experiments. However, achieving computational reproducibility is a difficult task due to the multitude of computational environments available. Recreating the exact setting involving the same code, data sources, programming languages, dependencies, and so on is a significant challenge. In this work, we propose to build a methodology supported by a software platform that allows researchers to create, configure, and execute a diversity of computational experiments in a systematic and user-friendly manner. Furthermore, we can use our approach to create a capsule of the research experiment containing all the relevant information needed to re-execute the experiment without the platform and achieve the results of the experiment.

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Methane biofixation by microalgae/ cyanobacteria systems

This project aims at evaluating the ability of microalgae and cyanobacteria to fixate CH_4 (and the resulting CO_2), in order to convert it into biomass and high-value biocompounds. We evaluate the impact of an atmosphere batch cultivation system and different gas mixtures O_2, CH_4 and CO_2 concentrations on cell growth, morphology and pigment composition of Synechocystis sp. and Chlorella vulgaris. Only the conditions with CO_2 and CO_2 & CH_4 promote cell growth. However, CH_4 consumption does not occur. O_2 concentrations of 40% had a limiting effect on the cell growth of C. vulgaris and Synechocystis sp.. The headspace composition strongly affected the morphology and pigments content of Synechocystis sp. cells. We also move forward to the contingency plan related to cocultivation of methanotrophic bacteria (*Methylococcus geothermalis*) with cyanobacteria (*Synechocystis sp.*).

Optimization of electric vehicle charging for sustainable energy systems

As the world transitions to Electric Vehicles (EVs), a critical concern arises — the potential force on grids due to uncoordinated charging. This PhD focuses on developing decision-making approaches for EV charging scheduling, incorporating the intricate dynamics of user behavior, preferences, and the operational needs of grid. Our approach covers both economic and Quality-of-Service dimensions, ensuring overarching solutions for both users and grid. Active participation in international conferences has facilitated the dissemination of our findings and discussions on future applications. Additionally, a submitted review paper examines influential factors shaping EV charging behavior, proposing effective methods for addressing them. This PhD serves as a crucial link between academic research and real-world applications, contributing to the sustainable evolution of EV charging strategies.

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Mobility mining – from individual to group urban mobility patterns

An adequate description of travel demand in an urban area is crucial for mobility management, fostering an efficient urban metabolism. However, to this day, traditional data gathering was unable to effectively provide the needed decision support backed by statistically unbiased evidence for all kinds of trips. This thesis proposal takes a radically new perspective to demand characterization, relating the user' profile to a predictable trip pattern, herein using all big data from Online Social Media (OSM), namely text, images, social links, and geodata. From here, the definition of homophily relationships (clusters) for associated users concerning mobility will allow, much more than usual, adequate characterization of transportation demand within a specific urban area. The ultimate goal is to provide the needed data-backed tools to allow governance to successfully fulfill users' mobility needs, providing conditions to have a better sustainable environment for a city.

2020_

Multiple benefits of energy efficiency policies: exploring new assessment tools

Energy efficiency funding projects often rely on cost-benefit analysis, primarily focusing on energy and emissions savings during the operational phase while overlooking impacts across other lifecycle phases inherent to energy efficiency strategies. To address this limitation, our project seeks to pioneer a holistic approach. By combining mathematical programming models with Hybrid Input-Output Lifecycle Analysis (HIO-LCA), we aim to assist public decision-makers (DMs) in selecting and evaluating energy efficiency measures for the residential sector. This approach considers potential economic, energy, environmental, and social benefits throughout the lifecycle of EE measures, offering a more comprehensive assessment and enhancing their overall appeal. Testing will be conducted in the Portuguese residential sector, with plans for extension to any country with available supporting data.

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RNNs for operator occupational risk analysis based on multimodal biosignal

My PhD thesis has two major objectives: 1) Build a Deep Learning framework for Biosignals processing and knowledge extraction. 2) Develop algorithms for occupational risk evaluation from physiological data. Deep Learning architectures for timeseries have shown to be effective in biosignal processing and knowledge extraction, outperforming traditional methods. As such, I am building a biosignals processing "neural library", which comprises networks that execute functions such as signal denoising or filling missing values. These trained networks "learn" the basic characteristics of the signals and, by fine-tuning them to perform different tasks (namely, risk detection from physiological data), it is possible to transfer prior knowledge. So far, the major advances that were reached in my PhD thesis were: the development and publication of a systematic review that organized the existing methodologies regarding the assessment of cardiovascular load in the workplace; the creation of 2 physiological signal databases: one in a laboratorial context (n=24) and a second in a real industrial environment (n=46); the development and publication of a denoiser network for ECG signals, based on Gated Recurrent Units, which was the first step in the creation of the "neural library".

Microbiome therapy for improved coral health and reef resilience

Microbiome manipulation has been proposed as a key strategy to improve coral health. This project aims to examine the role of aquarium facilities in microbiome conservation, and to develop probiotics to promote octocoral health. Tropical octocoral species were sampled from a long-term aquarium and from the Red Sea. The bacterial taxonomic composition was assessed through cultivation-dependent and -independent analyses. A total of 152 bacterial strains were isolated and grouped into 27 genera. The collection comprised "hard-to-cultivate" genera such as Endozoicomonas and Flammeovirga. Phenotypic screenings for host-beneficial properties were performed on 25 bacterial isolates. Twenty-two isolates presented antioxidant properties, 19 antimicrobial and 15 carbohydrate degrading activities. Aquarium mesocosm experiments are ongoing to determine the putative probiotics effects on octocorals.

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A decision-making tool for the renovation of buildings in coastal cities under future climate scenarios of the Middle East

Middle East countries lag in renovating their built environment to counteract the impact of climate change. The main reason for this is the low tax policy on fossil fuels, contributing to global warming. This project aims to identify clean energy technologies that reduce the buildings' dependence on fossil fuels. The project will analyze the energy and environmental impacts, which have not yet been assessed in this region. As coastal cities are more susceptible to global warming impacts, Bandar Abbas, a coastal city in Iran, is considered a case study. Energy simulations are employed to investigate the performance of a set of reference buildings and determine the most effective measures to cope with this impact under different climate scenarios. A tool will be developed to assist in the decision-making process of planners and it ultimately influences policymaking in those coastal cities.

2020_

The indoor environment of heritage buildings: monitoring and simulation

Nowadays several heritage buildings have been suffering operational changes over the last decades. Most cultural places are victims of their own success and suffer from being intensively explored as touristic sights. Therefore, it is urgent to study ways to characterize the indoor environmental conditions, identify the impact of tourism and define strategies that support preservation of collections. In this context, the doctoral research explores monitoring and simulation procedures to identify causes of inappropriate indoor environment conditions (hygrothermal, lighting and pollutants), and the associated risks of degradation, and discuss the most appropriate strategies to preserve heritage patrimony. The project will contribute with new scientific approaches to preventive conservation giving insights into the appropriate control of the indoor environment in heritage buildings.

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Digitalization of the footwear industry using artificial intelligence

Objectives: Develop a computer based system to choose the best arrangement of dampers on a shoe sole to improve comfort. Study the behavior of different geometries of the damper for further use. *Main achievements*: CFD (Computational Fluid Dynamics) model of damper compression mechanics. Achieved great shortening computational times testing 3D mesh complexity. Tests of model geometry influence. Dampers with front rib tend to offer more resistance to applied force. Use of AI (Artificial intelligence) technics to reduce the number of evaluated variables. The geometry influence and AI results indicate that the front rib is the most influent studied characteristic of the damper to obtain optimal comfort. After the data analysis results, we conclude that this problem can be optimized. A group of better results can be obtained using an optimization process. The next step is the study of the optimization algorithm. Test a multi-objective evolutionary algorithm and/or a neural network to find a pool of the best results to help both a human or an automatic decision-making process.

Using large-scale optimization methods to drive digital transformation: models for introducing additive manufacturing processes into complex manufacturing processes

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This project addresses the challenges associated with the industrialization of additive manufacturing (AM). The first step involved a classification method for AM technologies to assist in selecting suitable technologies for specific use cases, which culminated in a peer-reviewed publication. The second step consists of tackling the challenges associated with nesting and production scheduling in AM. A Constraint Programming model was first developed, leading to a conference paper. Further advancements were made using logic-based Benders decomposition, resulting in more effective methods to handle larger instances. These improvements produced a paper that proposes exact methods for the AM nesting and scheduling problem considering irregular-shaped parts, which is under revision. The next goal is to refine these methods to be able to tackle real-world instances.

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An integrated multiscale fatigue methodology applied to ocean structural systems

In Portugal, the production of marine renewable wind energy started in 2011, with the installation of a floating wind turbine platform. Besides, there is an interest in re-power decommissioned oil and gas offshore structures for wind energy generation, or extend the service life of wind turbines in operation. In this sense, this work intends to develop a fatigue methodology applied to support structures for wind towers in offshore environment. Thus, fatigue behaviour of S690 structural steel for longer service lives has been assessed, within the scope of optimize offshore structures and reduce material waste. Topics such as mechanism of failure, notch effect and load frequency effect were already addressed. At present, the influence of material degradation due to seawater corrosion and complex loads in structural integrity of offshore structures is the challenging task to fulfil.

2020_

A new adaptive design approach for active and improved performance pacifiers

Pacifiers are excellent to calm babies, but there are numerous risks about its prolonged use. The main goal of this project is to develop an innovative pacifier design methodology and adaptive pacifier with support of computational modeling tools, to monitoring its operation in real-time. Data mining will identify patterns in collected data to parameterize pacifier usage limits, considering individual suction patterns for continuous supervision. Key achievements include developing realistic pacifier computational models, optimized commercial pacifier models, compile a proof-of-concept technical report, outline prototyping steps and contacts, and regular meetings with pacifier producer to establish effective approaches. Prospects include a digital transformation in pacifier manufacturing and an intelligent, impactful pacifier in society, medical practices, and product industrialization.

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Feasibility study for the deepwater development of the Port of Leixões

Disruptive events sourced from several domains impact container ports' operations. To characterize the macro-environmental business conditions in which container ports operate, and find solutions to help them reshape in a sustainable way, it was developed an integrative investigation of the factors involved. This includes the assessment of political, economic, social, technological, legal, environmental and geographical drivers. It also comprises the development of a strategic framework that aims to culminate in a white book based on a well-rounded package of measures aimed at tackling current challenges arising in the seven domains. For this, the Port of Leixões is considered as a case study. The work plan is being carried out as planned and several oral communications were done. Also, a 1-month research stay in Normandy has taken place.

Virtus in medium est – history and planning towards an urban-rural future

The future of cities will depend on their formal and functional relationship with nature. Thus, operative concepts are needed for addressing specific realities and challenges, informing integrated strategies for sustainability. This proposal starts from an evolutionary analysis of the concept of "urban-rural space". Three case-studies will serve as reference: Lisbon, Barcelona and Bucharest; studying in each one the historical urban fabric, the planned expansion and the dominant architectural types, as well as their relationship with green spaces (public/private, leisure, agricultural production or environmental preservation). The study of the historical development and genesis of each territory will enable an inventory of solutions suited to their characteristics, which, given their diversity, allow us to think about other cities. This study will result in a monograph, a handbook and an exhibition, aimed at academic and general audiences.

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A supportive, ergonomic, and human-aware human-robot collaboration framework

Each year, Work-Related Musculoskeletal Disorders lead to an economic burden of EUR210 billion and represent 53% of all occupational diseases. Also, with an aging workforce, prioritizing improved conditions is crucial. This proposal aims at the development of an industrial Human-Robot Collaboration framework that brings innovation in ergonomic interventions by integrating artificial intelligence and wearable technology. Novelty includes bi-directional interaction between human and robot by identifying and monitoring in real-time the worker's motion, fatigue, and physical limitations, during a collaborative task, and tailoring the robot collaboration accordingly. Expected benefits include the operator's well-being, healthier and safer working environments, increased productivity and reduction on the costs derived from WRMSDs, while fostering companies' industrial competitiveness.

2020_

The role and value of aggregation of demand-side flexibility

The aim of my PhD project is to understand the role and value of an newfound entity in the power system called "aggregator" in managing the responses of the residential end-users to the incentives they will receive if they change their consumption pattern. From the energy transition perspective, the role of the aggregator is essential. In my PhD project, the performance of different electrical appliances have been modeled using physically-based modeling which is the most accurate method considering the state of the art. The energy management and operation scheduling of the electrical appliances are performed aiming to get the most advantage of the incentives paid by the aggregator to minimize the energy cost and discomfort of the end-users. However, the aggregator is seeking to maximize its profit by managing and trading the consumption changes (flexibilities) in the relative markets.

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Operational forecasting platforms based on morpho-hydrodynamic emulation methods

Extreme weather events, such as floods and droughts, are becoming more frequent and severe owing to climate change, leading to catastrophic consequences. Therefore, the development of methodologies to anticipate losses and identify vulnerable areas is crucia. In this context, numerical models provide reliable solutions for forecasting the effects of future events; however, they require considerable computational resources. The PhD project “Operational forecasting platforms based on morpho-hydrodynamic emulation methods” aims to develop artificial intelligence models to reduce the computational costs of numerical simulations. The developed methodology reduces the simulation time of the numerical simulations by 86% and preserves the accuracy of the original model. Moreover, it can be applied to estuarine and coastal models using two different software packages, Delft3D and XBeach.

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Understanding the relationship between perceived and objective bicyclist safety

We are witnessing a shift towards diverse transportation, including cycling, yet safety remains a significant hurdle due to inadequate infrastructure. To enhance cycling's appeal, cities must be reimagined and equipped with suitable facilities. However, cyclists' perception of safety may not align with the infrastructure's actual safety. The project seeks to explore the correlation between objective and subjective safety, identifying indicators for detecting areas where cyclists misjudge risk. The ultimate goal is to propose affordable safety interventions that enhance cyclists' perception of risk. Additionally, the research suggests a computer-assisted approach for decision-making on cycling infrastructure improvements, along with compiling potential corrective measures.

2021_

Monitoring of municipal waste streams and their transformation into geopolymers.

This research explores the synthesis and applications of geopolymers from fly ash for construction materials and their eco-friendly potential in wastewater treatment. The Box-Behnken design systematically refines production processes for both applications, manipulating key parameters. A notable formulation demonstrates exceptional compression (25.4 MPa) and flexural strength (6 MPa), offering insights into diverse construction needs. Simultaneously addressing escalating waste generation, the study valorizes fly ash from municipal solid waste into cost-effective adsorbents. Characterization techniques confirm improved properties compared to raw fly ash, validating geopolymerization success; amorphous nature and calcite prevalence are revealed, and acid-base characterization indicates electrostatic attraction, with a 75.83 mg/g adsorption capacity for phenolic compounds.

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Digital twin implementation for heritage buildings subjected to natural hazards

The research work aims to propose a holistic methodology for the structural integrity preservation of Built Cultural Heritage (BCH) to be framed in the broader scope of a Digital Twin (DT) paradigm implementation. The design of new DT processes and technologies for buildings requires holistic thinking. Therefore, a multidisciplinary framework will be proposed to make the BCH structures' conservation process less expensive, more efficient and more reliable than existing approaches.

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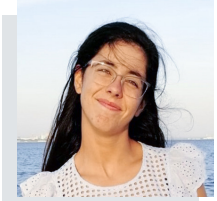
The implications of additive manufacturing technology adoption for supply chain resilience

Additive manufacturing technology adoption is changing the state of supply chains around the world, thus affecting their resilience. The focus of this PhD project is to investigate this phenomenon using a mixed-methods research approach. Frameworks are put forward for practitioners and academics to examine the effects of adopting additive manufacturing on the state and resilience of supply chains.



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Climate Change in the Western Iberian Coast: from the sea to estuaries

The main aim of my PhD is to assess long-term physico-chemical changes along the Western Iberian Coast (WIC) and study their relation to climate change, focusing on the adjacent coastal ocean and the WIC estuaries, with the final purpose to propose a set of measures to help manage possible effects of climate change in the region. So far, I have focused on looking for evidence (e.g. trends and changes) of the possible effects of climate change along the coastal ocean and have managed to cover changes in sea surface temperature and mean sea level. Slowly, I am migrating to estuarine systems, which are more complex due to their high dynamic and because there is less data available. In the near future, I hope to be able to portray the WIC estuarine scenario, regarding long-term variations in the physicochemical and biological parameters of the water column.

2021_

ALGTERNATIVE - AlGae To EneRgy aNd wAsTewater and GHG cleaning 4 Increasing ValuE

The use of fossil fuels is directly related to environmental impacts concerning atmospheric emissions and aquatic pollution. So, many strategies have been discussed to the development of sustainable energy process based on renewable sources, aiming at a circular economy approach. The ALGTERNATIVE project aims at developing a low carbon, simple, technically feasible, inexpensive and replicable process for biomass conversion into biofuels. Urban wastewater (WW) will be used as a feedstock for microalgae cultivation, which will be directly converted into drop-in liquid biofuels and bio-based products through Hydrothermal Liquefaction (HTL). The main advantage of HTL process is that there is no need to dry the biomass slurry prior the thermochemical conversion pathway, saving energy and costs. An upgrading of bio-oil will be carried out in order to deliver a product as close as possible to petroleum fuels or biodiesel. A significant global reduction in green house gases (GHG) emissions is expected as well as cleaned water which can be reused or discharged in compliance with the current EU legislation. Profits obtained from the WW treatment process, low cost feedstock and carbon credits will allow a reduction in production costs. It is expected that this research can be replicated with different types of wastewater and in different locations within the EU.

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Experimental campaign on the out-of-plane behavior of masonry structure by means of static and dynamic tests

My PhD project belongs to the civil engineering department and it is part of the STAND4HERITAGE project, which engages in introducing new standards for safeguarding built cultural heritage. The project is divided into four work packages, which aim to pursue the same goal giving insight into different aspects, i.e. from seismic signals to experimental, numerical and analytical points of view. My PhD project is focused on the experimental work package, which aims at experimentally investigating the dynamic response of masonry structures. The research question leading the work is: which are the key parameters that characterize the out-of-plane seismic response of historical masonry structures? Such a research question leads to addressing the main objective of the research, which consists of providing an extensive experimental campaign to improve the knowledge of masonry dynamics."

A platform strategy for cycling analytics in urban environements

Cycling is increasingly recognized as a fundamental element in urban mobility, and municipalities need new strategies to make better-informed decisions and investments. In recent years, there have been a growing volume of cycling data, and new mobility models have emerged trying to assess the cycling ecosystem from many perspectives. However, no model has become widely accepted to supporting decision-making. This seems mainly due to their development paradigm, which is usually a self-contained process, making these models difficult to generalize, reproduce and repurpose to other scenarios or datasets, if not at all impossible. The main objective of this work is to propose a new mobility model development paradigm, focused on incremental innovation, where new elements (models, visualizations, transformations, ...) are developed focusing on integrating and complementing existing ones.

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Power generation expansion planning for the large-scale integration of renewable energy sources in developing countries: the case of Angola

Angola presents an electrification rate of 43% corresponding to 18 million people without electricity access and has defined the expansion of the power system mainly with hydropower plants because there is a huge potential estimated at more than 18 GW. However, this dependence does not ensure the reliability of the power system in drought periods, being important the integration of the other non-conventional power plants like renewables energies sources (RES) also with high potential. The present research proposal aims to develop a power generation expansion planning model with large-scale RES integration for developing countries. The case of study will be the Angolan power sector. The model will take into account aspects such as the costs of expanding the electrical grid, the integration of intermittent RES into the electrical grid, the complementarity between RES and regions, distributed generation, and storage options. It will provide solutions to help power sector decision-makers.

2021_

Improving the service life of Engineered Wood Products

Timber biological degradation process is strongly correlated with the climate and exposure conditions and, despite wood being one of the most traditional building materials, the durability of EWP in various climates is still either questionable or unknown. Thus, this thesis program will quantify the predictable reduction, due to biological deterioration, in the service life of CLT considering different exposure conditions. Preventive measures, and maintenance plans to improve the service life will be defined as Guidelines for durability. To date, an extensive review of the literature on the topic has been carried out, identifying gaps in knowledge on the subject. Additionally, a wood degradation risk map was prepared considering the climatic conditions throughout the national territory. Finally, laboratory testing methods are being developed to create conditions for wood degradation.

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UV-filters from insular ocean-cities. Impact on the marine sustainability.

Organic UV filters (OUV-F) are chemical compounds that are found in Personal Care Products (PCPs). These compounds reach the ecosystem through activities such as skin washing during aquatic activities, sewage treatment discharges, and freshwater sources. Due to their characteristics, they are persistent in the ecosystem. Over time, they can accumulate in animal tissues, disrupting the endocrine system and becoming persistent pollutants. This project explores the possible bioaccumulation and biomagnification of 11 OUV-F through two marine trophic chains (coastal and pelagic). Also, it aims to evaluate how human pressure can affect the quantity of these contaminants in the marine environment. Samples collected from three locations with varying tourism pressures will be analyzed using HPLC-MS/MS.

Uncertainty interpretations for the robustness of object detection in self-driving vehicles

This research project aims to study uncertainty interpretations for deep learning-based object detection models in self-driving vehicles. We have achieved 2/3 of the project through the fulfilment of: our first goal, to study connections between uncertainty and interpretability including the analysis of the relationship between uncertainty and model underspecification with two papers awaiting review; the second one, to develop new uncertainty interpretations in object detection models, almost fully achieved through a method to generate uncertainty maps, has one paper in preparation and more to come. We also have worked with other students in the application of uncertainty to scarcely labelled settings and the use of deep reinforcement learning for planning tasks. This last work will be a bridge to start our study of error recovery in a planning layer when objects are missed in object detection.

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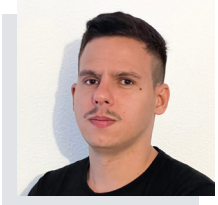
On the development of earth observation products for complex waters in support of water quality monitoring

This PhD project aims to develop improved satellite products to monitor water quality changes in transitional waters by using an innovative approach based on optical water classes, in which each pixel is classified and the most appropriate bio-optical algorithm is applied. The core of this research will be the identification of the water quality features associated with the different optical conditions and the analysis of their variability through space and time. Satellite products and methodologies developed within this project could also serve as support to water management applications, as an integration to the traditional costly in-situ monitoring programmes. We have been doing sampling campaigns, as in-situ measurements are essential for the development, calibration, and validation of satellite-derived data. Data collected allowed for the validation of existing methodologies and for a better understanding of the role of tidal fluctuations on the variability of water quality in transitional systems (i.e. estuaries).

2021_

Seaweed nanofluids for cooling photovoltaic solar panels used in space missions

Motivated by the contemporary space race, space missions face challenges with excessive heat in confined environments. Technological advancements for space exploration encounter limitations from heightened heat production. In space, extreme temperature variations require complex solutions. Nanofluids (NFs) are explored to optimize heat transfer. Conventional fluids with added nanoparticles (Nps) show enhancements, e.g., a 13% increase in thermal conductivity of water with 0.1% (wt%) aluminum hydroxide Nps. Progress in green synthesis, using algae like Chlorella vulgaris and Porphyra umbilicalis for Np production, is ongoing. An optimized transparent material serpentine facilitates heat exchange testing, enabling detailed fluid behavior observation.



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Ergonomic and sustainable criteria for human centered design of autonomous cars interiors

With the advent of autonomous vehicles (levels 3 to 5), the classic concept of the car interior must be redefined to fit the new requirements that are expected in terms of customisation, comfort, human-machine interface (HMI), adaptable interaction, and infotainment. Currently, the need to rethink the role of the car interior is a hot topic and represents several research challenges. The scope of this Ph.D. project is to provide criteria based on ergonomic methodologies to be integrated into innovative car interior, adaptable to the new mobility paradigms, specifically level 4 and Level 5 autonomous vehicles interior according to ergonomic principles and evaluations. In order to achieve that as a first step developed a questionnaire to understand the desires of the Portuguese users for autonomous car interior and evaluated usability of one autonomous car console.

An ecodesign approach to enhance the sustainability of novel bio-based technologies

Ex-ante life cycle assessment (LCA) is a future-oriented approach to assess the environmental impacts of novel technologies (at early R&D stages), involving process scale-up and scenario analysis. This PhD thesis aims to develop an ecodesign approach for bio-based products and technologies at lab/pilot scale and provide recommendations for improvement. It integrates ex-ante LCA with multi-criteria decision analysis (MCDA) to incorporate other technical and (socio-)economic performances and deal with trade-offs. The main achievements of this PhD work so far are: i) the LCA-MCDA framework for biomaterials (published); ii) Life cycle industrial-scale models for several products and processes (biopolymers/nanomaterials); Broad literature review on iii) ecodesign of novel bio-based films (published) and iv) ex-ante LCA (book chapter – under review).

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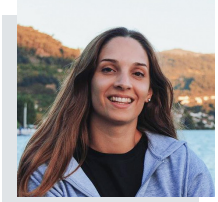
Sustainable production of bioactive metabolites from octocoral symbionts

This project explores one of the most prolific sources of natural products of our planet, the microbiomes of corals, to harvest novel chemical structures with potent bioactivities of promising use in biomedicine and biotechnology. The research addresses the current realization that marine host-associated bacteria produce many of the active compounds found in their host. It aims to uncover antibacterial and antifungal activities against notorious human- and aquaculture pathogens from a unique collection of symbiotic bacteria of octocorals from Portugal. Chemical extraction protocols will be optimized, and active metabolite extracts subjected to state-of-the-art LC-MS metabolomic profiling and analytical chemistry assessments. Up to now, a comprehensive review of compounds derived from coral-derived microbes has been developed and a major coral sampling event is being planned.

2021_

Development of an optimized system for wind energy prediction in portugal

According to APREN, in 2019, wind energy was the main source of electricity in Portugal, with a weight of 27% when compared to other national electricity sources. However, current methods of mapping the wind resource and forecasting wind production still present considerable errors, resulting in the waste of significant amounts of wind energy produced. It is crucial to develop tools that minimize these errors, contributing to the development of new wind farms and greater use of the wind energy currently produced. This project aims to develop a wind production forecasting system in Portugal that significantly reduces the errors obtained with current tools. This modelling system will be based on a mesoscale meteorological model optimized for Portugal considering its physical parameterization options according to the present atmospheric situation. As this research is a pioneer in Portugal, it is expected a strong scientific impact and political-socio-economic benefits for the country.



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Study of flexible perovskite solar cells for street furniture

Perovskite solar cells (PSCs) are seen as the next generation of power source, contributing for fostering the use of photovoltaics in urban environments. Their features offer an opportunity to conquer markets that are not attainable by silicon solar cells. Inverted PSCs are attracting increasing attention due to their easy-fabrication processes. However, the efficiencies obtained so far remain insufficient to justify the move to industrial-scale. The limitations reside in the yet to be proven long-term stability and the evidence that PSC can be produced at large-scale and low-cost. This workplan follows a research strategy that extends from fundamental research to applied technology development, including focus on stability, upscaling and cost. So far, inverted PSCs with 17% of efficiency were obtained. Substitution of the metallic back-contact with carbon-based materials is under study.

Development of an ecological thermal insulation product for a regenerative design

Global environmental awareness is leading the building industry to shift to a circular production model. Bio-based insulation is an eco-efficient alternative, stores CO_2 and has lower embodied energy, contributing to climate goals. The research work aims to develop a bio-based thermal insulation product based on Cortaderia Selloana stems, an invasive species in Portugal. Its use has a positive impact in controlling the spread and creates a value chain for this resource. The objectives include developing prototypes of insulation panels and evaluating its thermophysical properties; and analyzing its environmental and economic life cycle performance. Until now, stems were thermophysical characterized, and more material is being manipulated to create a panel of crushed reeds. The research work expects to contribute by creating a bio-based material to be used by the building industry.

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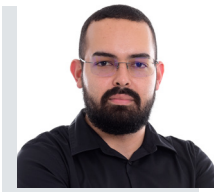

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Geosynthetics for sustainable cities: 3D models and mechanical damage

The goal of my project is to revolutionize the field of geosynthetics by enhancing our understanding of their mechanical behavior and their interaction with soil. Geosynthetics are innovative materials used in civil engineering for various applications, such as soil reinforcement, erosion control, and drainage systems. By improving our knowledge of these materials, we aim to optimize their use in geotechnical structures and construction projects, ultimately leading to safer and more efficient infrastructure development. Here are the key achievements obtained so far: i) I have conducted in-depth research in the field of numerical modeling and simulation of geosynthetics' mechanical behavior; ii) I have performed experimental campaigns to characterize the mechanical properties of geosynthetics, including their response to tension; iii) I have developed and numerically implemented constitutive models to describe the anisotropic behavior of geosynthetics. These models help us predict how geosynthetics will behave under various conditions.

2021_

A cyber-physical prototype for on-demand perfume optimal design and production

Perfume design is a complex task that normally relies on expertise from perfumers, which affects its ability to adapt to paradigm changes. Thus, a novel smart Cyber-Physical System (CPS) is proposed as an innovative solution. The main goal of this project is to build a CPS intended for on-demand optimal design and production of perfumes. The CPS will be powered by Deep Neural Network (DNN) surrogate models. All of the components together will compose a disruptive CPS with self-managing and cognitive abilities. These components will be concisely interconnected through the Internet of Things (IoT) and use Cloud Computing as engine. Some of the main achievements realized so far include the development of neural network-based surrogate models for prediction of important properties for perfume development.

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Energy and data science: evaluating the energy performance certificates of existing buildings

The problems of improving existing buildings' energy performance, reducing energy consumption, and improving indoor comfort with its many consequences are well known. Considering increasing urbanisation and climate change, governments define strategies to enhance and measure buildings' energy performance and energy efficiency. This work aims to improve buildings' energy performance and energy efficiency by using machine learning techniques to analyse energy performance certification data. This study has the following two main objectives. First, to perform automatic classification of the energy performance certification of buildings analysing energy performance certification data and second to perform automatic proposals of energy-efficient retrofitting measures to improve the energy performance of buildings whose energy performance has been classified by achieving the first objective. The main contribution is to inform private and public building sectors on achieving enhanced energy performance and predicting energy-efficient retrofit measures towards improving their energy performance.

Integration of performance indicators and digitalization for the railway assets management

This PhD project aims at developing a framework for the integration of performance indicators on a holistic and sustainable management of the railway system. These indicators are going to be defined considering the railway system reliability, safety and availability as well as the cost analysis and environmental impact. The decision-making process is going to be supported by the use of digitalization of the system.

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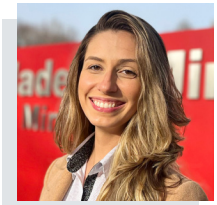

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Wooden buildings as a strategy for carbon neutrality in Portugal

The project addresses the development of a constructive system based on prefabricated wooden panels intended for buildings and the Portuguese context. It aims to design and validate the system behaviour in structural, functional, and logistic terms. By using a renewable, carbon sink material in association with prefabrication and modular construction concepts, it is expected to provide a sustainable alternative solution to conventional materials as a tool for meeting carbon neutrality targets. Progress of Task 1: review of the state of the art on relevant topics for the development of the constructive system; Progress of Task 2: preliminary development of the constructive system panels and feasibility analysis of a 3D modular system made from the 2D panels developed; Progress on Task 3: preliminary evaluation of the structural, thermal, and acoustic behavior of the constructive system panels; Dissemination of results; Defense and approval of the Thesis Project.

2021_

Road asset management considering connected and automated vehicles

This project explores the benefits of connected and automated vehicles in transportation systems, focusing on their impact on mobility, environment, safety, and economy. It emphasizes the need for asset management processes to optimize performance, resource allocation, and risk mitigation. The study also aims to identify how road design may evolve with the adoption of automated vehicles, potentially reducing construction costs. The primary goal is to develop a methodology for managing road assets in the context of automated vehicles. At the moment, it is identified four areas that involve the link between road asset management and vehicle automation: physical infrastructure; communication and navigation; policy and legislation; and innovation. Within these areas, it is possible to better help transport managers be prepared for the vehicles of the future.

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Reducing uncertainties in groundwater modeling to forecast long-term effects of climate change on water resources.

The work focuses on determining state, pressures, and driving forces that induce water quality issues between the aquifer system of Faro (South Portugal), when forecasting the effects of climate change. This resulted already in: Participation of a monitoring campaign for the eGROUNDWATER research project; Presentation of an abstract titled "Using remote sensing and FAO methodology for the determination of irrigation water needs in a semi-arid climatic region" at the 16° Congresso da Água; Collaboration in writing scientific report titled "Report on groundwater conceptual models for case studies" (eGROUNDWATER); Poster presentation at the 2023 Annual conference of the MPP; Acquired skills in groundwater modeling; Inscription to Portuguese language course. Considering the activities carried out and those planned, it is considered that the objectives set in the work plan have been achieved.

Human acceptable artificial intelligence for ergonomics recommendation

Addressing work-related disorders (WRDs) is crucial for ensuring employee well-being and productivity. WRDs lead to reduced productivity and more sick days, resulting in increased costs for companies and society. This work aims to develop multimodal, AI-based occupational health recommendation systems that address the complexity of WRDs. The foundation for these systems is everyday smart devices to assess workplace risks and provide personalized recommendations. So far, multimodal data has been collected from 40 participants over a span of a week with a self-developed Android app. The data was processed and analyzed to generate individualized reports for workers and organizations, including data visualizations and recommendations. Currently, the dataset is prepared for publication and an open-source Python toolbox for occupational health data visualizations is being developed.

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Harnessing technology to peatland landscapes & GHG in the Iberian Peninsula

Peatlands are unique ecosystems that provide key contributions to climate regulation. Over the last decades, multiple factors have accelerated peatland degradation in the Iberian Peninsula, including climate change, the spread of invasive plant species, and human-driven changes in land use and land cover (LULC). This project aims to forecast the impacts of these degradation drivers on Iberian peatlands and on the soil-atmosphere greenhouse gas fluxes. To develop task 2 and assess the LULC dynamics in the Iberian peatlands over the last 30 years, we have quantified and characterized the LULC transitions, based on a comprehensive database of peatland distribution records from the literature and fieldwork. Our main results showed that lowland littoral and sublittoral peatlands demonstrated higher susceptibility to LULC changes and must be an object of focus attention.

2021_

Which Resilience? The Agro-insurnace nexus under a changing climate

Adverse impacts of climate change disrupt stable conditions globally, leading to resilience erosion. Crop systems crucial for socioeconomic development are threatened. Urgent solutions are needed to address increasing volatility. Agricultural insurance emerges as a tool for adaptation and resilience. The industry's understanding remains unclear, despite awareness of transformative impacts. Resilience-building measures often fall short, with research focusing disproportionately on small-scale farms. Large-scale and non-family industrial farms, significant in developing nations, are overlooked. Most resilience literature originates from developed countries. This thesis explores insurance's role in promoting crop system resilience, addressing specific capacities and its catalyst effect.

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The behavior of laminated glass (LG) panels under various impulsive loads

The continuously increasing use of glass in buildings as well as the higher frequency of accidental or man-induced blast events has motivated significant research effort in recent years (Zhang and Bedon (2017)). The prosed research is established in this framework and aims to contribute to the characterization of the behavior of glass façade panels subjected to blast action. The work plan addresses aspects that haven´t been tackled yet and will pave the way for the establishment of design guidance regarding blast action in glass structures, aligned with Eurocodes design philosophy. The work entails an extensive parametric analysis, based on Finite Element Models (Abaqus software) calibrated with experimental data, covering the most representative structural parameters, leading to a large enough data for statistical validation regarding the typologies and material commonly used in practice and a vast extent of blast actions.

Sustainable transition in urban water management: the contribution of urban water communities

In the context of water scarcity and climate change, water efficiency, NbS and the circular economy are key to urban water management. The effective application of these principles is crucial for the sustainability of urban water and sanitation systems in order to fulfil national and international objectives. The research aims to develop an innovative model to promote sustainable urban communities, integrating natural approaches and valuing the circularity of water. Inspired by the need for intelligent and sustainable solutions, and faced with the consequences of climate change, the model will be validated in the context of urbanisation in Portugal. Comprehensive analyses will address the sizing and management of these solutions in urban contexts, making it possible to assess the economic and environmental impact of improving existing water and sanitation networks. This research will contribute to the development of approaches that promote sustainability, equity and security in water systems and guide future public policies in the sector.

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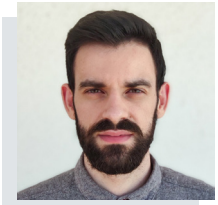
Risk-informed transport infrastructure network management

Transportation systems have a significant impact on the sustainability of urban areas. The economic impact on budgets, travel time and distance due to climate change is evidence of this. The present thesis aims at defining a holistic framework for the risk-based management of transport infrastructure networks. To anticipate the effects of climate change and ensure that service levels and resilience remain at acceptable levels, it is necessary to consider the level of exposure to disruptive events. In addition, transportation systems are composed of different types of assets, which react differently depending on the surrounding environment. The proposed work intends to establish an alternative infrastructure risk assessment procedure by accommodating, in a single methodology, the performance of different asset types, subjected to different hazards, independently of their characteristics.

2021_

Mod City. Transmedia projects for a sustainable and playful urbanism

"Mod City" is an innovative PhD project led by Tiago Mindrico, aiming to transform urban spaces through playful experiences. The project creates community workshop frameworks (like "Cassandra"), merging digital and physical realms, to foster community engagement and sustainable urban development. Some playful speculative workshops have been held in Nairobi, Athens, and Lisbon, showcasing the tangible impact of ludic urban experiences. Tiago has also contributed to academic discourse and collaborated with the National Network for Support to Victims of Domestic Violence. As an assistant lecturer at Instituto Politécnico de Leiria, Tiago is committed to knowledge dissemination. "Mod City" pioneers transmedia projects for sustainable and playful urbanism, propelling the discourse and application of ludic interventions for an equitable and sustainable urban future.



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Cyber-physical oriented chemical process for green and sustainable production

This project has examined the integration of mechanistic and data-driven models in chemical engineering, focusing on process systems engineering. The primary objectives were to enhance analytical tools for systems described by differential equations and explore how abundant data integration can refine mechanistic models.

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Integrating land management into the energy transition: spatial dynamics, challenges and policies

The energy transition from fossil to renewable sources is a worldwide strategic goal. However, land-use conflicts associated with the increase of renewable energy production sites have led to the loss of natural and semi-natural areas. In addition, there is also a concern to increase efficiency between renewable energy production and consumption sites. Therefore, this PhD project aims (i) to assess the land-use changes caused by the implementation of the renewable energy production facilities; (ii) to analyse the connection between the evolution of urban form and renewable energy consumption patterns; and (iii) to create different spatial explicit future scenarios for 2050 to identify the land-use optimization between urban form and renewable energy patterns. The results are expected to contribute to integrated spatial and energy planning policies.

2022_

Hierarchical methodology to support decision-making in infrastructure managment

In the context of ongoing climate change, awareness about transport infrastructure exposure to extreme events has been increasing. Likewise, the urgency of climate adaptation is also at the top of priorities, particularly in developed countries that have large transport networks to preserve. The main efforts conducted in the past have focused on the development of advanced models to tackle single hazards affecting one or two transport assets. While recognizing the importance of such efforts, a way to analyze several consecutive hazards affecting several assets simultaneously is still missing. Therefore, reality is actually what isn't being simulated. This thesis proposes a hierarchical methodology to create the most probable scenarios, the vulnerability of the transport assets affected by each scenario, as well as the consequences that their failure may introduce into the transport network functionality. The results will contribute to the resilience of the transport network and decision-making improvements.

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Urban stream rehabilitation for sustainable cities

Developing models to simulate the biological results of hydromorphological rehabilitation on urban streams.

Full Digital Twin: integration of open BIM IFC and facility management database.

The Industry 4.0 revolution has grown the necessity of the Facility Management (FM) discipline to deal with data from diverse sources, including real-time ones. Building Information Modelling (BIM) implementation in FM has arisen in this context. The use of BIM models to integrate real-time data is equivalent to the concept of Digital Twins (DT). Therefore, the Digital Twin (DT) technology can significantly support the FM sector. In this circumstance, practitioners of the FM sector need guidance on implementing an efficient integrated management system necessary for the current industry demands. Currently, through a partnership with a Portuguese city hall, the researcher is developing a web management platform that integrates visualization features and their existing FM management platform. This case study works as a smaller-scale sample of the final results intended for the project.

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Data-driven sustainability assessment for affordable housing in Portugal

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The urge of reverting climate change has made sustainability assessment a mandatory requirement within the AEC industry. The adoption of sustainable parameters by housing design becomes inevitable. However, in affordable housing, the investment in sustainability is quite restricted due to the highly constrained budget limitations. Furthermore, Lifecycle assessment (LCA) adds difficulties to many conceptual aspects of affordable housing because by definition it considers sustainability over the entire lifecycle of the building (from construction to operation, maintenance, demolition, and materials reuse or recycling). Digitalization in the AEC industry and the use of the data in digital format creates opportunities for collection and analysis of data that may help LCA and provide information on which solutions provide better sustainability performance, hence guiding design towards more optimized solutions. This research aims at using Data-driven techniques including machine learning and based on BIM models develop tools for optimizing design decisions that improve LCA results.

Marine microplastics identification and quantification through a microfluidic photoacoustic autonomous sensor

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Comsol Simulation Tests sought to validate the photoacoustic principle but were unsuccessful. Further study deemed the photoacoustic phenomenon impractical for determining polymer types. Throughout the year, key activities included literature review on spectroscopic methods. Raman tests on pellets and beach litter, ATR tests and Transmission/reflection tests were undertaken on thin films. A sophisticated system of ratios at four wavelengths was constructed to discern plastics in transmission mode. The prototype based on transmission/reflection, focusing on ratios between wavelengths with higher NIR radiation absorption, only differentiated two plastic types, resulting in abandonment. UV fluorescence tests assessed a UV Raman prototype's feasibility. Challenges and equipment availability issues caused about 5 months of delays. Consequently, the resolution approach shifted towards the UV Raman phenomenon.

2022_

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Ecodesign of plastic products: a novel approach and applications

This research project aims to develop a novel ecodesign approach using applications from the plastic industry to improve their life-cycle performance. The project involves exploring different ecodesign strategies, such as incorporating alternative materials. The ecodesign approach will integrate methodologies, such as Life Cycle Assessment & Costing, with Multi-Criteria Decision Analysis and Uncertainty analysis. The main milestone of this project has been to conclude the Life Cycle Assessment & Costing of three plastic applications (nutraceutical bottle, car interior door handle and carrier frame for instrument cluster) in partnership with industries in Portugal. The Stochastic Multi-Attribute Analysis is being explored to compare the environmental and other criteria and evaluate different weighting preferences (or decision makers with conflicting priorities).

Nature-based Solutions for coastal defence

Coastal areas are complex environments challenged regarding its resilience. Coastlines have mostly been protected by hard structures, yet these lead to sedimentary imbalance, hence the increased popularity of Nature-based Solutions (NBS). This work studies the implementation of oyster reefs in Ria Formosa (RF), in combination with the restoration of the existing ecosystems (dunes and marsh) – to dissipate wave energy and erosion, while providing additional co-benefits (e.g.water quality improvement). The research is divided into 3 tasks:1.literature review of NBS for coastal protection and associated co-benefits (ending);2.RF-area stakeholder engagement workshops to assess their perception and preference of different NBS for coastal using a multicriteria analysis(starting: jan24);3. cost-benefit analysis to determine the most cost-efficient and sustainable coastal protection alternative.

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Bottom-up mobilization: the role of social movements in sustainable mobility transitions

To address climate change, many global cities and international organisations aim to accelerate the transition towards sustainability. Mobility is often cited as a crucial element in achieving this goal. Practice, cultural, and structural changes are necessary to transition successfully through different phases. This study draws on two theoretical and practical frameworks for analysing sustainable transitions: the multilevel perspective (MLP) and socio-practice theory (SPT). This academic research field has mainly focused on state and market actors, neglecting the potential role of social movements in mobility transitions. Public participation is often considered a crucial factor for sustainability transitions. Therefore, this research analyses the role of social movements in sustainable transitions in urban mobility, specifically the starter cycling cities in the global North and South.

2022_

Urban spatial data analysis: towards safe, inclusive, and sustainable spaces

Commonly, cities are organized into areas with different socio-economic dynamics. Understanding these dynamics is of main interest to promote urban livability and sustainability. This research aims to model and understand the urban dynamics, identifying how space is used and if there are potentially isolated zones. We collected semantic information on the different areas, including socio-economic behavior and Points of Interest (POIs). Mobile phone data was also collected to perceive dynamics and recognize the population's mobility and homophily patterns (home, work, and other meaningful places are being identified). The areas were characterized in terms of POIs/services and socio-economic information will be added to complement this characterization. Next, we will analyze areas and groups of individuals, identify similar dynamics, cross this information, and analyze space and patterns.

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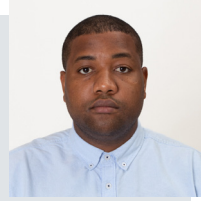
Prefabricated wood system for sustainable renovation of RC building envelopes

With the goal of reducing CO_2 emissions and making buildings more sustainable and energy efficient, this project aims to develop a prefabricated wood-based system to optimize the rehabilitation of reinforced concrete (RC) buildings, contributing to a more resilient and eco-friendly built environment. The primary objective is to create a new exterior envelope, that improves energy efficiency and structural safety, while incorporating new spaces and uses into the interior of the dwellings. Main achievements include the characterization of post-1960s RC structures by assessing perceptual and physical characteristics, and anomalies of several case studies. This achievement is significant as it helps us understand the physical requirements of these buildings and the residents' needs, ensuring that the prefabricated system enhances both buildings' performance and residents' quality of life.

Heat transfer enhancement of thermal solar systems

Solar thermal energy systems have been considered a promising solution to achieve carbon neutrality by 2050. Concentration Solar Power (CSP) is recognized as a renewable energy technology that can make a sounder contribution to the transformation of the energy sector since it captures the sun radiation in the form of heat, which can be used to produce electricity, steam, and serve other purposes in industry. From the different CSP technologies, the parabolic dish solar concentrator (PDSC) is considered one of the most promising solutions since it can be applied in several applications from the electricity production to the cooking, desalination, and irrigation. This versatility makes PDSC suitable to be implemented in regions in which the access to electricity is very scarce, improving the quality of life of rural population. This system composed of a solar concentrator, solar receiver, heat exchange fluid, and the solar tracking system.



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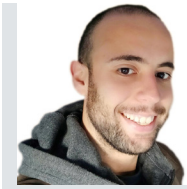

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Materials, design and biomechanics for a safer micromobility

This project comes in line with the research on the development of new liners for lightweight energy absorption systems, eco-friendly materials and biomechanics of brain injuries. Following the guidelines of UN2030 goals, it aims to provide enhancements in the domains of biomechanical injury assessment, propose and validate new design solutions for helmets focusing on the requirements of urban commuters resorting to micro-mobility transport solutions. Experimental campaigns have been done to test liners based on cork agglomerates and shear thickening fluids, and a numerical framework developed with the most promising solutions. After good preliminary results from the finite element analysis, a product design is being carried out to apply these materials into a convenient, practical and sustainable helmet. The first proof of concept was made and tested for impacts, with promising results.

2022_

Hybrid and distributed guidance and control for cooperative On-Orbit Servicing

An ever-increasing number of satellites is being deployed each year, which negatively impacts the lifetime of satellites, as more debris is created and collisions occur, rendering the systems inoperative and further worsening the problem. On-Orbit Servicing (OOS) is the key to solving this issue and enabling a sustainable growth in the number of satellites. This work aims to explore hybrid and distributed approaches to allocation, guidance, and control of satellites for cooperative OOS missions. We will investigate how innovative sensors can help in estimating the motion of inoperative satellites, study formation planning strategies for multi-agent systems of satellites and develop hybrid model-based control techniques to achieve the OOS mission objectives.

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Causal neural networks prediction for automated driving systems

To this date, several Tasks identified in the Workplan were completed. Starting with Task 2, called Autonomous Driving Simulation and Scenario Generation. To this end, the CARLA open source software was used and it was integrated with other software tools, such as the Apollo Open Autonomous Driving Platform and SUMO software (Simulation of Urban MObility), which allows general driving scenarios to be managed. In parallel with Task 2, Task 1 Reinforcement Learning in architectures with explainability was carried out, to properly integrate the algorithms under study in the simulation environment mentioned. Currently, there is a reassessment of the Work Plan being carried out on the works, as well as Literature Reviews being written for subsequent publication, concurrent with the rest of the tasks being carried out.

Increasing urban resilience through a Productive Urban Green Infrastructure in Great Porto

This research addresses urban challenges intensified by climate change and the Covid-19 pandemic, urging strategies for resilience. Despite the increasing demand for urban agriculture (UA) in Europe, integration into planning is limited. The research aims to develop a planning methodology, proposing a network of multifunctional green spaces with UA, termed Productive Urban Green Infrastructures (PUGI), adapted from existing plans. Through public and municipal engagement, it aims to gauge acceptance, focusing on the Metropolitan Area of Porto. Prototypes and design guidelines will be developed, assessing the contribution of PUGI to urban resilience via an indicator system. The initial and current stage involves a literature review on concepts and case studies for designing UA and a survey mapping UA in Portugal

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Strategies for smart ecosystems restoration and oceans sustainability

This project is focused on developing biomimetic marine structures that support marine ecosystem restoration, coastal protection, renewable energy production or monitoring of ocean and geological dynamic systems. This approach is based on the use of cement-based composite especially made for the marine environment and with smart properties. The study includes the development and characterization of a structure prototype made of this smart material, and the study of the new paradigms, and approaches that this innovation could enable, in the context of global changes. Due to its high-level characteristics, these strategies are expected to serve as future climate adaptation alternatives, providing various benefits, essentially, for ocean biodiversity, climate regulation, coastal protection and renewable energy production.

2022_

Monitoring maintenance management system for an infrastructure implementing MEMS sensor and novel BIM methodology

Assessing and predicting structural health is one of the most important aspects of an infrastructure's life cycle. The devices that are used in the modern era have enabled us to predict the future of the structure using various monitoring techniques and also various maintenance and management methodologies to prolong the life span of the structure and to have a healthy structure to be utilized by the user. The most contemporary system for monitoring with low installation and maintenance cost with high reliability is Micro-Electro-Mechanical Systems (MEMS) technology and Internet of Things network using LTE (4G Long Term Evolution). The management aspect can be developed using computerized systems such as Building Information Modelling (BIM) that help in the planning, designing, implementation and maintenance of the building. Present research work will use open source software and a standard file transfer data format to transfer information.

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Deep-sea acustic transducers development

Acoustic technology has the potential to develop new methods for underwater communications, and soundscape. Specifically, this project proposes solutions using piezoelectric transducers to be implemented in artificial reefs, autonomous probes, ROVs, or underwater optical cables, empowering these systems with deep-sea communications, geopositioning and soundscape. Activities conducted this year included reviewing hydrophone technology and underwater signal transmission, studying literature on underwater acoustic phenomena and piezoelectricity, and outlining requirements for developing hydrophones, categorized into transmitters and receivers. Simulations using Comsol were initiated to model piezoelectric materials. Additionally, modifications were made to sensors, such as perfecting a salinity sensor and creating a wave sensor to measure dynamic water pressure caused by surface waves.

Telework frequency and its effects on travel behavior in the post-COVID-19 era

Mandatory telework was one of the social distancing measures adopted during the COVID-19 pandemic. This resulted in changes in travel patterns. Telework effects on travel patterns are still contentious. Telework could change travel behavior and location patterns and increase sprawl. This work aims to study the impacts of telework on travel behavior. A Structural Equation Model was estimated using data collected in 2021 from three metropolitan areas, Lisbon (LMA), Istanbul, and Porto Alegre Metropolitan Areas, aimed at studying telework effects on weekly trips by transport mode, resulting in a paper submitted to Transportation Research Part A. Previously a qualitative analysis based on interviews made in the LMA was submitted to the Journal of Transport Geography. The next step will evaluate telework effects on travel patterns using data collected in the LMA during 2023.

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I4F Intelligent Fish Farming for Future

Weight dispersion is a problem that affects all phases of the aquaculture production cycle. It leads to losses due to opportunistic diseases and reduces revenue at sale. To minimize such problems, farmers regularly sort their fish stock. This is costly because it requires equipment, is labor-intensive and causes stress for the fish. The Fish Farming for Future project aims to develop a breakthrough and innovative machine learning-based platform that can predict weight distribution during the growth cycle based on rearing conditions (temperature, salinity, dissolved oxygen) to plan and determine optimized feeding and grading cycles that reduce costs, increase product quality and price, reduce risks, improve animal welfare, and reduce ecological impact. This is a breakthrough technology to improve aquaculture productivity, enhance sustainability and reduce the environmental footprint.

2022_

Vulnerability assessment of masonry arch bridges due to flood events

Masonry arch bridges (MABs) are crucial to Europe's infrastructure but face increasing vulnerability to extreme weather, notably floods intensified by climate change. This project pioneers a risk-informed management framework to assess and enhance MAB performance during and after flood events, optimizing resource allocation for long-term preservation. The main achievements include a comprehensive State of Art Review on flood and structural modelling. Through Finite Element Method (FEM) and Discrete Macro-Element Method (DMEM) analyses, Engineering Demand Parameters (EDPs) were quantified. Sensitivity analyses identified key structural parameters.

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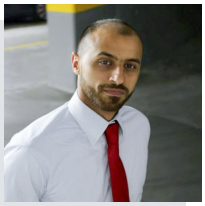

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Towards national implementation of BIM object data rules and compliance checking

Building Information Modelling (BIM) objects are at the heart of the transition of the Architecture, Engineering and Construction industry toward digitalization. BIM object creators are expected to comply with BIM object standards, taking into account compliance to Construction Product Regulations, standardization and interoperability requirements. This heavy task is limiting the widespread worldwide adoption of BIM processes. This work addresses this issue by (i) applying a systemized approach for clarifying the data needs of BIM objects for stakeholders using the definitions of Product Data Templates(PDT) and the Level of Information Need, (ii) creating a tool for the automation of the process of verifying if BIM objects are compliant to the latest standards and regulations, and (iii) implementing an open-source PDT query platform for the industry.

Color-based road nanosensors based on thermochromic and self-cleaning abilities

Materials Science has been employed in the domain of road engineering to confer new capabilities and advantages for the environment and society. The objective of this doctoral project is to develop smart road marking endowed with thermochromic and self-cleaning capabilities, aiming to enhance road safety and extend the service life of these elements. To date, efforts have been dedicated to the literature review and the development of smart road markings, with an emphasis on self-cleaning capability. As a result of these endeavours, scientific publications, participation in scientific events, and awards have been achieved.

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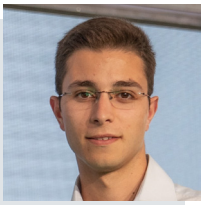
Anomaly detection models to improve the sustainability of water companies

The increase in data from the diversity of computing devices at our disposal is a precious element for extracting knowledge. In this work, I have been applying Machine Learning techniques in the context of anomaly detection and predictive models for time series problems to improve sustainability and decision-making in Wastewater Treatment Plants (WWTPs). Throughout this year, my work has focused on collecting and treating water from different sectors of several WWTPs, particularly in the analytical and energy control sectors, in addition to the flow of water that reaches these facilities. Furthermore, I have applied anomaly detection models, particularly for analytical control substances, and predictive models in the energy consumption and flow sector. As these infrastructures are part of our society, optimizing their sustainability will develop more sustainable cities for our community.

2022_

Nature-inspired micro reinforcement of coarse granular aggregates

My PhD project aims to develop understanding of the micromechanics of micro-reinforced coarse granular materials, used, for example, as a road base or railway ballast. Through fundamental experimental studies centred on element testing of scaled and full-size materials in loading paths representative of traffic conditions, the form of the micro-reinforcement will be optimised to increase its effectiveness. Until this moment, 1st year of 4, packing test, that easily validate the effectiveness of the reinforcement shape were performed. A statistical framework to compared different sized specimens were developed. The resulting understanding of how different micro-reinforcements interact with grains will be used to develop analytical models which will be used to further optimise the form of the micro-reinforcing elements (at industrial scale) and inform future design guidance.



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MAG-NET: an advanced framework for distributed plantwide process monitoring

The research introduces the MAG-NET (Multilevel and Multiscale Aggregation of Causal Networks) framework designed for statistical process monitoring within complex industrial systems. Grounded in causality, MAG-NET intends to effectively discern primary fault origins, facilitating fault diagnosis tasks. Furthermore, the framework streamlines variable aggregation and leverages multiscale analysis methodologies to pinpoint pertinent time scales for fault identification and prognosis of system degradation. Key achievements include inferring the causal network of the system, performing the functional decomposition of the network, and integrating it into fault detection and diagnosis. These accomplishments led to improved performance in detecting low-magnitude faults and conclusively diagnosing them.

AI applied to Earth observations of the Arctic Sea ice melt ponds

The project main goal is to enhance the understanding and information retrieval of the seasonal formation of melt ponds on the Arctic Sea ice. Melt ponds have a great importance in the context of climate change and Arctic energy budget. They lower sea ice albedo (fraction of incident radiation that is reflected by the surface) contributing to further ice melt. However, information on these features is currently very scarce. To tackle this issue, this research aims at using a combination of differente types of satellite sensors (namely Synthetic Aperture Radar and optical) and Artificial Intelligence (AI) methods, to help generate new, timely and more accurate information on these Arctic sea ice features.

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Addressing material efficiency in building renovation scenarios: a BIM-based decision support tool

The construction industry faces a significant increase in renovation processes, which are still inefficient in time, cost, and material. High-performance renovations can significantly reduce a building's operational and embodied environmental impact. However, as Designers adopt the BIM methodology, they lack computational tools and data crucial for supporting life cycle analysis and circular economy goals. This research supports informed decision-making in building renovation during early design. Specific goals include defining criteria that guide informed decisions, developing BIM-based tools to identify optimal design scenarios, and optimising these tools through AI techniques. Expected outcomes are enhanced BIM-based methodology streamlining the identification of optimal renovation scenarios and a database featuring the environmental characterisation of various renovation scenarios.

2022_

Influence of masonry pattern on the out-of-plane behaviour of masonry structures

Historic masonry structures (HMS) are often constituted by the assemblage of blocks with variable dimensions engendering complex arrangements. Furthermore, cross-sections' walls are sometimes made by more leaves, connected through the thickness in a more or less efficient way such that the real out-of-plane (OOP) behaviour is difficult to predict. Such geometrical uncertainties suggest investigations based on probabilistic approaches where masonry patterns are characterised by certain statistical variations. Through this PhD thesis the influence of masonry arrangements on the structural behaviour of HMS is investigated. At first, masonry pattern generators were developed to create random patterns and subsequently investigated. Afterwards, advanced numerical models based on the discrete element method (DEM) are adopted to perform parametric and sensitivity analyses aiming to develop easy-to-use analytical tools and provide useful guidelines for researchers and practitioners.

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Advanced MOF-based materials towards dual carbon dioxide capture and conversion

My main goal is to develop porous Metal-Organic Frameworks (MOF)-based platforms to capture and convert CO_2 in added-value chemical products, such as cyclic carbonates, with applicability in the pharmaceutical industry. A series of defect-engineered porous MOFs was prepared by introducing linker and/or metal center deficiencies, under ambient conditions. Different strategies were followed to obtain materials with distinct crystallinity. The synthesized materials are mainly based on UiO-66, MOF-808, MOF-818, MOF-74 and ZIF-8 structures. The silica SBA-16 and zeolite ZSM-5 were synthesized to prepare MOF-hybrid composites. Structural characterization of all the materials was carried by FTIR, powder XRD and SEM/EDS. In the following year, we hope to start preliminary catalytic studies of CO_2 conversion to evaluate the catalytic performance of the materials, close to ambient conditions.

Post-fire vegetation recovery under present and future climate change conditions

The current PhD proposal aims to analyse the post-fire vegetation recovery globally, focusing on fire-prone regions but also on areas which are observing an increment in fire weather conditions and fire occurrence. By combining long-term remote-sensing datasets with dynamical vegetation and land surface models' outputs, this project aims to identify patterns and quantify trends in post-fire recovery data to assess changes in fire disturbance regimes, both under present and future climate conditions.

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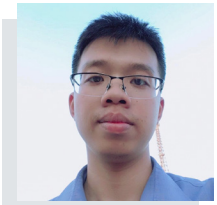

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The digital twin of critical infrastructures for developing sustainable cities

Digital twin (DT) is one of the most modern and promising technologies in realizing smart manufacturing and implementing Industry 4.0, DT offers an opportunity to integrate the physical world with the digital world with a seamless data source. DT technology has the potential to transform and improve the exploitation and management of infrastructure in civil engineering. Based on DT model, managers and maintenance operators can test different scenarios, improve efficiency, and make accurate decisions in maintenance of the structure, leading to reduction of management and other regular monitoring costs, as well as accurate prediction of risks in the service phase. This research focuses on building a digital twinning model for the continuous structural health monitoring of critical infrastructure in the service phase.

2022_

Modelling and optimization for sustainable INCONEL machining processes

Ni alloys, particularly INCONEL alloys, present very low machinability, making them a popular subject for machining studies. Generally, using high amounts of cutting fluid is needed to machine INCONEL alloys, however, the use of these coolants is extremely hazardous for the environment and worker safety, while increasing the overall process cost. To minimize these issues, many solutions can be adopted, such as the use of coated tools, lubrication techniques or even by trying to optimize the process itself. In this work, different sustainable INCONEL machining techniques will be tested, evaluating tool-wear, process vibrations and cutting forces, as well as the machined surface integrety of the workpiece material. Data obtained from these tests will be used to develop and validate process optimization models, with a focus on improving the process's sustainability while retaining good production quality, as well as predicting tool-wear and produced surface quality.

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Quantitative modelling of the ocean with acoustic waves

Seismic oceanography has proven its value to imaging the ocean in high-resolution using conventional multichannel reflection seismic data (MCS). The recorded acoustic responses depend on contrasts in ocean temperature and salinity. The processed data enable tracking interfaces between thermohaline layers and the study of fine-scale processes spatially. However, their interpretation has been focused on qualitative methods, and integration with dynamic ocean models is still unexplored. In this PhD, I will develop and implement methods to predict spatially ocean temperature and salinity through the integration of MCS data with direct observations (e.g., CTD, ARGO) in a spatial data science framework. These methods will be applied to existing data from Gulf of Cadiz. As a complementary and exploratory approach, and since MCS data acquisition is complex and expensive, I will look at using high resolution echosounders mounted in autonomous underwater vehicles to model in real-time the ocean.

Crop-watershed modelling of future agricultural water availability in Portugal

Although climate change impacts on agricultural crops in Portugal have already been extensively studied, research is still lacking on water availability for agriculture, as well as on its irrigation demands, under a climate change future. Therefore, the goal of my PhD project is to predict the future crop irrigation needs and agricultural water availability in Portuguese watersheds, using a coupled crop-watershed modelling system forced by state-of-the-art regional climate data. The outcomes of my research will be used to define climate change adaption strategies for the agricultural sector, that will be made available to farmers and other agriculture professionals through a web-based platform.

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Impact of climate change-driven wildfires on the life cycle of wood materials

Life cycle assessment (LCA) is an approach that can support decision-makers in implementing efficient solutions for the construction industry and reducing carbon emissions. Recently, wood has gained popularity as a sustainable alternative material. However, most LCA studies of wood materials currently rely on old studies, not accounting for the dynamic of forests and the effects of climate change, like wildfires, on the carbon cycle. The Mediterranean region has always been prone to Wildfires, constituting a significant source of carbon emissions, and climate change exacerbates this problem by drastically increasing the frequency, intensity, and duration. Therefore, this study aims to analyze the effects of wildfires on the carbon cycle of forests for the current and future climate change scenarios and to assess the effects of it on the built environment. Finally, the goal of this project is to develop a dynamic LCA of wood-based products considering the effects of climate change on Southern Europe, using Portugal as a case study.

Methodologies and tools for BIM-based calculation of the Whole Life Cycle Assessment emissions of NZEBs

The European Architecture, Engineering, and Construction (AEC) sector is currently undergoing a smart transformation, driven by the increased use of Building Information Modelling (BIM). This is particularly crucial today, as buildings need to present Net Zero Emissions (Net-ZEBs) during their whole life cycle, and BIM is an essential tool for the construction industry to improve the information flow. This project will develop a BIM-enabled LCA method that can facilitate low-carbon design under the transition for a smart AEC in Portugal.The findings of this project contribute to the achievement of UN Sustainable Development Goals related to sustainable cities and climate action targets, and the goal of reducing carbon emissions in the AEC sector.

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2023_

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Supporting the development of climate smart marine spatial planning in Portugal

Marine spatial planning (MSP) has become the prime focus for many policy-makers, being considered an important tool for promoting a better management of the oceans, through spatial and temporal planning of different maritime activities. Among the many threats faced in MSP development, climate change is considered to be one of the biggest. The intensification of climate-related impacts will continue to cause numerous problems to marine ecosystem services and depending human activities, thus affecting the development of a sustainable blue economy. Developing climate-smart marine spatial plans that properly integrate knowledge on climate risks and opportunities is fundamental. Hence, the main objective of the present proposal is to support such integration of knowledge by exploring the Portuguese case study to assess the vulnerability of national MSP initiatives and the blue economy to climate change.

The role of large-scale patterns in climate extremes in a changing climate

Extreme weather and climate events occur in complex dynamic conditions. Understanding the role of large-scale patterns in these extreme events is paramount to increase our knowledge on their impacts and future evolution in the context of climate change. In this context, this PhD work aims at studying large quasi-stationary areas of high atmospheric pressure, or atmospheric blockings, which are known for their links to temperature extremes, as well as the induction of dry or wet areas in the mid-latitudes by affecting the tracks of cyclones. Methodologically, this PhD aims at introducing machine learning in the identification and classification of these blockings as well as in the association with extreme weather. Furthermore, this study aims at assessing the past and future changes in the evolution of these large-scale events through the use of state-of-the-art paleo and climate models, respectively.

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Towards climate change mitigation by sustainable wire-arc additive manufacturing

Wire-Arc Additive Manufacturing (WAAM) is an emerging additive manufacturing (AM) process that uses wire as the feed-stock and an electric arc to melt it. WAAM has a promising sustainability potential due to its better material efficiency, higher build rates, and low cost. However, research on its sustainability from a Triple-Bottom-Line perspective i.e., environmental, economic, and social impacts is still new. This PhD plan proposes to evaluate the WAAMÂ´s environmental, economic, and social sustainability using Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Social Life Cycle Assessment (S-LCA) methodologies, respectively. Based on these assessments, process parameters, variables, and production scenarios ensuring sustainable production by WAAM will be recommended. Furthermore, an online platform will be created to quickly calculate and compare the environmental, economic, and social impacts of WAAM and other manufacturing processes to select the most sustainable approach.

Electricity everywhere in the ocean through wave energy self-powered buoys

Ana Carrelhas
Portuguese
–
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Supervisor: Professor Luís Manuel de Carvalho Gato

6.3 Networking and training

During 2023, MPP continued to integrate PhD candidates into the MPP community, providing networking opportunities and training to develop transversal skills.

The website section dedicated to the MPP PhD candidates was updated to include information from students selected in the 2020 and 2021 calls for PhD grants.

The 2023 MPP Annual Conference provided the opportunity for students to network with the MPP community. The MPP PhD candidates were invited to participate in the main scientific event for the MPP community, and to present a poster with their research work. The poster session was also open to students associated with MPP research projects either in Portugal or at MIT.

As part of the MPP training program, in 2023 the MPP coordination office organized workshops in transversal skills for MPP PhD candidates in oral communication and in writing impact statements for grant proposals.

The oral communication workshop aimed at improving students' communication skills to better present their work when addressing peers or lay people. It included practical training on structuring the storyline and delivering a pitch, and in giving an interview. The workshop was delivered by Ana Mena, innovation and education coordinator of the MPP, who held two one-day sessions in two different universities: one at the Faculty of Sciences of University of Lisbon, and the other at School of Engineering of University of Minho.

The writing impact statements workshop guided early career researchers through the information that most funders require beyond the scientific and technical aspects of their projects: namely, statements of impact, career development plans, communications programs, and other work plans to engage with stakeholders both within and outside of academia. A webinar session was held prior to the workshop, giving the opportunity to all PhD candidates to learn more about fellowship writing beyond the research project. The one-day workshop was held at Faculdade de Ciências da Universidade do Porto, and was delivered by Thiago Carvalho and David del Álamo, instructors from Fellowsherpa.

Following the success of the previous editions, MPP co-organized a third edition of the Marine Robotics Summer School. This initiative, open to all masters and PhD students working in Portuguese universities and at MIT, provides an exceptional learning experience by combining advanced theory and practice in marine robotics. During two weeks, students had the opportunity to interact with experts from MIT, University of Porto, and University of Azores. Students also engaged in several practical group activities including building "drifters" with recyclable materials equipped with GPS and temperature sensors, and practicing and operating at sea with the autonomous underwater vehicles, small remote-operated vehicles, and with unmanned aerial vehicles. The Summer School, held in Horta, Azores, hosted 24 students from MIT and Portuguese universities with a strong interest in marine robotics, oceanography, ocean observation, marine biology, marine archaeology, or ecosystem mapping.

07

Events, Networking Activities & Outreach

In 2023, MPP continued promoting new and inspiring opportunities to communicate our research and share scientific knowledge.

Throughout the year, we planned a diverse range of events, each strategically designed to make a positive impact on our community. From industry research meetings and workshops to educational sessions, these activities were designed to foster connections, educate, and promote community network and engagement.

In 2023 MPP held two idea sprints (Space Week at MIT and the Marine Robotics Summer School); two meetings with senior administration and officials (the ERC and PGC meeting); two educational courses for MPP PhD candidates; and participated in more than 11 networking and outreach activities, including Ciência 2023. One of the most important events was the MPP Annual Conference, which registered the largest number of attendees since 2018 — more than 150 in-person participants.

A few highlights from 2023 can be found below.

MARCH_

Informative Session *How to Apply For a MIT Portugal FCT-PhD Grants?*

March 2, online

The MPP online info session on "How to apply for an MPP-FCT PhD grant" joined online 35 prospective PhD students from different countries (Portugal, Brazil, Turkey, Cape Verde, and others) and Portuguese institutions (Técnico, Lisbon; University of Porto; University of Coimbra; University of Minho; University of Beira Interior; FCT Nova; University of Aveiro), to learn more about how to submit a successful application for a MPP-FCT PhD fellowship.

Figure 10. MPP Directors Zita Martins (left) and Pedro Arezes (right), and Innovation and Education Coordinator Ana Mena (center), explaining the PhD call.

MARCH_

Flagship Projects Follow-up Meeting

March 6, DST Group, Braga

For the first time, the meeting took place outside the academic environment to reinforce the close interaction and collaboration between industry and academia.

This meeting produced the latest updates on the projects to guarantee that they are moving forward and to promote a collaborative environment between the participants.

The meeting was open to the MPP community and focused on the technical and scientific aspects of project results. In attendance were 35 participants: Programs Directors and the DST Group CEO; projects' principal investigators and some team members; the Portuguese area leaders; and some MPP PhD students. They had the opportunity to share ideas and explore synergies and future collaborations.

Figure 11. MPP flagship projects follow-up meeting with MPP Directors (top left photo) Pedro Arezes (right) and Doug Hart (left) and the CEO of DST Group, José Teixeira (center) . The Flagship projects PI's presenting the project (second left photo) and attendees making questions and visiting the venue (right photos, top down).

MARCH_

Space Week at MIT

March 15–17, MIT, Cambridge

Figure 12. The three students (left to right:) João Ribeiro, Rania Rebbah, and Nuno Gonçalves at Space Week.

MPP sponsored the participation of three students in this event that celebrated space exploration across the MIT campus. João Ribeiro, an MPP PhD candidate carrying out his PhD in the field of Machine Learning and Computational Design, at FEUP; Rania Rebah, a first-year PhD student in Mining Engineering and Geo-resources, at FEUP; and Nuno Gonçalves, a second-year PhD student in Physics Engineering at FCUL, University of Lisbon were the selected students out of 16 applications.

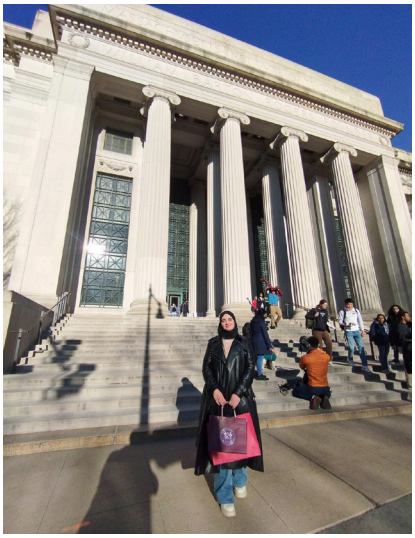


Figure 13. Rania Rebbah at MIT.

"The MIT Space Week showed me other perspectives on space technology and how we can use it in other industries. It was a great opportunity to connect with people from different backgrounds and forge new collaborations."

"All these people I met inspired me, as a woman in STEM, to always think big and bold. I would like to thank the MIT Portugal Program for being selected."

– Rania Rebbah, PhD student in Mining Engineering and Geo-resources, at FEUP

APRIL_

Oral Communication Course

April 5 and 18, Faculty of Sciences of University of Lisbon (FCUL) and School of Engineering from University of Minho (EEUM)

Figure 14. MPP PhD students during the course at FCUL (left) and UMinho (right).

Twenty-three MPP PhD students attended the oral communication course to improve their skills when presenting their work in public. MPP promoted two sessions at two Portuguese universities (Lisbon and Minho). 73.3% of the students that answered the evaluation form regarding this course rated the course as "Outstanding; I learned a lot."

"I'm here today to give my heartfelt thanks and gratitude, and to emphasize the importance of the partnership in promoting research and innovation in Portugal, and the potential for the partnership to continue to drive economic growth and workforce development in Portugal."

– Prof. Dava Newman

MAY_

MPP former director Prof. Dava Newman awarded the title of *Doctor Honoris causa* in Engineering from the Universidade do Minho

May 19, University of Minho, Guimarães

In her speech, Prof. Dava Newman thanked this honorable distinction and highlighted the accomplishments of MPP that contributed to this occasion.

Figure 15. Prof. Dava Newman receiving the award by the rector of University of Minho, Prof. Rui Vieira de Castro, and António Cunha (left photo); Dava Newman with the MPP National Director, Prof. Pedro Arezes (below).

"Through this collaboration, we can continue to push the boundaries of what is possible.

The MIT Portugal Program is a shining example of what can be achieved when we work together, across borders and disciplines, to tackle the most pressing challenges of our time."

– Prof. Dava Newman

JUNE_

Speed Meeting MIT Portugal PhD Students

June 2, online

Promoted by the MPP PhD student community, this event gathered online over 30 PhD students who shared with the colleagues their work and interests in order to know each other and start identifying common research interests. This was the first initiative organized by the student community.

Figure 16. Screenshot of the students during the speed meeting.

JULY_

Ciência 2023

July 5, University of Aveiro

Figure 17. Speakers of the International Partnership Session at Ciência 20203. From MPP (left photo) Eunice Costa (second from left), Pedro Arezes (second from right); and (right photo) Eduardo Pereira (second from left) and Doug Hart (second from right)

MIT Portugal, along with the CMU Portugal Program and UT Austin Portugal, hosted the "FCT International Partnerships: Building bridges across the Atlantic" session at the 2023 Encontro Ciência Summit, to present and discuss the impact of their partnership.

In attendance were over 50 people. An overview video was produced to present the key outcomes of these partnerships.

The session began with an open discussion involving stakeholders from the three programs.

Pedro Arezes, MIT Portugal Director, and MPP PhD alumna Eunice Costa represented the MPP. Costa currently holds a prominent role as the leader of the Research & Development area of Inhalation and Advanced Drug Delivery at Hovione.

Next, three flagship projects showed the outcomes and achievements resulting from these partnerships. Eduardo Pereira (University of Minho) presented the MPP flagship project K2D – Knowledge and Data from the Deep to Space, which is developing a system for monitoring the oceans on a global scale.

JULY_

2nd Marine Robotics Summer School

July 11 to 22, Faial, the Azores

For two weeks, attendees acquired expertise in marine robotics and oceanography, more specifically in applications for ocean observation, archaeology, and mapping of ecosystems (Figures 18 and 19)

Figure 18. Students and some instructors of the Marine Robotics Summer School, in the Azores, in July 2023.

This summer school was jointly organized by the MPP, LSTS – Underwater Systems and Technology Laboratory (FEUP), and the University of Azores, with the participation of AIR Centre; CoLab +ATLANTIC; Gaspar Frutuoso Foundation; School of the Sea of the Azores; and Instituto de Investigação em Ciências do Mar – OKEANOS. The summer course had the high patronage of the Regional Government of Azores.

Following the previous summer school, António Oliveira from INESC TEC, visited MIT as visiting scholar at Professor John Leonard's laboratory. MIT students Erin Menezes and Fiona J. Gillespie interned in Portugal, at OceanScan and at INESC TEC respectively.

81
Student applications

24
Selected Grad students in Engineering and Science fields

8 *Nationalities*

(Portuguese, American, Canadian, French, German, Indian, Egyptian, and Brazilian)

10 *Students from MIT*

12 *Students from Portuguese universities, of which 7 female and 5 male:*

University of the Azores, University of Porto (Faculty of Engineering, and Faculty of Sciences), University of Aveiro, , University of Lisbon (Instituto Superior Técnico, and Faculty of Sciences), and University of Algarve (represented as red dots in the map).

Figure 19. Facts and figures of the second Marine Robotics Summer School, illustraded above.

Figure 20. Above, the winning team of the ocean drifter challenge. Students deploying the ocean drifter they developed (top left photo) and doing some water safety exercises (bottom left).

"I interned at OceanScan, a company that creates light autonomous underwater vehicles (LAUV) for various underwater applications. This company is an extension of LSTS, an ocean robotics research lab at the University of Porto that had presented and demonstrated their vehicles at the 2022 Marine Robotics Summer School in Faial, Azores. I really enjoyed my time in the internship where I worked on designing an attachment with thrusters for the LAUV that would allow the vehicle to maintain position underwater and be controlled in all directions."

– Erin Menezes, Department of Mechanical Engineering, MIT Class of 2024

"Through connections I made at the 2022 Azores summer course, I interned at INESC TEC's Center for Robotics and Autonomous Systems in Porto this past summer. I worked on developing capabilities for autonomous docking. I created a vision-based localization system accurate up to 20m, accompanied with lidar-based obstacle detection."

– Fiona J. Gillespie, Graduate Student, MIT Department of Electrical Engineering and Computer Science

SEPTEMBER_

2023 MIT Portugal Annual Conference

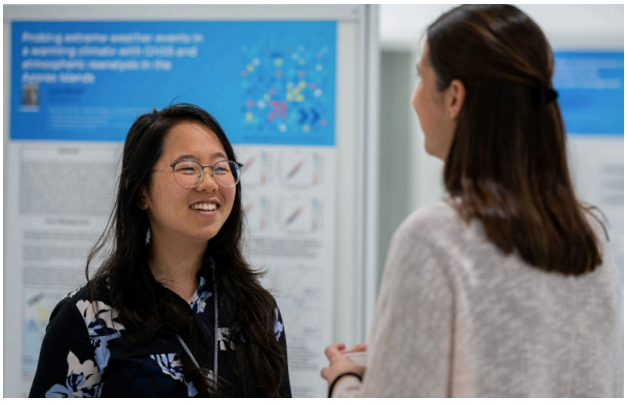
Sept. 22, Altice Forum Braga

On Friday, 22 Sept., MPP held their annual conference in the Altice Forum in Braga. This year's conference, titled "Research that impacts society," focused on the results of the seven flagship projects.

The conference included 150 participants, with 34 speakers from diverse backgrounds sharing insights and making connections. The conference included a student poster session with over 60 posters showcasing cutting-edge research from Portuguese and MIT students and researchers. The best five posters were recognized with a prize.

Figure 21. MPP Annual Conference: attendees; posters presentation; and sessions.


VIPS
Very Important PhD Students
SCIENCE is my super power!
I am engineering the future



NOVEMBER_

"Everything that is not Research" Workshop

Nov. 23 –24, online and Faculty of Sciences of University of Porto

Figure 22. MPP PhD students (left photo) and the instructor Thiago Carvalho (left, in bottom photo) and David del Álamo (right, in bottom photo) during the course.

Twelve MPP PhD students had the opportunity to improve their skills when writing grant proposals by attending the "Everything that is not Research" Workshop. The course, taught by Thiago Carvalho and David del Álamo, was structured as a workshop in which theoretical talks were combined with writing and other exercises. MPP PhD candidates learned about eligibility, impact statements, and soft skills requirements that are often underestimated when preparing fellowship or grant proposals.

DECEMBER_

MiFire payload was successfully launched to space

December 19, online and at West Texas.

MiFiRE payload, from the MPP Blue Origin Payload Competition, was successfully launched into space on board of New Shepard Rocket from Blue Origin #NS24.

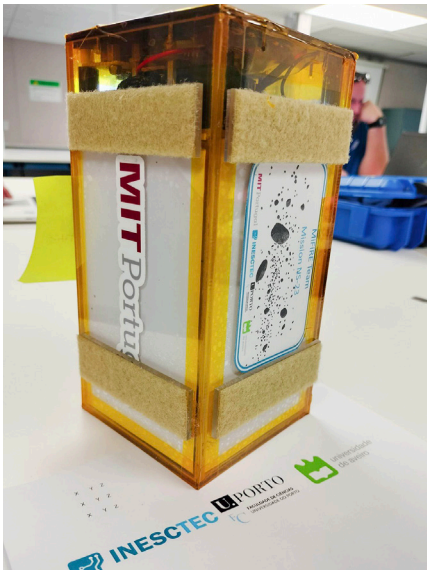


Figure 23. MiFire Payload.

The Mifire - Microgravity Fine Regolith Experiment was selected amongst 5 competing proposals in a contest launched by MIT Portugal which partnered with BLUE ORIGIN to include a nano-experiment on the New Shepard. The experiment was developed by students Vítor Martins, Ivan Sá, Ana Caldeira, and Maria Marques, from the Faculty of Sciences at the University of Porto with Professor Rui Moura mentoring the group. The team worked with Cody Paige, a PhD candidate from MIT's Human Systems Lab in the Department of Aeronautics and Astronautics.

08

Communications Overview

The main areas of communication activity over the last year are set out below. The activity reflects the use of a range of communications channels and tools.

MIT Portugal website

https://mitportugal.org/

A website is a fundamental tool to disseminate information about the Program's latest activities and initiatives. In 2023, MPP published 17 articles, and the website received 27,798 visits. The most visited pages, according to Google Analytics, were the 2023 PhD call; the Marine Robotics Summer School, and the Annual Conference.

27,798
Visitors

Social media

Social media has become an indispensable aspect of modern communication, enabling the rapid dissemination of information and playing a vital role in reaching our audience.

For this reason, through the years, MPP has been committed to building a strong online presence and network, with an active presence in four social media channels: Twitter (now called X), LinkedIn, Facebook, and YouTube.

› **Facebook**

https://www.facebook.com/MIT.Portugal.Program

› **LinkedIn**

https://www.linkedin.com/company/mit-portugal-program

› **X (formerly Twitter)**

MIT Portugal Program (@MITPortugal)/ X (twitter.com)

› **YouTube**

https://www.youtube.com/@mitportugalvideo

The number of publications exceed 300 posts. These posts are mainly related on Program initiatives (events, research and education calls); and relevant news regarding MPP projects, Directors, and community.

The number of followers on the four social media channels continued increasing in 2023. As of this report, we are connecting with a community of over 23.000 followers.

LinkedIn amassed the greatest number of followers. The other channels registered more modest growth.

Social media platforms can evolve, and their popularity may fluctuate over time, but even with a small following it is important to have an established presence on multiple platforms that will contribute to MPP's online credibility and visibility. By publishing new content, MPP has the potential to reach a larger audience through shares and interactions. In 2024 the program should consider to extend his presence at Instagram.

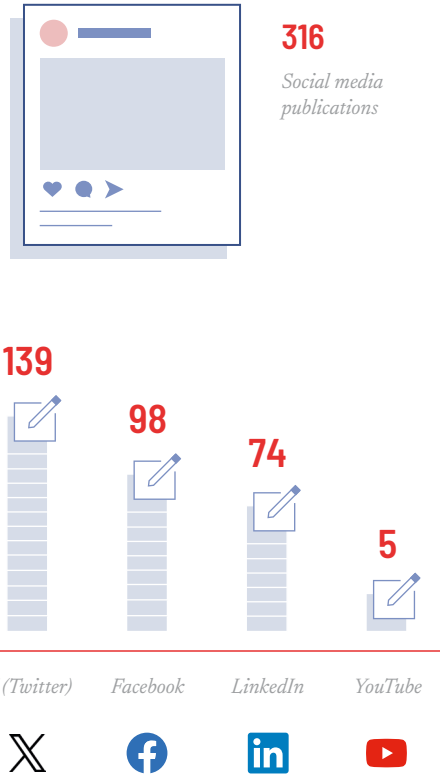


Figure 24. Number of social media publications through the four channels (total 316).

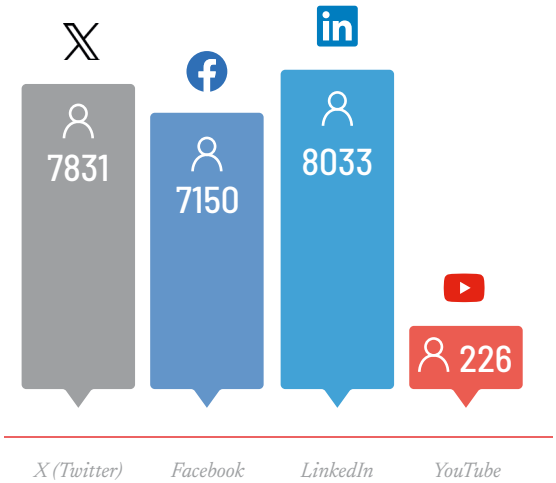


Figure 25. Number of social media followers (Total 23 240).

LinkedIn

The MPP LinkedIn page had 4,227 followers in October 2020, and 5,347 in December 2021. The page reached 6,884 in 2022 and 8.033 in 2023, an increase of 1,149 followers (16.69% growth rate). Since 2020, this social media channel grew by 90.04%, which demonstrates the efforts made to improve this channel in recent years.

Twitter (X)

Since 2020, Twitter also increased its number of followers. At the beginning of 2020, it had 6,929 followers, 7,568 in 2021, and 7,746 in 2022, and now 7,831 (an increase of 1.10%).

Facebook

The MPP Facebook account currently has 7,150 followers, a small increase over 2022 (7,079 followers). Facebook is growing slowly (1%).

YouTube

In 2023, MPP YouTube channel has 226 subscribers (growth rate of 5.12%). Through this year the Program published five new videos on the YouTube Channel and had over 1.3K views. Those videos were related to three of the flagship projects final presentation at the 2023 Annual Conference, and the overview video with some of the key outcomes of the three American international partnerships.

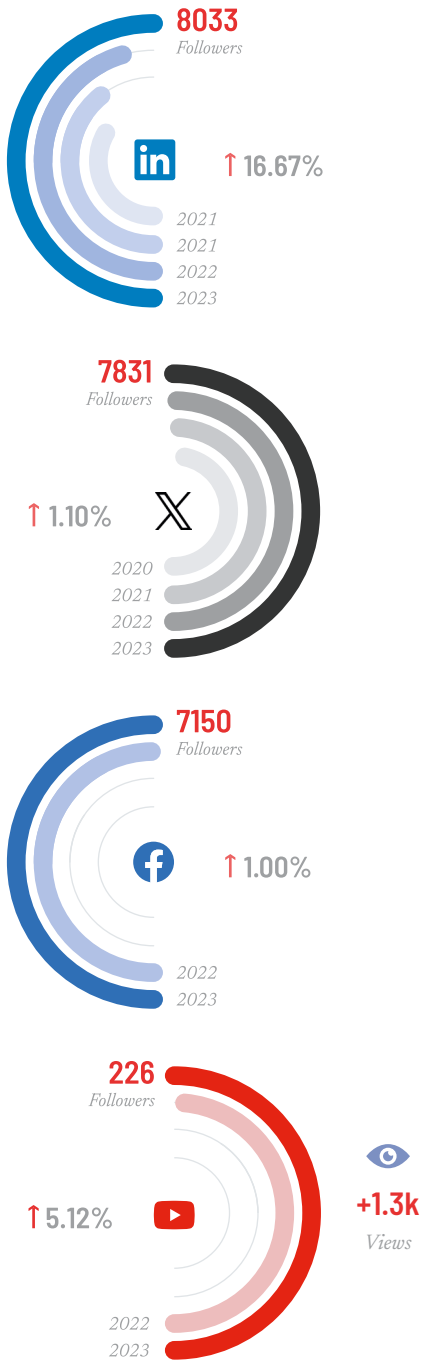


Figure 26. Number of followers by year, and growth rate of each social media channel.

Press and Media Communication

Establishing press and media communication to highlight Program initiatives and achievements to stakeholders and the public is another goal of the Program's communication strategy.

In 2023, MPP submitted three specific press releases to the Portuguese media, which were related to the call for PhD grants; the 2nd edition of the Marine Robotics Summer School (in collaboration with Okeanos, University of Azores), and the MPP Annual Conference. These resulted in 8 press articles published in the Portuguese media, which can be found in news pieces' outcomes.

The year was marked by the strategic contact with *90 segundos de Ciência* – Portuguese radio program that shows the science that is being done in Portugal – were MPP featured with three flagship projects (K2D; Newsat and Operator). The Program also contributed for the news coverage made by Sapo Tek regarding MPP impact and results.

Overall, the Program was featured in more than 50 articles and mentions related to the MPP.


AZORES
Azores Deep-Sea Ecology Research Group
ellesse
OCEAN

09

Outputs of the Program

9.1
Peer-reviewed Articles

MPP Projects

Review

Colaninno, N., Basu, R., Hosseini, M., Alhassan, A., Liu, L., & Sevtsuk, A. (2023). A sidewalk-level urban heat risk assessment framework using pedestrian mobility and urban microclimate modeling. *Environment and Planning B, in review*.

Seed: Developing a pedestrian model for Lisbon to plan for low-carbon mobility

Articles

Ahani, P., Arantes, A., & Melo, S. (2023). An Optimization Model for Structuring a Car-Sharing Fleet Considering Traffic Congestion Intensity. *Journal of Advanced Transportation*, 2023, 9283130.

https://doi.org/10.1155/2023/9283130

Flagship: C-TECH

Araújo, G.R., Gomes, R., Gomes, M.G., Guedes, M.C., & Ferrao, P. (2023). Surrogate Models for Efficient Multi-Objective Optimization of Building Performance. *Energies*, 16(10), 4030.

https://doi.org/10.3390/en16104030

Flagship: C-TECH

Brouwer, Y., Barbosa-Póvoa, A.P., & Antunes, A.P.; Ramos, T.R.P. (2023). Comparison of different waste bin monitoring approaches: An exploratory study. *Waste Management & Research,* 41(10), 1570-1583.

https://doi.org/10.1177/0734242X231160691

Exploratory

Cunha, S., & Ferrao, P. (2023). Urban Metabolism Characterization from the National to the Regional Scale: A Case Study of Lisbon. *Environments*, 10(2), 14.

https://doi.org/10.3390/environments10020014

Flagship: C-TECH

Doshi, M.M., Bhabra, M.S., & Lermusiaux, P.F.J. (2023). Energy-time optimal path planning in dynamic flows: Theory and schemes. *Computer Methods in Applied Mechanics and Engineering*, 405, 115865.

https://doi.org/10.1016/j.cma.2022.115865

Flagship: K2D and Seed

Ferreira, B.M., Graça, P.A., Alves, J.C., & Cruz, N.A. (2023). Single Receiver Underwater Localization of an Unsynchronized Periodic Acoustic Beacon Using Synthetic Baseline. *IEEE Journal of Oceanic Engineering*, 48(4), 1112 – 1126.

https://doi.org/10.1109/JOE.2023.3275611

Flagship: K2D

Ferreira, T., Figueiredo, A., Raposo, D., Luís, M., Rito, P., & Sargento, S. (2023). Improving mmWave backhaul reliability: A machine-learning based approach. *Ad Hoc Networks*, 140, 103050.

https://doi.org/10.1016/j.adhoc.2022.103050

Flagship: SNOB

Ferreira, T., Figueiredo, A., Raposo, D., Luís, M., Rito, P., & Sargento, S. (2023). Millimeter-Wave Feasibility in 5G Backhaul: A Cross-Layer Analysis of Blockage Impact. *IEEE Access*, 11, 5178-5192.

https://doi.org/10.1109/ACCESS.2023.3236100

Flagship: SNOB

Gee, K., Kim, S.I., Quinlan, H., & Hart, A.J. (2023). A physics-based modeling framework to assess the cost scaling of additive manufacturing, with application to laser powder bed fusion. *Rapid Prototyping Journal,* 29(5), 980-1003.

https://doi.org/10.1108/RPJ-02-2022-0065

Seed

Graca, P.A., Alves, J.C., & Ferreira, B.M. (2023). Sensor Placement in an Irregular 3D Surface for Improving Localization Accuracy Using a Multi-Objective Memetic Algorithm. *Sensors*, 23(14), 6316.

https://doi.org/10.3390/s23146316

Flagship: K2D

Lima, P., Baptista, P. & Gomes, R. (2023). Framework for Quantifying Energy Impacts of Rehabilitation of Derelict Buildings: Assessment in Lisbon, Portugal. *Energies*, 16(9), 3677.

https://doi.org/10.3390/en16093677

Flagship: C-TECH

Nandy, A.; Yue, S.; Oh, C.; Duan, C.; Terrones, G. G.; Chung, Y. G.; Kulik, H. J.,A Database of Ultrastable MOFs Reassembled from Stable Fragments with Machine Learning Models. *Matter*, 6, 1585-1603.

https://doi.org/10.1016/j.matt.2023.03.009

Seed: Engineering Metal-Organic Frameworks for Stability in Gas Storage Applications

Matos, T., Pinto, V., Sousa, P., Martins, M., Fernández, E., Henriques, R., & Gonçalves, L.M. (2023). Design and In Situ Validation of Low-Cost and Easy to Apply Anti-Biofouling Techniques for Oceanographic Continuous Monitoring with Optical Instruments. *Sensors,* 23(2), 605.

https://doi.org/10.3390/s23020605

Flagship: K2D

Saadi, J.I., & Yang, M.C. (2023). Generative Design: Reframing the Role of the Designer in Early-Stage Design Process. *Journal of Mechanical Design,* 145(4), 41411.

https://doi.org/10.1115/1.4056799

Flagship: NewSat

Terrones, G. G.; Chen, Y.; Datar, A.; Lin, L.-C.; Kulik, H. J.; Chung, Y. G., SESAMI APP: An Accessible Interface for Surface Area Calculation of Materials from Adsorption Isotherms. *Journal of Open Source Software*, 8, 5429

https://doi.org/10.21105/joss.05429

Seed: Engineering Metal-Organic Frameworks for Stability in Gas Storage Applications

Viegas, R., Zabel, F., & Silva, A. (2023). In-Lab Demonstration of an Underwater Acoustic Spiral Source. *Sensors*. 23(10), 4931.

https://doi.org/10.3390/s23104931

Flagship: K2D

Xin, H.H., Liu, J.L., Correia, J.A.F.O., Berto, F., Veljkovic, M., & Qian, G.A. (2023). Mixed-mode fatigue crack propagation simulation by means of Geq and walker models of the structural steel S355.

Theoretical and Applied Fracture Mechanics, 123, 103717.

https://doi.org/10.1016/j.tafmec.2022.103717

Exploratory: Exploratory Analysis of Biomimetic-inspired Oceanic Hyperloop Transport Infrastructures

Yeh, C.Y., Cohen, A., D'Oliveira, R.G.L., Médard, M., Mittleman, D.M., & Knightly, E.W. (2023). Securing Angularly Dispersive Terahertz Links With Coding. *IEEE Transactions on Information Forensics and Security*, 18, 3546-3560.

https://doi.org/10.1109/TIFS.2023.3267664

Flagship: SNOB

Yue, S., Oh, C., Nandy, A., Terrones, G. G., Kulik, H. J., Effects of MOF linker rotation and functionalization on methane uptake and diffusion. *Molecular Systems Design & Engineering*, 8, 527-537

https://doi.org/10.1039/d2me00237j

Seed: Engineering Metal-Organic Frameworks for Stability in Gas Storage Applications

MPP PhD Candidates

(Authorship by MPP2030 students is underlined)

Review

Afonso, I.S., Nobrega, G., Lima, R., Gomes, J.R., & Ribeiro, J.E. (2023). Conventional and Recent Advances of Vegetable Oils as Metalworking Fluids (MWFs): A Review. *Lubricants*, 11(4), 160.

https://doi.org/10.3390/lubricants11040160

Barbosa, F.V., Teixeira, S.F.C.F., & Teixeira, J.C.F. (2023). Convection from multiple air jet impingement - A review. *Applied Thermal Engineering*, 218, 119307.

https://doi.org/10.1016/j.applthermaleng.2022.119307

Biguino, B., Haigh, I.D., Dias, J.M., & Brito, A.C. (2023). Climate change in estuarine systems: Patterns and gaps using a meta-analysis approach. *Science of the Total Environment,* 858, 159742.

https://doi.org/10.1016/j.scitotenv.2022.159742

da Rocha Segundo, I. G., Margalho, É. M., Lima, O. de S., Pinheiro, C. G. da S., de Freitas, E. F., & Carneiro, J. A. S. A. O. (2023). Smart Asphalt Mixtures: A Bibliometric Analysis of the Research Trends. *Coatings*, 13(8), 1396.

https://doi.org/10.3390/coatings13081396

Dias, M., Silva, L., Folgado, D., Nunes, M.L., Cepeda, C., Cheetham, M., & Gamboa, H. (2023). Cardiovascular load assessment in the workplace: A systematic review. *International Journal of Industrial Ergonomics,* 96, 103476.

https://doi.org/10.1016/j.ergon.2023.103476

Duarte, M.S., Martins, G., Oliveira, P., Fernandes, B., Ferreira, E.C., Alves, M.M., Lopes, F., Pereira, M.A., & Novais, P. (2023). A Review of Computational Modeling in Wastewater Treatment Processes. *ACS ES&T Water*.

https://doi.org/10.1021/acsestwater.3c00117

Fonseca, J., & Bacao, F. (2023). Tabular and latent space synthetic data generation: a literature review. *Journal of Big Data*, 10(1), 115.

https://doi.org/10.1186/s40537-023-00792-7

Pais, A.I., Belinha, J., & Alves, J.L. (2023). Advances in Computational Techniques for Bio-Inspired Cellular Materials in the Field of Biomechanics: Current Trends and Prospects. *Materials,* 16(11), 3946.

https://doi.org/10.3390/ma16113946

Pereira, L.D., Saraiva, N.B., & Soares, N. (2023). Hygrothermal Behavior of Cultural Heritage Buildings and Climate Change: Status and Main Challenges. *Applied Sciences-Basel*, 13(6), 3445.

https://doi.org/10.3390/app13063445

Pinheiro, C., Landi, S., Lima, O., Ribas, L., Hammes, N., Segundo, I. R., Homem, N. C., Castelo Branco, V., Freitas, E., Costa, M. F., & Carneiro, J. (2023). Advancements in Phase Change Materials in Asphalt Pavements for Mitigation of Urban Heat Island Effect: Bibliometric Analysis and Systematic Review. *Sensors*, 23(18), 7741.

https://doi.org/10.3390/s23187741

Articles

Afonso, C., Lima, O., Segundo, I. R., Landi, S., Margalho, É., Homem, N., Pereira, M., Costa, M. F. M., Freitas, E., & Carneiro, J. (2023). Effect of Iron-Doping on the Structure and Photocatalytic Activity of TiO2 Nanoparticles. *Catalysts*, 13(1), 58.

https://doi.org/10.3390/catal13010058

Anjos, R., Carlos, D.M., Gouveia, S., Pinho-Lopes, M., & Powrie, W. (2023). Soil-Geosynthetic Interaction Under Triaxial Conditions: Shear Strength Increase and Influence of the Specimen Dimensions. *International Journal of Geosynthetics and Ground Engineering*, 9, 83.

https://doi.org/10.1007/s40891-023-00502-6

Azevedo, A., Navarro, L. C., Cavalheri, T., Santos, H. G., Martins, I., & Ozório, R. (2023). Morphological traits for allometric scaling of the European Sea Bass Dicentrarchus labrax (Linnaeus, 1758) from Southern Portugal population. *Journal of Fish Biology*, 103(2), 425–438.

https://doi.org/10.1111/jfb.15460

Biguino, B., Antunes, C., Lamas, L., Jenkins, L.J., Dias, J.M., Haigh, I.D., & Brito, A.C. (2023). 40 years of changes in sea surface temperature along the Western Iberian Coast. *Science of the Total Environment,* 888, 164193.

https://doi.org/10.1016/j.scitotenv.2023.164193

Bona, S., Silva-Afonso, A., Gomes, R., Matos, R., & Rodrigues, F. (2023). Nature-Based Solutions in Urban Areas: A European Analysis. *Applied Sciences*, 13(1), 168.

https://doi.org/10.3390/app13010168

Brito, A.C., Pereira, H., Picado, A., Cruz, J., Cereja, R., Biguino, B., Chainho, P., Nascimento, A., Carvalho, F., Cabral, S., Santos, C., Palma, C., Borges, C., & Dias, J.M. (2023). Increased oyster aquaculture in the Sado Estuary (Portugal): How to ensure ecosystem sustainability? *Science of the Total Environment,* 855, 158898.

https://doi.org/10.1016/j.scitotenv.2022.158898

Castro, A., Ribeiro, J., Reino, L., & Capinha, C. (2023). Who is reporting non-native species and how? A cross-expert assessment of practices and drivers of non-native biodiversity reporting in species regional listing. *Ecology and Evolution*, 13(5), e10148.

https://doi.org/10.1002/ece3.10148

Correia, M.G., & Ferreira, A. (2023). Road Asset Management and the Vehicles of the Future: An Overview, Opportunities, and Challenges. *International Journal of Intelligent Transportation Systems Research*, 21, 376-393.

https://doi.org/10.1007/s13177-023-00366-0

Dantas, R., Gouveia, M., Silva, F. G. A., Fiorentin, F., Correia, J. A. F. O., & Lesiuk, G. (2023). Notch effect in very high-cycle fatigue behaviour of a structural steel. *International Journal of Fatigue,* 177, 107925.

https://doi.org/10.1016/j.ijfatigue.2023.107925

Diaz de Tuesta, J.L., Silva, A.S., Roman, F.F., Sanches, L.F., da Silva, F.A., Pereira, A.I., Silva, A.M.T., Faria, J.L., & Gomes, H.T. (2023). Polyolefin-derived carbon nanotubes as magnetic catalysts for wet peroxide oxidation of paracetamol in aqueous solutions. *Catalysis Today*, 419, 114162.

https://doi.org/10.1016/j.cattod.2023.114162

Faria, J., Marques, C., Pombo, J., Mariano, S., & Calado, M.d.R. (2023). Optimal Sizing of Renewable Energy Communities: A Multiple Swarms Multi-Objective Particle Swarm Optimization Approach. *Energies*, 16(21), 7227.

https://doi.org/10.3390/en16217227

Fereidani, N.A., Rodrigues, E., & Gaspar, A.R. (2023). The effectiveness of the Iranian building code in mitigating climate change in Bandar Abbas. *Energy for Sustainable Development*, 76, 101266.

https://doi.org/10.1016/j.esd.2023.101266

Fernandes, J., & Ferrao, P. (2023). A New Framework for Circular Refurbishment of Buildings to Operationalize Circular Economy Policies. *Environments*, 10(3), 51.

https://doi.org/10.3390/environments10030051

Fernandes, J., & Ferrão, P. (2023). Urban Metabolism-Based Approaches for Promoting Circular Economy in Buildings Refurbishment. *Environments,* 10(1), 13.

http://dx.doi.org/10.3390/environments10010013

Sara Silva Lopes, João Cunha Borges, Rui del Pino Fernandes e Teresa Marat-Mendes (2023). How do we design an habitat? Influence and implications of urban design in territorial, social, economic and environmental sustainability. *Cidades* [Online].

http://journals.openedition.org/cidades/8133

Ferraz-Caetano, J. (2023). The Artificial Intelligence Explanatory Trade-Off on the Logic of Discovery in Chemistry. *Philosophies*, 8(2), 17.

https://doi.org/10.3390/philosophies8020017

Ferraz-Caetano, J., Teixeira, F., & Cordeiro, M. N. (2023). Systematic Development of Vanadium Catalysts for Sustainable Epoxidation of Small Alkenes and Allylic Alcohols. *International Journal of Molecular Sciences*, 24(15), 12299.

https://doi.org/10.3390/ijms241512299

Fonseca, J., & Bacao, F. (2023). Geometric SMOTE for imbalanced datasets with nominal and continuous features. *Expert Systems with Applications*, 234, 121053.

https://doi.org/10.1016/j.eswa.2023.121053

Fonseca, J., & Bacao, F. (2023). Improving Active Learning Performance through the Use of Data Augmentation. *International Journal of Intelligent Systems*, 2023, 7941878.

https://doi.org/10.1155/2023/7941878

Gaspar-Cunha, A., Costa, P., Delbem, A., Monaco, F., Ferreira, M.J., & Covas, J. (2023). Evolutionary Multi-Objective Optimization of Extrusion Barrier Screws: Data Mining and Decision Making. *Polymers*, 15(9), 2212.

https://doi.org/10.3390/polym15092212

Gaspar-Cunha, A., Costa, P., Monaco, F., & Delbem, A. (2023) Many-Objectives Optimization: A Machine Learning Approach for Reducing the Number of Objectives. *Mathematical and Computational Applications* 28(1), 17.

https://doi.org/10.3390/mca28010017

Geada, P., Francisco, D., Pereira, F., Maciel, F., Madureira, L., Barros, A., Silva, J., Vicente, A., & Teixeira, J. (2023). Multivariable optimization process of heterotrophic growth of Chlorella vulgaris. *Food and Bioproducts Processing,* 138, 1-13.

https://doi.org/10.1016/j.fbp.2022.12.004

Gholipour, A., Fragoso, R., Galvão, A., & Finger, D.C. (2023). Mapping the causality of interacting perceptions for nature-based solution and sludge treatment reed bed: A causal loop diagram in Iceland. *Nature-Based Solutions,* 3, 100049.

https://doi.org/10.1016/j.nbsj.2023.100049

Gomes Correia, M., & Ferreira, A. (2023). Road Asset Management and the Vehicles of the Future: An Overview, Opportunities, and challenges. *International Journal of Intelligent Transportation Systems Research,* 21(3), 376–393.

https://doi.org/10.1007/s13177-023-00366-0

Guari, N.M.C., Silva, A.S., de Tuesta, J.L.D., Pottker, W.E., Cordeiro, P.Y., & Gomes, H.T. (2023). Magnetic CoFe2O4@carbon yolk-shell nanoparticles as catalysts for the catalytic wet peroxide oxidation of paracetamol: kinetic insights. *Global NEST Journal*, 25(2), 57-66.

https://doi.org/10.30955/gnj.004309

Hernandez, C., Rodrigues, C., Marques, P., & Freire, F. (2023). Life cycle assessment of a large volume parenteral for hospital use. *Resources, Conservation and Recycling*, 198, 107120.

https://doi.org/10.1016/J.RESCONREC.2023.107120

Karimzadeh, S., Funari, M. F., Szabó, S., Hussaini, S. M. S., Rezaeian, S., & Lourenço, P. B. (2023). Stochastic simulation of earthquake ground motions for the seismic assessment of monumental masonry structures: Source-based vs site-based approaches. *Earthquake Engineering & Structural Dynamics*, 2023, 1-28.

https://doi.org/10.1002/eqe.4012

Lima, O., Fernandes, G., & Tereso, A. (2023). Benefits of Adopting Innovation and Sustainability Practices in Project Management within the SME Context. *Sustainability*, 15(18), 13411.

https://doi.org/10.3390/su151813411

Lima, O., Freitas, E., Cardoso, P., Segundo, I.R., Margalho, E., Moreira, L., Nascimento, J.H.O., Landi, S., & Carneiro, J. (2023). Mitigation of Urban Heat Island Effects by Thermochromic Asphalt Pavement. *Coatings*, 13(1), 35.

https://doi.org/10.3390/coatings13010035

Maranha, J., Nascimento, P.J., Calcerano, T.A., Silva, C., Mueller, S. & Moniz, S. (2023). A decision-support framework for selecting additive manufacturing technologies. *Journal of Manufacturing Technology Management*, 34(7), 1279-1311.

https://doi.org/10.1108/JMTM-02-2023-0047

Martins, A. J. G., & Sá, A. (2023). Characterisation of the outdoor public space: a model for assessment. *U. Porto Journal of Engineering,* 9(4), 144-166.

https://doi.org/10.24840/2183-6493_009-004_002151

Menten, G., Melo, W., Pinho, J., Iglesias, I., & Antunes do Carmo, J. (2023). Simulation of Saltwater Intrusion in the Minho River Estuary under Sea Level Rise Scenarios. *Water,* 15(13), 2313.

https://doi.org/10.3390/w15132313

Moretto, S., Santos Silva, A., Diaz de Tuesta, J. L., F. Roman, F., Cortesi, R., Bertão, A. R., Bañobre-López, M., Pedrosa, M., M.T. Silva, A., & T. Gomes, H. (2023). Comprehensive characterization and development of multi-core shell superparamagnetic nanoparticles for controlled delivery of drugs and their kinetic release modelling. *Materials Today Chemistry,* 33, 101748.

https://doi.org/10.1016/j.mtchem.2023.101748

Müller-Carneiro, J., Rodrigues, C., Dias, L. C., Antunes, C. H., Mattos, A. L., & Freire, F. (2023). A multi-criteria framework for the ecodesign of bio-based materials at early development stages. *Journal of Cleaner Production*, 427, 139268.

http://dx.doi.org/10.1016/j.jclepro.2023.139268

Müller-Carneiro, J., de Figueirêdo, M. C. B., Rodrigues, C., de Azeredo, H. M. C., & Freire, F. (2023). Ex-ante life cycle assessment framework and application to a nano-reinforced biopolymer film based on mango kernel. Resources, *Conservation and Recycling*, 188, 106637.

https://doi.org/10.1016/j.resconrec.2022.106637

Naghshineh, B., Fragoso, M., & Carvalho, H. (2023). Rethinking Additive Manufacturing for Spare Parts Supply Chain Management. *Research-Technology Management*, 66(4), 38-47.

https://doi.org/10.1080/08956308.2023.2207970

Pais, A., Alves, J.L., & Belinha, J. (2023). Predicting trabecular arrangement in the proximal femur: An artificial neural network approach for varied geometries and load cases. *Journal of Biomechanics*, 161, 111860.

https://doi.org/10.1016/j.jbiomech.2023.111860

Pais, A., Alves, J.L., Jorge, R.N., & Belinha, J. (2023). Multiscale Homogenization Techniques for TPMS Foam Material for Biomedical Structural Applications. *Bioengineering,* 10(5), 515.

https://doi.org/10.3390/bioengineering10050515

Paiva, L., Pinho-Lopes, M., Valente, R., & Paula, A. M. (2023). Three-dimensional modelling of in-isolation tensile response of geogrids using hyperbolic constitutive models. *Finite Elements in Analysis and Design*, 225, 104008.

https://doi.org/10.1016/j.finel.2023.104008

Rasouli, V., Gomes, Á., & Henggeler Antunes, C. (2023). An optimization model to characterize the aggregated flexibility responsiveness of residential end-users. *International Journal of Electrical Power and Energy Systems,* 144, 108563.

https://doi.org/10.1016/j.ijepes.2022.108563

Ribeiro, F.J., Lopes, J.A.P., Fernandes, F.S., Soares, F.J., & Madureira, A.G. (2023). The role of hydrogen electrolysers in frequency related ancillary services: A case

study in the Iberian Peninsula up to 2040. *Sustainable Energy, Grids & Networks*, 35, 101084.

https://doi.org/10.1016/j.segan.2023.101084

Rodrigues, C., Veloso, M., Alves, A., & Bento, C. (2023). Sensing Mobility and Routine Locations through Mobile Phone and Crowdsourced Data: Analyzing Travel and Behavior during COVID-19. *ISPRS International Journal of Geo-Information,* 12(8), 308.

http://dx.doi.org/10.3390/ijgi12080308

Rodrigues, E., Fereidani, N.A., Fernandes, M.S., & Gaspar, A.R. (2023), Climate change and ideal thermal transmittance of residential buildings in Iran. *Journal of Building Engineering* 74, 106919.

https://doi.org/10.1016/j.jobe.2023.106919

Roman, F. F., De Grande Piccinin, L., Santos Silva, A., Diaz de Tuesta, J. L., Freitas, I. V. K., Vieira, A., Gonçalves Lenzi, G., Manuel Tavares Silva, A., Faria, J. L., & Gomes, H. T. (2023). Carbon Nanomaterials from Polyolefin Waste: Effective Catalysts for Quinoline Degradation through Catalytic Wet Peroxide Oxidation. *Catalysts*, 13(9), 1259.

https://doi.org/10.3390/catal13091259

Roman, F.F., Diaz de Tuesta, J.L., Sanches, F.K.K., Silva, A.S., Marin, P., Machado, B.F., Serp, P., Pedrosa, M., Silva, A.M.T., Faria, J.L., & Gomes, H.T. (2023). Selective denitrification of simulated oily wastewater by oxidation using Janus-structured carbon nanotubes. *Catalysis Today*, 420, 114001.

https://doi.org/10.1016/j.cattod.2023.01.008

Sampaio, A. P. C., Müller-Carneiro, J., Pereira, A. L. S., de Freitas Rosa, M., Mattos, A. L. A., de Azeredo, H. M. C., & de Figueirêdo, M. C. B. (2023). Ecodesign of bio-based films for food packaging: Challenges and recommendations. *Environmental Development,* 48, 100926.

http://dx.doi.org/10.1016/j.envdev.2023.100926

Saraiva, N.B., Pereira, L.D., Gaspar, A.R., & Costa, J.J. (2023). Measurement of particulate matter in a heritage building using optical counters: Long-term and spatial analyses. *Science of the Total Environment,* 862, 160747.

https://doi.org/10.1016/j.scitotenv.2022.160747

Silva, A.S., Roman, F.F., Dias, A.V., Diaz de Tuesta, J.L., Narcizo, A., da Silva, A.P.F., Çaha, I., Deepak, F.L., Bañobre-Lopez, M., Ferrari, A.M.C., & Gomes, H.T. (2023). Hybrid multi-core shell magnetic nanoparticles for wet peroxide oxidation of paracetamol: Application in synthetic and real matrices. *Journal of Environmental Chemical Engineering*, 11(5), 110806.

https://doi.org/10.1016/j.jece.2023.110806

Silva, A. S., Alves, F., Diaz de Tuesta, J. L., Rocha, A. M. A. C., Pereira, A. I., Silva, A. M. T., & Gomes, H. T. (2023). Capacitated Waste Collection Problem Solution Using an Open-Source Tool. *Computers*, 12(1), 15.

https://doi.org/10.3390/computers12010015

Silva, A. L., Oliveira, P., Durães, D., Fernandes, D., Névoa, R., Monteiro, J., Melo-Pinto, P., Machado, J. & Novais, P. (2023). A Framework for Representing, Building and Reusing Novel State-of-the-Art Three-Dimensional Object Detection Models in Point Clouds Targeting Self-Driving Applications. *Sensors*, 23(14), 6427.

https://doi.org/10.3390/s23146427

Sousa, A. (2023). Criatividade no turismo como fator de sustentabilidade turística. *Revista Portuguesa de Estudos Regionais,* 64, 97-113.

https://doi.org/10.59072/rper.vi64.106

Sousa, A. (2023). A sustentabilidade da oferta turística urbana: Uma revisão sistemática da literatura. *Revista Portuguesa de Estudos Regionais*, 66, 81-97.

https://doi.org/10.59072/rper.vi66.411

Sousa, A. (2023). Papel das rotas culturais imateriais para a sustentabilidade turística. Uma proposta de rota imaterial no Funchal (Portugal). *Revista Portuguesa de Estudos Regionais*, 66, 99-115.

https://doi.org/10.59072/rper.vi66.410

Sousa, B., Magaia, N., & Silva, S. (2023). An Intelligent Intrusion Detection System for 5G-Enabled Internet of Vehicles. *Electronics*, 12(8), 1757.

https://doi.org/10.3390/electronics12081757

Souza, R. R., Sá Barbosa, F. M., Nobrega, G., Cardoso, E. M., Teixeira, J. C. F., Moita, A. S., & Lima, R. (2023a). An innovative PDMS cell to improve the thermal conductivity measurements of nanofluids. *Thermal Science and Engineering Progress*, 42, 101926.

https://doi.org/10.1016/j.tsep.2023.101926

Souza, R. R., Sá Barbosa, F. M., Nobrega, G., Cardoso, E. M., Teixeira, J. C. F., Moita, A. S., & Lima, R. (2023b). Experimental study of an innovative elastomer-based heat exchanger. *Case Studies in Thermal Engineering*, 49, 103365.

https://doi.org/10.1016/j.csite.2023.103365

Szabó, S., Funari, M. F., & Lourenço, P. B. (2023). Masonry patterns' influence on the damage assessment of URM walls: Current and future trends. *Developments in the Built Environment*, 13, 100119.

https://doi.org/10.1016/j.dibe.2023.100119

Tamagusko, T., Gomes Correia, M., Rita, L., Bostan, T., Peliteiro, M., Martins, R., Santos, L. D., & Ferreira, A. (2023). Data-Driven Approach for Urban Micromobility Enhancement through Safety Mapping and Intelligent Route Planning. *Smart Cities*, 6(4), 2035–2056.

https://doi.org/10.3390/smartcities6040094

Tran, M.Q., Sousa, H.S., Ngo, T.V., Nguyen, B.D., Nguyen, Q.T., Nguyen, H.X., Baron, E., Matos, J., & Dang, S.N. (2023). Structural Assessment Based on Vibration Measurement Test Combined with an Artificial Neural Network for the Steel Truss Bridge. *Applied Sciences*, 13(13), 7484.

https://doi.org/10.3390/app13137484

Tran, M.Q., Sousa, H.S., Matos, J., Fernandes, S., Nguyen, Q.T., & Dang, S.N. (2023). Finite Element Model Updating for Composite Plate Structures Using Particle Swarm Optimization Algorithm. *Applied Sciences,* 13(13), 7719.

https://doi.org/10.3390/app13137719

Vieira, M., Snyder, B., Henriques, E., White, C., & Reis, L. (2023). Economic Viability of Implementing Structural Health Monitoring Systems on the Support Structures of Bottom-Fixed Offshore Wind. *Energies*, 16(13), 4885.

https://doi.org/10.3390/en16134885

Vlachakis, G., Colombo, C., Giouvanidis, A. I., Savalle, N., & Lourenço, P. B. (2023). Experimental characterisation of dry-joint masonry structures: Interface stiffness and interface damping. *Construction and Building Materials*, 392, 130880.

https://doi.org/10.1016/j.conbuildmat.2023.130880

Vuoto, A., Funari, M.F., & Lourenco, P.B. (2023). On the Use of the Digital Twin Concept for the Structural Integrity Protection of Architectural Heritage. *Infrastructures*, 8(5), 86.

https://doi.org/10.3390/infrastructures8050086

Weber de Melo, W., Pinho, J., & Iglesias, I. (2023). Coastal morphodynamic emulator for early warning short-term forecasts. *Environmental Modelling & Software*, 165, 105729.

https://doi.org/10.1016/j.envsoft.2023.105729

Wilson, R., Szabó, S., Funari, M. F., Pulatsu, B., & Lourenço, P. B. (2023). A Comparative Computational Investigation on the In-Plane Behavior and Capacity of Dry-Joint URM Walls. *International Journal of Architectural Heritage*, 1–22.

https://doi.org/10.1080/15583058.2023.2209776

Epub Ahead of Print and In Print

Colombo, C., Savalle, N., Funari, M. F., Vlachakis, G., Giouvanidis, A., Karimzadeh, S., & Lourenço, P. (2023). Experimental investigation of the horizontal load orientation on masonry corner failure. *International Journal of Masonry Research and Innovation*,

https://doi.org/10.1504/IJMRI.2023.10054545

Ferraz-Caetano, J., Teixeira, F., & Cordeiro, M.N.D.S. (2023). Explainable Supervised Machine Learning Model To Predict Solvation Gibbs Energy. *Journal of Chemical Information and Modeling*.

https://doi.org/10.1021/acs.jcim.3c00544

9.2
Books or Book Chapters

MPP Projects

Silva, D. P., Holt, J. J., Pratumshat, S., Pascoal-Faria, P., Mateus, A., & Mitchell, G. (2023). Crystallisation from Anisotropic Polymer Melts. In Jyotishkumar Parameswaranpillai, Jenny Jacob, Senthilkumar Krishnasamy, Aswathy Jayakumar, and Nishar Hameed (eds) *Polymer crystallization - methods, characterization and applications*. Essay, WILEY VCH. ISBN: 9783527350810

Exploratory: Changing the design paradigm - 3D printing on molecular texture in plastics (3DPMTP)

MPP PhD Candidates

(Authorship by MPP2030 students is underlined)

Iglesias, I., Pinho, J.L., Bio, A., Avilez-Valente, P., Melo, W., Vieira, J., Bastos, L., & Veloso-Gomes, F. (2023). A importância dos modelos numéricos na previsão dos efeitos das alterações climáticas e dos eventos extremos em áreas estuarinas. In: A. Nunes & L. Lourenço (Eds.) *Análise e modelação de risco no ordenamento do território,* vol 11 (pp. 13-44). RISCOS - Associação Portuguesa de Riscos, Prevenção e Segurança. ISSN 2184-5727.

https://doi.org/10.34037/978-989-9053-18-2_11

Noorimotlagh, Z., Silva, A. S., Diaz de Tuesta, J. L., Mirzaee, S. A., Martínez, S. S., & Gomes, H. T. (2023). Chapter 7 - Wastewater purification using advanced functionalized nanoparticles. In: S. ul Islam, C. M. Hussain, & S. K. Shukla (Eds.), *Antiviral*

and Antimicrobial Coatings Based on Functionalized Nanomaterials (pp. 223–283). Elsevier.

https://doi.org/10.1016/B978-0-323-91783-4.00002-4

Pereira, J., Oliveira, P., Duarte, M.S., Martins, G. & Novais, P. (2023). Using Deep Learning Models to Predict the Electrical Conductivity of the Influent in a Wastewater Treatment Plant. In: P. Quaresma, D. Camacho, H. Yin, T. Gonçalves, V. Julian, & A.J. Tallón-Ballesteros (Eds.) *Intelligent Data Engineering and Automated Learning – IDEAL 2023. IDEAL 2023. Lecture Notes in Computer Science,* vol 14404. Springer, Cham.

https://doi.org/10.1007/978-3-031-48232-8_13

Santos, F. A., de Souza, M. D., Oliveira, P., Matos, L. N., Novais, P., & Zanchettin, C. (2023). Image Classification Understanding with Model Inspector Tool. In: P. García Bringas, et al. (Eds.) *Hybrid Artificial Intelligent Systems. HAIS 2023. Lecture Notes in Computer Science,* vol 14001. Springer, Cham.

https://doi.org/10.1007/978-3-031-40725-3_52

Savalle, N., Funari, M. F., Fernandes, L., Colombo, C., Szabó, S., Hussaini, S., Karimzadeh, S., & Lourenço, P. B. (2023). Large Static Testing Equipment: Design and Testing of a Settlement Facility. In: C. Chastre et al. (Eds.) *Testing and Experimentation in Civil Engineering. TEST&E 2022. RILEM Bookseries*, vol 41 (pp. 171–183). Springer, Cham.

https://doi.org/10.1007/978-3-031-29191-3_15

Silva, A.S., Lima, J., Pereira, A.I., Silva, A.M.T., Gomes, H.T. (2023). Execution Time Experiments to Solve Capacitated Vehicle Routing Problem. In: O. Gervasi, et al. (Eds.) *Computational Science and Its Applications – ICCSA 2023 Workshops. ICCSA 2023. Lecture Notes in Computer Science*, vol 14111. Springer, Cham.

https://doi.org/10.1007/978-3-031-37126-4_19

Silva, A. S., Lima, J., Pereira, A. I., Silva, A. M. T., & Gomes, H. T. (2023). System size influence on optimization of municipal solid waste collection. In: C. Vilarinho, F. Castro, & M.J. Quina (Eds.) *WASTES: Solutions, Treatments and Opportunities IV* (pp. 252–257). CRC Press.

https://doi.org/10.1201/9781003345084-41

Tenório, M., Branco, J. M., & Silva, S. M. (2023). Application of a Prefabricated Wooden-Based System for Collective Buildings in a Four-Storey Portuguese Building. In: F. Gaspar, & A. Mateus (Eds.) *Sustainable and Digital Building* (pp. 183–193). Springer International Publishing.

https://doi.org/10.1007/978-3-031-25795-7_13

Tran, M.Q., Sousa, H.S., & Matos, J.C. (20239). Application of AI Tools in Creating Datasets from a Real Data Component for Structural Health Monitoring. In: M. Noori, C. Rainieiri, M. Domaneschi, & V. Sarhosis (Eds.) *Data Driven Methods for Civil Structural Health Monitoring and Resilience,* chapter 9. CRC Press (Taylor & Francis) 2023,

https://doi.org/10.1201/9781003306924-9

Epub Ahead of Print or Accepted for Publication

Cardoso, A., Colim, A., Braga, A. C., Carneiro, P., Costa, N., Arezes, P., & Bicho, E. (2024). Development of a Rapid Assessment Method of the Potentiality to Transform Manufacturing Workstations into an Assistive Collaborative System. In: P.M. Arezes, et al. (Eds.) *Occupational*

and Environmental Safety and Health V. Studies in Systems, Decision and Control, vol 492 (pp. 87–97). Springer, Cham.

https://doi.org/10.1007/978-3-031-38277-2_7

Kirkici, H., Colim, A., Carneiro, P., & Pedrosa, P. (2024). Development of a Questionnaire to Understand Future Users' Preferences About Human-Centric Autonomous Car Interior. In: P.M. Arezes, et al. (Eds.) *Occupational and Environmental Safety and Health V. Studies in Systems, Decision and Control,* vol 492. Springer, Cham.

https://doi.org/10.1007/978-3-031-38277-2_9

Mindrico, T., Gouveia, P., Queirós, M., & Batista, A. (2023). How ludic culture can unblock inequalities in a planetary scale?". In. *New Coordinates for Creative Hybrid Space-Experiences Environments, communities, identities, and art*. 2024.

Mindrico, T., & Kanyangi, K. (2023) Character Design for Ludic Hybrid Environments: New Possibilities for Equity, Diversity, and Inclusion. In *Experiences in Hybrid Spaces: Creation, Reception, Understanding*. 2024.

9.3 Proceedings or Conference Papers

MPP Projects

Basu, R., Colaninno, N., Alhassan, A., & Sevtsuk, A. (2023). Hot and Bothered: Exploring the Effect of Heat on Pedestrian Behavior and Accessibility. *Cities*, in review.

Seed: Developing a pedestrian model for Lisbon to plan for low-carbon mobility

Bigelow, Z., & Velásquez-García, L.F. (2023). Fully 3D-Printed Miniature Langmuire Multi-Probe Sensor for Cubesat Ionospheric Plasma Diagnostics. *2023 IEEE 36th International Vacuum Nanoelectronics Conference (IVNC)* (pp. 103-105).

https://doi.org/10.1109/IVNC57695.2023.10188955

Flagship: NewSat

Diaz, A., & Velàsquez-Garcìa, L.F. (2023). Miniature, 3-D Printed RF Quadrupole Mass Filters For Cubesats. *2023 IEEE 36th International Vacuum Nanoelectronics Conference (IVNC)* (pp. 106-108).

https://doi.org/10.1109/IVNC57695.2023.10188995

Flagship: NewSat

Kachkine, A., Owens, C.E., Hart, A.J., & Velásquez-Garcia, L.F. (2023). 3D-Printed, Non-Planar Electron Sources For Next-Generation Electron Projection Lithography. *2023 IEEE 36th International Vacuum Nanoelectronics Conference (IVNC)* (pp. 128-130).

https://doi.org/10.1109/IVNC57695.2023.10188962

Flagship: NewSat

Dias, E., Raposo, D., Esfahanizadeh, H., Cohen, A., Vasudevan, V.A., Ferreira, T., Luís, M., Sargento, S., & Médard, M. (2023). Millimeter-Wave Testbed and Modeling in NeXt Generation URLLC Communications. *2023 IEEE 24th International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)* (pp. 480-482).

https://doi.org/10.1109/WoWMoM57956.2023.00083

Flagship: SNOB

Silva, H., Godinho, N., & Sousa, B. (2023). SALEM: Service Fairness in Wireless Mesh Environments. *2023 IEEE 20th Consumer*

Communications & Networking Conference (CCNC) (pp.1-6).

https://doi.org/10.1109/CCNC51644.2023.10060742

Flagship: SNOB

Vasudevan, V.A., Soni, T., & Médard, M. (2023). Practical Sliding Window Recoder: Design, Analysis, and Usecases. *2023 IEEE 29th International Symposium on Local and Metropolitan Area Networks (LANMAN)* (pp. 1-6).

https://doi.org/10.1109/LANMAN58293.2023.10189420

Flagship: SNOB

Gaspar, A.R., Nunes, A., & Matos, A. (2023). Limit Characterization for Visual Place Recognition in Underwater Scenes. In: Tardioli, D., Matellán, V., Heredia, G., Silva, M.F., Marques, L. (eds) *ROBOT2022: Fifth Iberian Robotics Conference. ROBOT 2022. Lecture Notes in Networks and Systems*, vol 589. Springer, Cham.

https://doi.org/10.1007/978-3-031-21065-5_6

Flagship: K2D

Silva, H., Moreno, T., Almeida, A., Soares, A. L., & Azevedo, A. (2023). A digital twin platform-based approach to product lifecycle management: Towards a transformer 4.0. *International Conference Innovation in Engineering* (pp. 14-25).

https://doi.org/10.1007/978-3-031-09360-9

Flagship: Transformer 4.0

Pascoal-Faria, P., Silva, D., Mateus, A. Mitchell, G. R. (2023). Digitalisation of Material Science – Improving Product Design in the Context of Industry 4.0. *Materials Today: Proceeding.*

https://doi.org/10.1016/j.matpr.2023.06.237

Exploratory: Changing the design paradigm – 3D printing on molecular texture in plastics (3DPMTP)

MPP PhD Candidates

(Authorship by MPP2030 students is underlined)

Boas, A. V., André, J., Cerqueira, S. M., & Santos, C. P. (2023). A DMPs-based Approach for Human-Robot Collaboration Task Quality Management. *2023 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)* (pp. 226-231).

https://doi.org/10.1109/ICARSC58346.2023.10129609

Bona, S., Silva-Afonso, A., Gomes, R., & Rodrigues, F. (2023). Strategic Plan for Water Losses Management in Water Supply Systems. *Proceedings of the 3rd International Conference on Water Energy Food and Sustainability (ICoWEFS 2023).*

Bona, S., Silva-Afonso, A., Gomes, R., & Rodrigues, F. (2023). Nature-based Solutions for Sustainable Urban Water Management: Addressing the Challenges in Urban Areas. *Proceedings of the 2nd International Conference on Construction, Energy, Environment & Sustainability (CEES 2023).*

Colombo, C., Vlachakis, G., Angel, C. C., Giouvanidis, A. I., Savalle, N., Mendes, N., & Lourenço, P. B. (2023). Tangential interface stiffness estimation of dry-joint masonry structures through an extended experimental campaign. *14th North American Masonry Conference (14th NAMC).*

Dias, M., Probst, P., Silva, L., & Gamboa, H. (2023). Cleaning ECG with Deep Learning: A Denoiser Based on Gated Recurrent Units. *Doctoral Conference on Computing, Electrical and Industrial Systems* (pp. 149-160).

https://doi.org/10.1007/978-3-031-36007-7_11

El Sibaii, M., Rocha Ribeiro, R., Dias, R., Pinto, J.R., Granja, J., & Azenha, M. (2023). Towards Standardization of Data for Structural Concrete: Product Data Templates. In: A. Jędrzejewska, F. Kanavaris, M. Azenha, F. Benboudjema, & D. Schlicke (Eds.), *International RILEM Conference on Synergising Expertise towards Sustainability and Robustness of Cement-based Materials and Concrete Structures. SynerCrete 2023*, Vol. 43, (pp. 24). Springer, Cham.

https://doi.org/10.1007/978-3-031-33211-1_24

Fernandes, J., & Ferrão, P. (2023). Improving building refurbishment strategies to promote Circular Economy, *Proceedings of the International Symposium on Waste Management and Sustainable Landfilling, SARDINIA 2023.* Cagliari (IT), ISBN 9788862650335. ISSN 2282- 0027.

Fonseca, J., Bell, A., Abrate, C., Bonchi, F., & Stoyanovich, J. (2023). Setting the Right Expectations: Algorithmic Recourse Over Time. *EAAMO '23: Proceedings of the 3rd ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization,* (pp. 1-11).

https://doi.org/10.1145/3617694.3623251

Justino, M., Probst, P., Zagalo, D., Cepeda, C., & Gamboa, H. (2023). Multimodal Stress Classification Based on Biosignals Extracted from Smart Devices and Electromyography. *Proceedings of the 16th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2023)*, Vol 4: BIOSIGNALS (pp. 265-272).

https://doi.org/10.5220/0011687200003414

Lima Jr., O., Segundo, I. R., Mazzoni, L., N., Freitas, E., Carneiro, J. (2023). Smart Road Markings: Anti-Aging, Photoluminescence, Self-Cleaning, and Thermochromism. *DCE23 - Doctoral Congress in Engineering.*

Martins, D., Cerqueira, S.M., Vieira, T.P., Pombeiro, A., & Santos, C.P. (2023). Towards a User-specific Ergonomics-based Approach for an Activity Assessment Tool. *2023 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)* (pp. 220-225).

https://doi.org/10.1109/ICARSC58346.2023.10129578

Martins, J., Cerqueira, S. M., A. F. Silva, A. Catarino, A. Rocha and C. P. Santos (2023). Towards a Smart-Vest for Forward Posture Monitoring: Improving Usability with E-Textiles. *2023 IEEE 7th Portuguese Meeting on Bioengineering (ENBENG)* (pp. 215-218).

https://doi.org/10.1109/ENBENG58165.2023.10175331

Mendes, F., Probst, P., Oliosi, E., Silva, L., Cepeda, C., & Gamboa, H. (2023). Analysis of Postural Variability of Office Workers Using Inertial Sensors. *Proceedings of the 16th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2023)* Vol 4: BIOSIGNALS (pp. 273-280).

https://doi.org/10.5220/0011688500003414

Murta, J., da Silva, A. P., dos Santos, C. E., Macanjo, D., & Gomes, H. (2023). The Effect of Adding Alumina as an Aluminum Source to the Diatomaceous Earth-Based Geopolymer. *Engineering Proceedings*, 5.

https://doi.org/10.3390/ASEC2023-15907

Nascimento, P., Silva, C., Mueller, S., Moniz, S. (2023). Nesting and Scheduling for Additive Manufacturing: An Approach Considering Order Due Dates. In: Almeida, J.P., Geraldes, C.S., Lopes, I.C., Moniz,

S., Oliveira, J.F., Pinto, A.A. (eds) *Operational Research. IO 2021. Springer Proceedings in Mathematics & Statistics*, vol 411. Springer, Cham.

https://doi.org/10.1007/978-3-031-20788-4_8

Oliosi, E., Probst, P., Rodrigues, J., Silva, L., Zagalo, D., Cepeda, C., & Gamboa, H. (2023). Week-Long Multimodal Data Acquisition of Occupational Risk Factors in Public Administration Workers. *2023 19th International Conference on Intelligent Environments (IE)* (pp. 1-8)

https://doi.org/10.1109/IE57519.2023.10179099

Paredes, R., & Reis, M. S. (2023). Decentralized process monitoring: unlocking causal insights for enhanced fault detection and diagnosis. In: Instituto Politécnico de Bragança (Ed.), *CHEMPOR 2023—14th International Chemical and Biological Engineering Conference – Book of Abstracts* (pp. 143-144). Retrieved from

https://bitok.datastore.pt/scimeet-prod/cms/chempor2023.events.chemistry.pt/f4656b60-b2bf-49cd-a428-d97e5443845b/CHEMPOR2023_BookofAbstracts.pdf

Paiva, L., Pinho-Lopes, M., Valente, R., & Paula, A. M. (2023). Topology optimization of a junction in a biaxial geogrid under in-isolation tensile loading. *Geosynthetics: Leading the Way to a Resilient Planet* (pp. 2140-2145).

https://doi.org/10.1201/9781003386889

Ribeiro, B.A., Ribeiro, J.A., Ahmed, F., Tavares, S.M., Penedones, H., Sarmento, L. & Belinha, J. (2023). Scalar Field Prediction on Structural Analysis using Graph Neural Networks. *Proceedings of the 7th ECCOMAS Young Investigators Conference (ECCOMAS YIC 2023)*.

https://doi.org/10.5281/zenodo.8393048

Ribeiro, F. J., Lopes, J. A. P., Soares, F. J., & Madureira, A. G. (2023). Assessing the Membership of Portugal and Spain in the FCR Cooperation: TSO Costs and VPP Revenues. *2023 International Conference on Smart Energy Systems and Technologies (SEST)* (pp. 1-6).

https://doi.org/10.1109/SEST57387.2023.10257468

Shariatzadeh, M., Antunes, C. H., & Lopes, M. A. (2023). Bi-Objective Optimization of EV Charging in a Workplace Parking Lot. *2023 International Conference on Smart Energy Systems and Technologies (SEST)* (pp. 1-6).

https://doi.org/10.1109/SEST57387.2023.10257500

Silva, A. S., Pereira, A. I., Lima, J., Silva, A. M. T., & Gomes, H. T. (2023). Execution time as a key parameter in the waste collection problem. *2023 18th Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1–6).

https://doi.org/10.23919/CISTI58278.2023.10211886

Szabó, S., Funari, M. F., Pulatsu, B., Giouvanidis, A. I., Karimzadeh, S., & Lourenço, P. B. (2023). Macro vs Micro Limit Analysis models for the seismic assessment of in-plane masonry walls made with quasi-periodic bond types. *Procedia Structural Integrity,* Vol. 44 (pp. 1340–1347).

https://doi.org/10.1016/j.prostr.2023.01.172

Tenente, M., Henriques, C., Gomes, Á., da Silva, P. P., & Trigo, A. (2023). Multiple Impacts of Energy Efficiency Technologies in Portugal. In: C. Henriques, C. Viseu (Eds.), *EU Cohesion Policy Implementation - Evaluation Challenges and Opportunities. EvEUCoP 2022*. (pp. 131-146). Springer Proceedings in Political Science and International Relations. Springer, Cham.

https://doi.org/10.1007/978-3-031-18161-0_9

Tenório, M., Silva, S. M., & Branco, J. M. (2023). Prediction of the Acoustic Insulation of a Prefabricated Wooden-Based System for Collective Buildings. *World Conference on Timber Engineering 2023 (WCTE2023)* (pp. 1960-1967).

https://doi.org/10.52202/069179-0259

Tran, M.Q., Sousa, H.S., Texeira, E., Matos, J.C., & Dang, H.T. (2023). Digital Twin - Solution in the Digital Age for Improving Critical Infrastructure Resilience to Extreme Events. In: F. Biondini & D.M. Frangopol (Eds.) *Life-Cycle of Structures and Infrastructure Systems* (pp. 4147-4154). CRC Press.

https://doi/org
/10.1201/9781003323020-511

Vlachakis, G., Colombo, C., Giouvanidis, A. I., Mendes, N., Savalle, N., & Lourenço, P. B. (2023). Energy Loss Mechanisms of Rocking Blocks: Experimental Observations. *9th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering Methods in Structural Dynamics and Earthquake Engineering (COMPDYN 2023)* (pp. 3960-3971).

https://doi.org
/10.7712/120123.10694.20724

Epub Ahead of Print and In Press

Dantas, A., Dantas, R., Cipriano, G.P., De Jesus, A., Lesiuk, G., Fonseca, C., Moreira, P., & Correia, J.A.F.O. (2023) Effect of seawater corrosion on the mechanical behavior of S690 steel. *5th International Conference on Structural Integrity – ICSI 2023.*

Szabó, S., Funari, M. F., D'Altri, A. M., & de Miranda, S. (2023). A Two-Step Approach for the Seismic Assessment of Masonry Structures Accounting for the Actual Masonry Pattern. *COMPDYN Proceedings, 9th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, COMPDYN 2023* (pp. 1-1). Athens. ISSN 2623-3347.

Szabó, S., Pulatsu, B., Funari, M. F., & Lourenço, P. (2023). Cross-section influence on the out-of-plane behavior of historic masonry walls: A parametric study. *Proceedings of the 2023 CSCE Conference.*

Tran, M.Q., Sousa, H.S., Nguyen, N.T.C., Nguyen, Q.H., & Campos e Matos, J. (2024). Opportunities and Challenges of Digital Twins in Structural Health Monitoring. In: T. Nguyen-Xuan, T. Nguyen-Viet, T. Bui-Tien, T. Nguyen-Quang, & G. De Roeck (Eds.) *Proceedings of the 4th International Conference on Sustainability in Civil Engineering. ICSCE 2022. Lecture Notes in Civil Engineering*, vol 344. Springer, Singapore.

https://doi.org/
10.1007/978-981-99-2345-8_69

9.4
PhD Thesis

João Fonseca

NOVA University of Lisbon

The Role of Synthetic Data in Improving Supervised Learning Methods: The Case of Land Use/Land Cover Classification

October 12th, 2023

9.5 Oral Communications

MPP PhD Candidates

(Authorship by MPP2030 students is underlined)

Alves, A., Marques da Costa, E., & Gomes, E. (2023, July 10-15). Solar energy expansion in Portugal: a recent trend impacting farming and forestry [Conference presentation]. 35th AESOP Annual Congress 2023: Integrated Planning in a world of turbulence. Lodz, Poland

Alves, A., Marques da Costa, E., Caetano, M., & Gomes, E. (2023, November 14-17). Energia solar fotovoltaica em Portugal: oportunidade de desenvolvimento ou competição territorial? [Conference presentation]. XIV Congresso da Geografia Portuguesa: Territórios em Transição e Sustentabilidade: crises e respostas. Lisbon, Portugal

Alves, A., Marques da Costa, E., Caetano, M., & Gomes, E. (2023, March 27-29). A transição energética em Portugal: avaliação de metas e análise do consumo de solo da energia solar fotovoltaica [Conference presentation]. VII Workshop RIDOT: O ordenamento Territorial no contexto das mudanças climáticas: oportunidades para o desenvolvimento territorial sustentável. Curitiba, Brazil

Alves, A., Marques da Costa, E., Gomes, E., & Niza, S. (2023, July 19-21). Clean energy, unclear metrics: can optimal locations for sustainable energy production be identified? [Conference presentation]. 30th APDR Congress: Sustainability Development Challenges of Territories in Contexts of Uncertainties due to External Shocks and Risks. Braga, Portugal

Alves, A., Marques da Costa, E., Gomes, E., & Niza, S. (2023, November 14-17). Solar Sustentável: proposta de medição e avaliação de uma estratégia de localização ótima para Portugal continental [Conference presentation]. XIV Congresso da Geografia Portuguesa: Territórios em Transição e Sustentabilidade: crises e respostas. Lisbon, Portugal

Alves, A., Marques da Costa, E., Gomes, E., & Niza, S. (2023, September 14-17). Energy Transition in the Portuguese context - Competing versus Sustainability Outlooks [Conference presentation]. 23rd European Colloquium on Theoretical and Quantitative Geography. Braga, Portugal

Anjos, R., (2023, July 12-14). Micro-reinforcement of coarse granular aggregates. Research Summit 2023. University of Aveiro.

Antunes, H., (2023, June-15-16). Food Productive Green Infrastructure: an opportunity to create new urban morphologies based on agriculture. DCE 2023 (Symposium Spatial Planning). FEUP, Porto

Antunes, H., (2023, September 10-13). Planning for food resilience in Great Porto: an assessment of the current situation. ECLAS 2023 conference Labyrinth of the World. Brno, Czech Republic

Biguino, B., (2023, June 8). The influence of climate change on the physicochemical properties of Sado Estuary (Portugal): linking in situ, model and satellite data. ASLO Aquatic Sciences Meeting 2023. Palma de Mallorca, Spain

Bona, S., (2023, June 27-30). Nature-based Solutions for Sustainable Urban Water Management: Addressing the Challenges in Urban Areas. 2nd International Conference on Construction, Energy, Environment & Sustainability (CEES 2023). Funchal, Madeira, Portugal

Bona, S., (2023, May 10-12). Strategic Plan for Water Losses Management in Water Supply Systems. 3rd International Conference on Water Energy Food and Sustainability (ICoWEFS 2023). Leiria

Cardoso. A., (2023, November 10). The role of Ergonomics in the digital transformation of manufacturing settings: Measuring cognitive workload and trust in collaborative robotic systems. University of Minho, Azurém Campus (Within the scope of the master's degree seminar cycle in Human Engineering)

Castro, A., (2023, September 19). Who is reporting non-native species and how? A cross-expert assessment of practices and drivers of non-native biodiversity reporting in species regional listing. 52nd Annual Meeting of the Ecological Society of Germany. Austria and Switzerland

Colombo, C., Vlachakis, G.,Mendes, N.,Giouvanidis, A. I., Savalle, N., & Lourenço, P. B. (2023, August 27-30). Revisiting the rocking overturning spectrum of free-standing blocks via shaking table tests. Engineering Mechanics Institute 2023 (EMI 2023). Palermo (Italy)

Costa, P., (2023, September 13-15). Evolutionary Multi-Objective Optimization of Shoe Sole Damper Geometry: Data Mining and Decision Making. International Conference on Polymer Process Innovation | PPI 2023. Guimarães

da Silva, A. P. (2023, December 11). Eco-Friendly Fly Ash-Derived Geopolymers for Wastewater Treatment. I Seminar | PhD in Chemical and Biological Sciences. Vila Real, Portugal

da Silva, A. P. (2023, December 11). Optimizing the Synthesis of Geopolymers from Fly Ash: A Box-Behnken Design for Enhanced Mechanical Performance in Sustainable Construction Materials. I Seminar | PhD in Chemical and Biological Sciences. Vila Real, Portugal

da Silva, A. P. (2023, March 3). Production of geopolymers based on fly-ash and their application as adsorbent for wastewater treatment. Ciências Químicas e Biológicas, no âmbito do Evento EliteSci – Student Conference. Universidade de Trás-os-Montes e Alto Douro

da Silva, A. P. (2023, May 10-12). Reactive materials and solutions towards treatment and reuse of waters with contaminants of emerging concern. International Conference on Water Energy Food and Sustainability (ICoWEFS 2023). Leiria, Portugal

da Silva, A. P. (2023, May 17-19). Production of activated carbon from residual sources and their application in the adsorption of phenol and gallic acid. 1st Mediterranean Conference on Porous Materials. Crete, Greece

Dantas, R., (2023, April 2-4). Frequency effect in fatigue behavior of a structural steel and a spring steel. IRAS. Porto

Dantas, R., (2023, August 28 - September 1). An analysis of notch sensitivity in the VHCF fatigue regime of S690 steel. ICSI: 5th International Conference on Structural Integrity. Funchal, Madeira, Portugal

Dias, M., (2023, May). "Learning from Biosignals". Tec2Med Congress 2023. FCT Nova, Lisboa

Dias, M., (2023, September). "Operator 4.0: Digital Transformation in Industry with a Focus on Operator 4.0". MIT Portugal Program 2023 Conference. Braga

Fernandes, J., Cosentino, L., & Mateus, R. (2023, June 15-16). Contribution of earthen construction towards a circular and

regenerative built. International Seminar Which Future for Vernacular Architecture & Earthen Architecture. Porto

Fernandes, R., (2023, November 14). Pressões recentes de uso e ocupação do solo nas turfeiras ibéricas. XIV Congresso da Geografia Portuguesa. Lisboa, Portugal

Fernandes, R., (2023, September 20). Land use and land cover pressures on Iberian peatlands Power to the Peatlands. Antwerp, Belgium

Fernandes, del Pino, R., Marate-Mendes, T., Cunha Borges, J., (2023, September 13-14). Formas urbanas e modos de vida na periferia urbana. O caso da Bobadela, em Lisboa: passado, presente e futuro. Congresso do Portuguese-Language Network of Urban Morphology (PNUM 2023). Sintra, Portugal

Fernandes, del Pino, R., Marate-Mendes, T., Cunha Borges, J., (2023, September 13-14). A cidade-jardim revisitada: O paisagismo enquanto ferramenta para a criação de habitats sustentáveis. Congresso do Portuguese-Language Network of Urban Morphology (PNUM 2023). Sintra, Portugal

Fernandes, J., Improving building refurbishment strategies to promote Circular Economy. International Symposium on Waste Management and Sustainable Landfilling. SARDINIA 2023. Cagliari (IT)

Gomes Correia, M., (2023, November 28). Road Asset Management Considering Connected and Automated Vehicles. OPL Research Group Seminars

Gomes Correia, M., (2023, September 30 – October 4). Automatização do Processo de Importação e Conflação Massiva no OpenStreetMap: Estudo de Caso em Fortaleza/CE. State of the Map Brasil 2023. Curitiba, Paraná, Brasil

Hernandez, C., Freire, F., Rodrigues, C. (2023, May 29). Ecodesign of plastic products: a novel approach and applications [Conference presentation]. XV meeting EfS, Students & Companies. Coimbra, Portugal

Hernandez, C., Rodrigues, C., Penha, B., Simões, T., & Freire, F. (2023, May 11). Carbon footprint and energy assessment of plastic products produced at Neutroplast [Conference presentation]. International Conference on Water Energy Food and Sustainability (ICoWEFS 2023). Leiria, Portugal

Jóia Santos, C., Ferreira, J.C., Beck, M.W. (2023, November 29-30). Nature-based Solutions and Coastal Resilience: How can nature protect us from nature. Encontro MARE 2023, Figueira da Foz, Portugal

Kapler, B.L., (2023, February 6-7). Telework frequency and its effects on travel behavior in the post-covid-19 era. 19th GET meeting. Oeiras, Lisbon, Portugal

Kapler, B.L., (2023, July 11-15). Are we moving online? An analysis of COVID-19 impacts on telecommuting: consequences for urban planning. AESOP Annual Congress 2023. Lodz, Poland

Kapler, B.L., (2023, June 21-22). Women in work from home: does gender impact telework engagement. NECTAR Workshop, Clusters 6 & 7. Coimbra, Portugal

Kapler, B.L., (2023, September, 6-8). Telework frequency and travel behavior during the COVID-19 pandemic. A study across different geographies from the Lisbon, Istanbul, and Porto Alegre Metropolitan Areas 25th Euro Working Group on Transportation Conference. Santander, Cantabria, Spain

Lima, O., Jr., (2023, April 21, 28-19). Thermochromic Asphalt Pavement Toward the Mitigation of Urban Heat Island Effects. Pavement Functional Design and Management. Guimarães, Portugal

Lima, O., Jr., (2023, June 15-16). Smart Road Markings: Anti-Aging, Photoluminescence, Self-Cleaning, and Thermochromism. Doctoral Congress in Engineering. Porto, Portugal

Meireis, C. (2023, june 27-30). Strategies for the Retrofitting of RC Building Envelopes using Natural Based Materials. International Conference on Construction, Energy, Environment & Sustainability. Funchal, Portugal

Mindrico. T., (2023, February 13). Unitary urbanism through the lens of ludification: An artistic project promoting inclusion and accessibility in public space. Communities and Artistic Participation in Hybrid Environment (CAPHE) Kenyatta University. Nairóbi, Quénia

Mindrico. T., (2023, November 29). Playful Revolution: Integrating Ludic Design and Art in Civic Media for Social and Environmental Transformation. National and Kapodistrian University of Athens, Department of informatics & telecommunications. Grécia Athena Research & Innovation Center

Mindrico. T., (2023, September 11). How does the ViViDo Platform empower and support connections. The Perspective of the National Network for Support to Victims of Domestic Violence. 3rd Digital Geographies Conference: can digital technologies bring hope to vulnerable territories.

Mindrico. T., (2023, September 28). Ludic Urban Experience "Cassandra". Case Study of a community mapping workshop framework. URBEXPLORERS CONFERENCE Tesserae Urban Social Research. Berlim, Germany

Müller-Carneiro, J. (2023, April 26). Ecodesign de bioprodutos em desenvolvimento laboratorial: Investigação conjunta da UC (Portugal) e da Embrapa (Brasil) [Oral Communication]. Economia circular nas Empresas e na Investigação Científica, Department of Mechanical Engineering. Coimbra, Portugal

Müller-Carneiro, J. (2023, January 13). Structured scenario approaches for (prospective) LCA [Oral Communication]. Life-cycle lunch seminar, Center for Industrial Ecology, ADAI. Coimbra, Portugal

Müller-Carneiro, J., Rodrigues, C., Figueirêdo, M.C.B., & Freire, F. (2023, February 28 – March 3). Life cycle assessment of nanocellulose production from food waste. [Conference presentation]. Young Biomass Researchers conference, World Sustainable Energy Days 2023. Wels, Austria

Navarro, L.C., Azevedo, A., Matos, A., Rocha, A., Ozório, R., (2023, June 16) Comparing Morphological Traits of Fish Images to Determine Isometric or Allometric Growth oral presentation at Symposium on Electrical and Computer Engineering. DCE2023 5th Doctoral Congress in Engineering. FEUP, Porto, Portugal

Oliveira L.M.C., Santana V.V., Rodrigues A.E., Ribeiro A.M., Nogueira I.B.R. (2023, September 12-15)

Oliveira, P., (2023, November 22). Using Deep Learning Models to Predict the Electrical Conductivity of the Influent in a Wastewater Treatment Plant. 24th International Conference on Intelligent Data Engineering and Automated Learning (IDEAL 2023). Évora, Portugal

Oliveira, P., (2023, November 30). A Self-Organizing Map Clustering Approach to Support Territorial Zoning. 26th Iberoamerican Congress on Pattern Recognition. Coimbra, Portugal

Oliveira, P., (2023, September 6). Image classification understanding with Model Inspector tool. 18th International Conference on Hybrid Artificial Intelligence Systems (HAIS 2023). Salamanca, Spain

Paredes, R., (2023, September 12-15). Decentralized Process Monitoring: Unlocking causal insights for enhanced fault detection and diagnosis. 14th International Chemical and Biological Engineering Conference. Bragança

Príncipe, J., (2023, 13 September). Oral communication entitled "Comparison of Energy Consumption and Carbon Footprint of Perovskite Solar Cells with Different Architectures. 14 International Chemical and Biological Engineering Conference (ChemPor). Bragança

Pereira, R., Norton, A., Nóbrega, J.M., Santos, C. P. (2023, October 30). SmartPacif – A Innovative adaptive pacifier capable of malocclusions monitorization, - Final session TEC+ Program, Auditório do IB-S, Gualtar, Braga, Portugal

Pereira, R. (2023, October 24) Future Pacifiers Best Student Initiative of the University of Minho, Health and Well-being category, Department of Polymer Engineering, School of Engineering, University of Minho

Reis, A.L. (2023, September 13-15). An optimization framework to assess the demand-side management capacity of a Water Supply System. [Conference presentation]. 11th IWA International Conference on Efficient Urban Water Use. Bordeaux, France

Reis, A.L., Andrade-Campos, A., Henggeler Antunes, C., & Lopes, M.A.R. (2023, June 19-21). A Mixed-Integer Nonlinear Programming Model for Integrated Management of Resources in Water Supply Systems. [Conference presentation]. 7th ECCOMAS Young Investigators Conference. Porto, Portugal

Ribeiro, J. A., (2023, July). Graphs or Subgraphs? A Comparative Analysis of Graph Neural Networks for Stress Prediction. USNCCM17. Albuquerque, New Mexico

Ribeiro, J. A., (2023, June). Scalar Field Prediction on Structural Analysis using Graph Neural Networks. YIC2023. FEUP, Porto

Ribeiro, J. A., (2023, June). Simulated Structural Plate with Holes Dataset for Machine Learning Application. YIC2023. FEUP, Porto

Ribeiro, J. A., (2023, June). SimuStruct: An Integrated Approach of FEniCS and Machine Learning for Stress Prediction in Plates with Holes. FEniCS 2023. Pula Caliary, Italy

Ribeiro, J. A., (2023, November). Advancing Structural Design with Machine Learning: Stress Field Prediction in Plates with Cutouts. CILAMCE 2023. Porto

Ribeiro, J. A., (2023, November). Aircraft Structures Life-cycle Simulation Through Digital Twins And Model Updating Techniques. CILAMCE 2023. Porto

Ribeiro, J. A., Ribeiro, B. A., Ahmed, F., Penedones, H., Belinha, J., Sarmento, L., Bessa, M. A., & Tavares, S. (2023). SimuStruct: Simulated Structural Plate with Holes Dataset with Machine Learning Applications. Workshop on "'Machine Learning for Materials'" ICLR 2023.

https://openreview.net/forum?id=s3tOuyR1vM7

Rocha, J., Matos, T., Faria, C., Penso, C.M., Martins, M., Gomes, P., & Gonçalves, L.M. (2023, October 29 – November 1). Wave Profile and Tide Monitoring System for Scalable Implementation. [Conference presentation]. IEEE Sensors 2023 conference. Vienna, Austria

Santana. V., (2023, September 12-15). A framework for predicting odor threshold values of perfumes by scientific machine learning and transfer learning. 14th International Chemical and Biological Engineering Conference (CHEMPOR-2023). Instituto Politécnico de Bragança

Saraiva, N. B., Gaspar, A. R., Gaspar; Costa, J. J. (2023, June). Indoor Environment Quality of Historic Buildings of the University of Coimbra. Investigar Património – Celebração do 10º aniversário da Universidade de Coimbra como património mundial da UNESCO. Coimbra

Serra, G., (2023, July 13). Designing for Sustainability and Safety in Urban Micro-mobility: A Novel helmet Concept. Research Summit. Universidade de Aveiro

Serra, G., (2023, October 3). Designing for Sustainability and Safety in Urban Micro-mobility: A Novel helmet Concept. ECIU Research Conference. Barcelona

Serra, G., (2023, September 8). A New Frontier in Helmet Design: Bridging safety and sustainability for urban micro-mobility. Cork in Science and Applications 2023. Espinho

Silva, A. S., (2023, August 27). Time-dependency of Guided Local Search to Solve the Capacitated Vehicle Routing Problem with Time Windows. Ponta Delgada (presented virtually)

Silva, A. S., (2023, December 9). Magnetic properties of carbon nanotubes synthesized by chemical vapor deposition using polyolefins as carbon source. CHEMPOR. Bragança

Silva, A. S., (2023, July 1). Execution Time Experiments to Solve Capacitated Vehicle Routing Problem, ICCSA 2023 Athens (presented virtually)

Silva, A. S., (2023, July 20). Execution time as a key parameter in the waste collection problem, CISTI, Aveiro

Silva, A. S., (2023, September 6). System size influence on optimization of municipal solid waste collection. Wastes 2023. Coimbra

Szabó, S., (2023, May 25). Cross-section influence on the out-of-plane behavior of historic masonry walls: A parametric study. CSCE Conference. Moncton, Canada

Tran, M.Q., (2023, September 20-22). Effect of bridge foundation stiffness on dynamic behavior of bridge structure. IABSE Congress New Delhi 2023 Engineering for Sustainable Development. New Delhi

Weber de Melo, W., (2023, March 24). Desenvolvimento de um Emulador de Modelos Numéricos para Redução do Tempo de Cálculo em Simulações da Morfodinâmica Estuarina e Costeira. 16.º Congresso da Água. Lisboa

9.6 Prizes and Honors

MPP PhD Candidates

Adriano Santos Silva
Best conference paper: "Time-dependency of Guided Local Search to Solve the Capacitated Vehicle Routing Problem with Time Windows"
by OL2A 2023, September 2023

Amir Gholipour
2nd Prize for Innovation "Desafio à Inovação, O Caminho da Inovação 2023"
by Águas do Tejo Atlântico, October 2023, Lisbon, Portugal,

Ana Rita Pereira
Award of 12 hours of business support consulting
by Focus@TecMinho at the University of Minho, February 2 to May 2, 2023

Best MIT Portugal Student Poster Award in the Digital Transformation in Manufacturing category
by MIT Portugal Program at the 2023 MIT Portugal Conference, September 2023, Braga, Portugal

Selection for Technology Acceleration Program (TEC+) at the University of Minho
October 2023

Beatriz Biguino
Charles Boyden Fund for Small Grants
by ECSA

Gabriel Serra
Born from Knowledge
by Agência Nacional de Inovação (ANI)

The James Dyson Award
by The James Dyson Foundation

BikeUP Award
by Associação Nacional das Indústrias de Duas Rodas (ABIMOTA)

João Fonseca
Best AI Track Paper award
by ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization Program Chairs

João Ribeiro
Huawei Scholarship Award
by Huawei, March 23

José Ferraz Caetano
Best MIT Portugal Student Poster Award
by MIT Portugal Program at the 2023 MIT Portugal Conference, September 2023, Braga, Portugal

Advocate Policy Scholarship – United Nations International Conference on Chemicals Management 2023
by United Nations Secretariat, United States

Livia Cosentino
Best MIT Portugal Student Poster Award in Sustainable Cities
by MIT Portugal Program at the 2023 MIT Portugal Conference, September 2023, Braga, Portugal

Lucas Paiva
Finalist on the Young Engineers Competition
by 12th International Conference on Geosynthetics, 2023.

Mariana Dias
Fulbright Grant with FCT support

Orlando Lima Júnior
Outstanding Presentation as a Young Researcher
by Pavement Functional Design and Management

Phillip Probst
Beatrice Worsley Full Paper Award
by 19th International Conference on Intelligent Environments (IE) 2023

Rafael Anjos
Best graduate student Award (BSc + Meng) in Civil Engineering of 2021/2022
by the University of Aveiro

Raquel Fernandes
2023 Allan Robertson Grants for Research Students and Young Professionals
by International Peatland Society

9.7 Courses and Workshops Organized

MPP PhD Candidates

Ana Rita Pereira
5th FOAM@IBERIA MEETING
Venue: Centro Cultural Vila Flor in Guimarães, Portugal
Organizers: Member of the Local Organizing Committee
November 2-3, 2023

Camila Penso
2nd Symposium of the Doctorate in Electronics and Computer Engineering (DEEC)
Venue: Universidade do Minho, PDEC
November 3, 2023

Cláudia Rodrigues
3º Workshop de Visualização e Análise de Dados Espaciais
Venue: University of Coimbra
Organizers: Carlos Lisboa Bento, Evgheni Polisciuc, Cláudia Rodrigues, Adriana Bernardo, Joana Simões, and Patrícia Costa.
June 1, 2023

Daniel Lima
Seminário Construir com Madeira 2023
Venue: University of Minho Campus Azurém
Organisers: Timber Research Group of University of Minho
June 7, 2023

Mariana Dias
Physiological signal processing with Matlab Workshop
Venue: Tec2Med Congress 2023
May 2023

Matlab applied to Signal Processing Workshop
Venue: NOVA FCT
April 2023

Marina Tenório
Seminário Construir com Madeira 2023
Venue: University of Minho Campus Azurém
Organisers: Timber Research Group of University of Minho
June 7, 2023

Matheus Gomes Correia
Introdução ao OpenStreetMap,
Venue: Semana Acadêmica do Curso Técnico em Geoprocessamento do IFRS Campus Rio Grande,
October 5, 2023

Mohamad El Sibaii
Towards country-wide implementation of BIM oriented Product Data Templates – 6th PDEC Annual Workshop
Venue: Campus de Azurém, University of Minho, Guimarães, Portugal
December 6, 2023

Orlando Lima Júnior
Pavement Functional Design and Management.

Venue: Campus de Azurém, University of Minho, Guimarães, Portugal
April, 21, 28 and 29, 2023

Rafael Anjos
VIII Encontro Internacional Da Casa Das Ciências

Venue: University of Aveiro
July 17 and 18, 2023

Raul Fretes
Climate Youth Training Series (Global Youth Coalition and Oxford Net Zero)

Venue: Online
April to October, 2023

Tiago Mindrico
Workshop: Exploring Hybrid Realms: Representations, Perspectives and Methodologies. Venue: Athena Research & Innovation Center, Grécia National and Kapodistrian University of Athens

November 29, 2023

Seminar with Anthony Mbatia, from Kenya, (Founder and Lead Developer, Auravision Interactive), on the theme VR and Mobile Apps for Health: Use cases and impact in the context of Kenyan Surgical Service delivery.

Venue: Instituto Politécnico de Leiria Escola Superior de Artes e Design das Caldas da Rainha, Portugal
March 3, 2023

9.8 Outreach Activities

MPP PhD Candidates

André Cardoso
Speed dating with MPP students

Co-organization of this event aimed at promoting networking between students from the MIT Portugal community
Online
June 6, 2023

Gabriel Serra
Ciência Viva Science and Technology Week – "O potencial papel da cortiça e fluidos não newtonianos em equipamentos de proteção para a micromobilidade – o caso de um estudo de um capacete, o Flatie".

Online
November 24, 2023

José Ferraz Caetano
Youth Advocate at the 5th International Conference on Chemicals Management, organized by United Nations Environmental Program (Regional European Office)

Venue: Bonn, Germany
September 2023

Matilde Marques
Open Day of Técnico – "The wonderful world of marine bacteria"

Venue: Instituto Superior Técnico, Lisbon, Portugal
May 20, 2023

Paolo Tufoni
Using remote sensing and FAO methodology for the determination of irrigation water needs in a semi-arid climatic region

Venue: Congress Centre LNEC
March 21 -24, 2023

9.9 News in Media

Call for MPP-FCT PhD Grants

1. Jornal Económico – Programa MIT Portugal tem 10 Bolsas para Doutoramentos em Ciências do Clima e Alterações Climáticas

2. RUM – MIT Portugal vai atribuir dez bolsas de doutoramento na área do Clima e Alterações Climáticas

3. E-global – Programa MIT Portugal tem 10 bolsas de doutoramento para atribuir a investigadores na área do clima

4. Human Resources Portugal – Programa MIT Portugal tem 10 bolsas de doutoramento para atribuir a investigadores na área do clima

5. Uniarea – Programa MIT Portugal tem 10 bolsas de doutoramento para os próximos cientistas em alterações climáticas

6. Mais Superior – Procuram-se os próximos cientistas em alterações climáticas!

Marine Robotics Summer School

7. RTP Açores – Escola de verão sobre robótica marinha decorre no Faial

Annual Conference

8. Jornal Económico – Projetos de investigação representam um investimento de 24 milhões de euros em Portugal

Flagship Project K2D

9. "Negócios e Empresas" da TSF - Rádio Notícias

10. Jornal de Negócios – DSTelecom à frente de cabo único mundial com norte-americanos

11. O Vilaverdense – Empresa de braga instala cabo submarino inteligente para ajudar a detetar sismos e tsunamis

12. Sapo Tek – Foi instalado o segundo cabo submarino inteligente em Sesimbra para ajudar a detetar sismos e tsunamis

13. O Minho – Consórcio liderado por empresa de Braga lança cabo submarino inteligente que vai até 100 metros de profundidade

14. 90 Segundos de Ciência – Eduardo Pereira – projeto K2D quer usar os cabos submarinos para estudar o oceano profundo

Others

15. Público – Experiência portuguesa foi ao espaço no foguetão de Jeff Bezos

16. Expresso – Portugal deu €310 milhões a três universidades dos EUA: reitores contestam acordo, relatórios duvidam dos benefícios

17. Expresso – MIT responde a críticas dos reitores portugueses e sublinha importância económica da parceria com Portugal

18. CNN Portugal – Parcerias com os EUA. Ex-Administradora da NASA diz que fim seria um retrocesso

19. MIT News – Transatlantic connections make the difference for MIT Portugal

20. Jornal de Notícias – Impacto Transformador

21. CNN Portugal – O Titan ou outras "aventuras" pelo mundo ou pelo espaço: "Não há atalhos possíveis porque há vidas humanas em risco" (entrevista Dava Newman)

22. Science AAAS – Science partnerships between Portugal and top U.S universities under threat

23. Sapo Tek – Parcerias portuguesas com universidades americanas chegam à maioridade com transformação ou fim em perspetiva

24. Sapo Tek – 180 projetos juntaram investigadores portugueses e do MIT nos últimos 17 anos

25. Sapo Tek – Do fundo do mar ao Espaço. Inovação abriu caminho para novas descobertas lideradas por empresas portuguesas

26. Sapo Tek – Investigação com universidades portuguesas e americanas acelera inovação em três empresas

27. Expresso – Ensino Superior: ministra põe fim a parcerias com universidades americanas, ex-ministro critica o cancelamento "prepotente e precipitado"

28. Sapo Tek – Coro de críticas obriga ministério de Elvira Fortunato a esclarecer posição (mas não todas as dúvidas) sobre parcerias com universidades americanas

29. Sapo Tek – Ministério de Elvira Fortunato chama universidades americanas para discutir parcerias

30. Sapo Tek – Parcerias para a ciência com universidades americanas renovadas por mais um ano

31. Público – Elvira Fortunato já tinha defendido novas parcerias com universidades estrangeiras

32. Eco Sapo – Elvira Fortunato esconde parecer que defende parcerias da FCT com escolas americanas

33. Expresso – Ministra da Ciência garante que parcerias com universidades americanas não terminaram e que estão a ser renegociadas

34. Sol Sapo – Uma oportunidade perdida

35. Notícias Magazine – App ajuda a combater poluição nos oceanos

36. Sapo Tek – SMART: Se viu lixo no mar pode reportar através desta aplicação

37. Smart Cities – Nova app para acabar com o lixo nas praias

38. Correio do Minho – UMinho atribui doutoramento honoris causa a Dava Newman e José Ramos

39. Jornal de Guimarães – Antiga administradora da NASA, Dava Newman, com honoris causa na UMinho

40. Braga TV – UMinho atribui Honoris Causa a Dava Newman e José Ramos

41. Diário do Minho – Altice Forum Braga celebra 5.º aniversário com Cristina Ferreira e Bonnie Tyler a marcarem presença

42. Notícias UPorto – Experiência que começou na FCUP foi ao espaço em voo da Blue Origin

43. Notícias UPorto – Programa MIT Portugal financia investigação da FEUP sobre "betão digital

MPP alumni

Andreia Machado

PhD from Biomedical Engineering

44. Notícias Magazine – Inês Machado, a cientista premiada que investiga o cancro

MPP PhD Students

Gabriel Serra

Sustainable Cities

45. RTP1 – Capacete em cortiça dobrável deverá chegar ao mercado no próximo ano

46. Antena 1 (José Candeias – Há Conversa) – Primeiro Capacete de Cortiça

47. Recicla – Flattie: O capacete feito de cortiça que pode ser reciclado

48. Noticias Magazine – Flattie, um capacete plano de cortiça que dá para reciclar

49. UA Notícias – First cork helmet for cyclists bears UAveiro's signature

Lucas Paiva

Sustainable Cities

50. UA Notícias – Alunos da UA entre 10 finalistas mundiais em concurso de engenharia civil

Joana Fernandes

Sustainable Cities

51. 90 Segundos de Ciência – Joana Fernandes – Ferramenta Digital ajuda projetistas a promover a economia circular na reabilitação de edifícios

52. Revista Edifícios e Energia – Os edifícios na transição para a Economia Circular, revista Edifícios e Energia

José Ferraz Caetano

Data Science

53. Notícias UPorto – Programa MIT Portugal distingue trabalho de doutorando da FCUP

9.10 Patents

Mitchell, G., Silva, D., Pinheiro, J., Mateus, A., Faria, P., and Alves, N. "Método e dispositivo de fabrico aditivo por extrusão para definição das propriedades dos materiais poliméricos utilizados" National Patente n.º 118151

Exploratory: Changing the design paradigm – 3D printing on molecular texture in plastics (3DPMTP)

9.11 Other Outputs

Posters presented at MIT Portugal 2023 Annual Conference

Altice Forum Braga, September 22

The event showcased the cutting-edge research from Portuguese and MIT Students and researchers with 63 Conference Posters and recognized the best 5 posters.

Best Poster

1. João Luís Lopes e Rocha. Low-cost and Low-power System for Wave Profile and Tide Monitoring.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/low-cost-and-low-power-system-wave-profile-and-tide-monitoring

Earth Systems: Oceans to Near Space.

2. José Ferraz-Caetano. Data Driven, Explainable Machine Learning Models for Accurate Thermodynamic Predictions.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/data-driven-explainable-machine-learning-models-accurate-thermodynamic-predictions

Data Science

3. Livia Tavares Cosentino. Development of an ecological thermal insulation product for a regenerative design.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/development-ecological-thermal-insulation-product-regenerative-design

Sustainable Cities

4. Rita Pereira. Advancing on a Novel Pacifier Design Methodology to Improve Oral Health: A Comprehensive Computational

Model of Pacifier Sucking.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/advancing-novel-pacifier-design-methodology-improve-oral-health-comprehensive-computational-model

Digital Transformation in Manufacturing

5. Tiago F. R. Ribeiro. From Fire to Data: Capturing Wildfire Dynamics with Semantic Segmentation & Spatiotemporal Reconstruction.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/fire-data-capturing-wildfire-dynamics-semantic-segmentation-spatiotemporal-reconstruction

Climate Science & Climate Change

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6. Adilson Campos de Paula Junior. Development of optimized compressed earth blocks based on circular economy concepts.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/development-optimized-compressed-earth-blocks-based-circular-economy-concepts

Sustainable Cities

7. Adriano S. Silva. Heuristic vs Metaheuristic algorithms for waste collection route optimization.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/heuristic-vs-metaheuristic-algorithms-waste-collection-route-optimization

Sustainable Cities

8. Amir Gholipour. Dewatering efficiency in a novel pilotscale of worm sludge treatment reed bed: temperate climate, Portugal.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/dewatering-efficiency-novel-pilotscale-worm-sludge-treatment-reed-bed-temperate-climate-portugal

Sustainable Cities

9. Ana Luísa Reis. An optimization framework to support water supply systems in the energy transition.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/optimization-framework-support-water-supply-systems-energy-transition

Sustainable Cities

10. Ana Paula Ferreira da Silva. Transforming Municipal Solid Waste into Geopolymers: A Sustainable Solution.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/transforming-municipal-solid-waste-geopolymers-sustainable-solution

Sustainable Cities

11. André Alves. What Spatial Planning for the Energy Transition? Unraveling the Territorial Implications of Solar Energy Production in Portugal.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/what-spatial-planning-energy-transition-unraveling-territorial-implications-solar-energy-production

Sustainable Cities

12. André Cardoso. Introducing Assistive Assembly: Reducing cognitive workload, unlocking efficiency.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/introducing-assistive-assembly-reducing-cognitive-workload-unlocking-efficiency

Digital Transformation in Manufacturing

13. António José Ventura de Oliveira. How should feature characteristics and information value reflect on localization and path planning procedures for underwater navigation?.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/how-should-feature-characteristics-and-information-value-reflect-localization-and-path-planning

Earth Systems: Oceans to Near Space

14. Aydan Aghabayli. Data-driven sustainability assessment for affordable housing in Portugal.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/data-driven-sustainability-assessment-affordable-housing-portugal

Sustainable Cities

15. Bardia Naghshineh. The implications of Additive Manufacturing technology adoption for Supply Chain Resilience.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/implications-additive-manufacturing-technology-adoption-supply-chain-resilience

Digital Transformation in Manufacturing

16. Bruna Thomazinho França. ALGTERNATIVE - ALGae Towards Energy, Recycling Nutrients in wAstewaTer and biofuel production for Increasing ValuE.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/algternative-algae-towards-energy-recycling-nutrients-wastewater-and-biofuel-production-increasing

Sustainable Cities

17. Cadence Payne. The AEROS Mission: Characterizing Multi-Spectral Ocean Measurements through Small Satellite Connectivity.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/aeros-mission-characterizing-multi-spectral-ocean-measurements-through-small-satellite-connectivity

Earth Systems: Oceans to Near Space

18. Camila Maria Penso. Photoacoustic sensor for microplastics identification in marine environments.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/photoacoustic-sensor-microplastics-identification-marine-environments

Earth Systems: Oceans to Near Space

19. Carlos Junior Arias Hernandez. Ecodesign of plastic products: a novel approach and applications.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/ecodesign-plastic-products-novel-approach-and-applications

Sustainable Cities

20. Catarina Jóia Santos. Nature-based Solutions (NBS) for Coastal Protection: why do we need nature to protect us from nature?.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/nature-based-solutions-nbs-coastal-protection-why-do-we-need-nature-protect-us-nature

Earth Systems: Oceans to Near Space

21. Cedric Honnet. Modernizing photovoltaic textiles for scalability and wearable applications.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/modernizing-photovoltaic-textiles-scalability-and-wearable-applications

Digital Transformation in Manufacturing.

22. Charlene Xia. Holographic Microscopy Drifter for Monitoring the Health of Aquaculture Microbiome.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/holographic-microscopy-drifter-monitoring-health-aquaculture-microbiome

Climate Science & Climate Change

23. Cláudia Rodrigues. URBAN SPATIAL DATA ANALYSIS: Towards Safe, Inclusive, and Sustainable Space.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/urban-spatial-data-analysis-towards-safe-inclusive-and-sustainable-spaces

Sustainable Cities

24. Cláudio Meireis. The Habitable Envelope: A Paradigm Shift in Building Renovation.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/habitable-envelope-paradigm-shift-building-renovation

Sustainable Cities

25. Fernando Ribeiro. Assessing the membership of Portugal and Spain in the FCR Cooperation.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/assessing-membership-portugal-and-spain-fcr-cooperation

Sustainable Cities

26. Filipa Corais. Living Labs for Transition Experiments (TE). A New Methodology to Accelerate the Change of Behaviors, Attitudes and Mindsets (MACBAM) towards Sustainable Mobility.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/living-labs-transition-experiments-te-new-methodology-accelerate-change-behaviors-attitudes-and

Sustainable Cities

27. Gabriel F. Serra. Designing for sustainability and safety in urban micromobility: a novel helmet concept

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/designing-sustainability-and-safety-urban-micromobility-novel-helmet-concept

Sustainable Cities

28. Hatice Kirkici Gonçalves. User experience assessment with high level autonomous car console prototype.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/user-experience-assessment-high-level-autonomous-car-console-prototype

Sustainable Cities

29. Heloisa Amaral Antunes. Increasing urban resilience through a Productive Urban Green Infrastructure in Great Porto.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/increasing-urban-resilience-through-productive-urban-green-infrastructure-great-porto

Sustainable Cities

30. Henrique Diogo Silva. A Twin enabled Digital Industrial Platform.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/twin-enabled-digital-industrial-platform

Digital Transformation in Manufacturing

31. Hyeonseok Kim. 3D Printed, Internally Fed Electrospray Thrusters for Cubesats.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/3d-printed-internally-fed-electrospray-thrusters-cubesats

Earth Systems: Oceans to Near Space

32. Jade Müller Carneiro. How can we steer R&D of bio-based products towards sustainability?.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/how-can-we-steer-rd-bio-based-products-towards-sustainability

Sustainable Cities

33. Jennifer Kim. Network Slicing with Network Coding: An Optimal Approach for Resource Allocation.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/network-slicing-network-coding-optimal-approach-resource-allocation

Sustainable Cities

34. Joana F. Couceiro. Pharmaceutical and Biotechnological Applications of the Coral Microbiome.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/pharmaceutical-and-biotechnological-applications-coral-microbiome

Earth Systems: Oceans to Near Space

35. João Alves Ribeiro. Optimizing Structural Analysis: Stress Field Prediction in Plates with Holes using Graph Neural Networks.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/optimizing-structural-analysis-stress-field-prediction-plates-holes-using-graph-neural-networks

Digital Transformation in Manufacturing

36. Johnattan Ontiveros. Learning by Doing: The Role of Contractors in Building Electrification.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/learning-doing-role-contractors-building-electrification

Sustainable Cities

37. Jordi Vila-Pérez. A High-Order Discontinuous Galerkin Approach for Physics-Based Thermospheric Modeling.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/high-order-discontinuous-galerkin-approach-physics-based-thermospheric-modeling

Earth Systems: Oceans to Near Space

38. Kurran Singh. Open Set Opti-Acoustic Semantic Mapping for Underwater Vehicles.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/open-set-opti-acoustic-semantic-mapping-underwater-vehicles

Earth Systems: Oceans to Near Space

39. Laísa Braga Kappler. Telework frequency and its effects on travel behavior in the post- COVID-19 era.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/telework-frequency-and-its-effects-travel-behavior-post-covid-19-era

Sustainable Cities

40. Lucy Brock. Probing extreme weather events in a warming climate with GNSS and atmospheric reanalysis in the Azores Islands.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/probing-extreme-weather-events-warming-climate-gnss-and-atmospheric-reanalysis-azores-islands

Climate Science & Climate Change

41. Luiz Claudio Navarro. I4F Project – Intelligent Fish Farming for Future.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/i4f-project-%E2%80%93-intelligent-fish-farming-future

Data Science

42. Mahla Shariatzadeh. Bi-objective Optimization of EV Charging in a Workplace Parking lot Considering EV Users' Charging Preferences.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/bi-objective-optimization-ev-charging-workplace-parking-lot-considering-ev-users%E2%80%99-charging

Sustainable Cities

43. Maria José Morais. Integration of performance indicators and digitalization for the railway assets management.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/integration-performance-indicators-and-digitalization-railway-assets-management

Sustainable Cities

44. Mariana Dias. Learning from biosignals: a neural framework for knowledge extraction.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/learning-biosignals-neural-framework-knowledge-extraction

Data Science

45. Martin Nisser. Towards On-Demand Manufacturing: A Review of Technical Capabilities and Future Perspectives.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/towards-demand-manufacturing-review-technical-capabilities-and-future-perspectives

Digital Transformation in Manufacturing

46. Nazanin Azimi Fereidani. Enhancing Energy Efficiency and Climate Robustness in Iranian Residential Buildings.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/enhancing-energy-efficiency-and-climate-robustness-iranian-residential-buildings

Sustainable Cities

47. Orlando Lima Jr. Photocatalytic and thermochromic materials applied to road engineering.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/photocatalytic-and-thermochromic-materials-applied-road-engineering

Sustainable Cities

48. Paolo Tufoni. Using remote sensing and FAO methodology for the determination of irrigation water needs in a semi arid climatic region.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/using-remote-sensing-and-fao-methodology-determination-irrigation-water-needs-semi-arid-climatic

Climate Science & Climate Change

49. Paulo Nascimento. Nesting and scheduling problems in additive manufacturing: a decomposition approach.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/nesting-and-scheduling-problems-additive-manufacturing-decomposition-approach

Digital Transformation in Manufacturing

50. Phillip Probst. Human Acceptable Ergonomics Recommendations.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/human-acceptable-ergonomics-recommendations

Digital Transformation in Manufacturing

51. Ricardo Magalhães. What if you could eliminate your biggest threat? Get ahead of your manufacturing competitors.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/what-if-you-could-eliminate-your-biggest-threat-get-ahead-your-manufacturing-competitors

Digital Transformation in Manufacturing

52. Rishabh V. More. Unearthing Mud's Hidden Strength – Micromechanics of the Yield Stress and Flow for Safer Dams and Disaster Prevention.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/unearthing-mud%E2%80%99s-hidden-strength-%E2%80%93-micromechanics-yield-stress-and-flow-safer-dams-and-disaster

Sustainable Cities

53. Rita Dantas. Fatigue analysis of a structural steel for ocean systems applications considering seawater environment.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/fatigue-analysis-structural-steel-ocean-systems-applications-considering-seawater-environment

Climate Science & Climate Change

54. Rodrigo Paredes. Causality: Unlocking the power of discovering causal associations in data for monitoring complex industrial processes.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/causality-unlocking-power-discovering-causal-associations-data-monitoring-complex-industrial

Digital Transformation in Manufacturing

55. Rui del Pino Fernandes. Virtus in medium est History and Planning towards an urban-rural future.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/virtus-medium-est-history-and-planning-towards-urban-rural-future

Sustainable Cities

56. Sara Aparício. Sea ice Melt pond retrievals using AI-based Earth observation methods.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/sea-ice-melt-pond-retrievals-using-ai-based-earth-observation-methods

Earth Systems: Oceans to Near Space

57. Sara Caroline Bona. Impacts of Water Efficiency in Buildings on the Urban Water Cycle.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/impacts-water-efficiency-buildings-urban-water-cycle

Sustainable Cities

58. Simone Coelho Fernandes. Advanced MOF-based materials towards dual carbon dioxide capture and conversion.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/advanced-mof-based-materials-towards-dual-carbon-dioxide-capture-and-conversion

Climate Science & Climate Change

59. Tiago Ermitão. Assessment of Changes in Post-Fire Vegetation Resilience over Mediterranean Region.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/assessment-changes-post-fire-vegetation-resilience-over-mediterranean-region

Climate Science & Climate Change

60. Tiago Miguel Mindrico. Cassandra: A Case Study on the Ludic Urban Experience -Unveiling a Framework for Community Mapping Workshops Promoting Sustainability.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/cassandra-case-study-ludic-urban-experience-unveiling-framework-community-mapping-workshops

Sustainable Cities

61. Vahid Rasouli. Impact of Rewarding Strategy and Energy Price Scheme on Mobilization the Flexibility of Residential End-users.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/impact-rewarding-strategy-and-energy-price-scheme-mobilization-flexibility-residential-end-users

Sustainable Cities

62. Willian Weber de Melo. Reducing the simulation time of coastal numerical models with deep learning-based emulators.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/reducing-simulation-time-coastal-numerical-models-deep-learning-based-emulators

Earth Systems: Oceans to Near Space

63. Zoey Bigelow. MINIATURE 3D-PRINTED SUPER SENSOR: Multi-Langmuir Probe Device for CubeSat Ionospheric Plasma Diagnostics.

https://mitportugal.mit.edu/poster-gallery/2023/student-posters/miniature-3d-printed-super-sensor-multi-langmuir-probe-device-cubesat-ionospheric-plasma-diagnostics

Earth Systems: Oceans to Near Space

Project Research Posters

64. Eurico Dias. QoS Session-Aware SDN Planes for xURLLC Cellular Hybrid Backhauls.

https://mitportugal.mit.edu/poster-gallery/2023/project-research-posters/qos-session-aware-sdn-planes-xurllc-cellular-hybrid-backhauls

Sustainable Cities

65. Hélder Silva. AEROS: Portuguese Cubesat for Ocean Monitoring (concept, testing and launch).

https://mitportugal.mit.edu/poster-gallery/2023/project-research-posters/aeros-portuguese-cubesat-ocean-monitoring-concept-testing-and-launch

Earth Systems: Oceans to Near Space

66. Pedro Valente. Demo: Edge based IPFS in a Disaggregated Mobile Core.

https://mitportugal.mit.edu/poster-gallery/2023/project-research-posters/demo-edge-based-ipfs-disaggregated-mobile-core

Sustainable Cities

Posters at Other Conferences

MPP PhD Candidates

Ana Paula Ferreira da Silva

Application of powder fly-ash geopolymers as adsorbents of phenolic compounds present in model wastewater

Conference: 1st Mediterranean Conference on Porous Materials
Location: Crete, Greece
May 2023

Comparative Analysis of Catalysts in Catalytic Wet Peroxide Oxidation for Enhanced Removal of Pharmaceutical Pollutants

Conference: XXVII Encontro Luso-Galego de Química
Location: Porto, Portugal
November 2023

Development of CO2-activated carbons from exhausted olive pomace and their application in the treatment of olive mill wastewater by continuous adsorption process

Conference: XXVII Encontro Luso-Galego de Química
Location: Porto, Portugal
November 2023

Joana Couceiro
Aquimarina aquimarinae sp. nov. and Aquimarina spinosulus sp. nov., new bacterial species with versatile natural product biosynthesis potential.

Conference: BAGECO 2023
Location: Copenhagen, Denmark

Pharmaceutical and Biotechnological Applications of the Coral Microbiome

Conference: 2nd Microbiome Summit
Location: Lisboa, Portugal

Joana Fernandes
A new BIM-based method to promote Buildings Circular Economy at a neighborhood scale

Conference: 11th International Conference on Industrial Ecology (ISIE2023)
Location: Leiden, The Netherlands

Matilde Marques
Insights into the culturable bacterial community of long-term aquarium tropical octocorals.

Conference: 16th Symposium on Bacterial Genetics and Ecology (BAGECO)
Location: Copenhagen, Denmark
June 2022

Paulo Costa
Evolutionary Multi-Objective Optimization of Shoe Sole Damper Geometry: Data Mining and Decision Making

Conference: Foam@inberia 2023
Location: Guimarães, Portugal
November 2023

Tiago Mindrico
Ludic hybrid-space experiences in education: Which skills can transmedia game-based learning projects teach?

Conference: New Coordinates for Creative Hybrid Space-Experiences
Location: Nairobi, Kenya and online
16 -17 February 2023

Camila Penso
Low-cost portable sensor for uPlastics Differentiation

Conference: Ciência 2023
Location: Aveiro, Portugal
5 julho 2023

João Rocha
Wave Profile and Tide Monitoring System for Scalable Implementation

Conference: Ciência 2023
Location: Aveiro, Portugal
5 july 2023

Other Publications

MPP PhD Students

Fernandes, del Pino, R., Marate-Mendes, T., Cunha Borges, J., Lopes Silva, S. (2023). Let's talk about: Habitat - expressions in territorial, social, economic and environmental sustainability. Revista Cidades, Comunidades e Território

https://journals.openedition.org/cidades/8133

Ferraz-Caetano, J., Teixeira, F., & Cordeiro, M. N. D. S. (2023). ΔG-RDKit: Solvation Free Energy Database. Retrieved from

http://dx.doi.org/10.5281/ZENODO.8121619

Lectures and Mentorships

MPP PhD Candidates

José Ferraz Caetano
"Modelos Experimentais em Toxicologia" – Computational Chemistry Models for theoretical and laboratory development for toxicology research
Venue: Master in Toxicology from Cooperativa de Ensino Superior Politécnico e Universitário, Portugal


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10

MPP2030 in a nutshell: 2018-2023

MPP 2030

In 2006, the Ministry of Science, Technology, and Higher Education (MCTES) established partnerships with several North American universities. The partnership with the Massachusetts Institute of Technology (MIT) — MIT Portugal — has been particularly fruitful for Portugal, benefiting from the academic and scientific excellence and entrepreneurial culture that is internationally recognized at MIT.

Over the past 17 years, the MIT Portugal Program (MPP) has been a beacon of collaboration and transformation in research, education, and innovation. The impact of this partnership is not and cannot be confined to scientific, bibliometric, or economic metrics; it is engraved into the fabric of Portugal's scientific and business communities.

MPP has played a crucial role in advancing Portugal's research capabilities, uplifting universities into internationally recognized research institutions, nurturing cutting-edge research and academic programs, fostering a culture of entrepreneurship and innovation, and creating a dynamic network of collaboration. Innovation and entrepreneurship activities resulted in the creation of more than 80 startups, mobilizing more than 85 million euros in venture capital and creating skilled jobs. They have also spawned a new model of industry-academia interaction, boosting the presence of highly qualified staff in companies and fostering an increase in patents, including in more traditional sectors. The impact of these investments is evident in the 28 patents (worldwide) that have been issued to date.

This Program has cultivated critical mass in key scientific areas, stimulating the growth of Portugal's technological innovation ecosystem. The institutional development of several Portuguese universities has been enriched through the immersion of their faculty and researchers in the MIT environment, which serves as a benchmark of international excellence.

The first phases created educational programs that provided Portugal with critical mass in strategic sectors, while the most recent focus (2018-23) has been on collaborative projects — 110 funded projects.

Within the scope of the third (and last) phase, also known as MPP2030, new strategic research areas were identified: Climate Science & Climate Change; Earth Systems: from the Oceans to Near Space;

Digital Transformation in Manufacturing; and Sustainable Cities — all of which include data science and AI approaches and methodologies. MPP2030 funded seven large-scale collaborative flagship research projects, each led by an industry partner. These flagship projects have been instrumental in connecting the Portuguese industry partners, research community, and MIT.

In addition, MPP2030 has funded more than 100 smaller innovative research projects with one-year grants.

"The MPP program has played a vital role in my academic and professional journey. As a PhD candidate, I've had some amazing opportunities through this program, such as being a visiting student at MIT, presenting at the MPP Annual Conferences, and participating in MIT Space Week. These experiences have significantly expanded my research abilities and allowed me to collaborate with top experts at MIT. The MPP program has equipped me with essential skills in AI and Structural Design, while also encouraging my commitment to innovation and collaboration, leading to significant achievements in these fields"

– João Ribeiro, MPP PhD candidate in the field of Machine Learning and Computational Design at FEUP; visiting student at DeCoDE lab, MIT

All projects include close collaboration among Portuguese and MIT researchers, thus reinforcing the essential collaborative partnership of MPP2030.

There are many Project success stories with strategic impact, such as the one addressing the surveillance and maintenance of submarine cables, with geostrategic links to the United States, led by DST and involving the Portuguese Navy. Other transformative examples are the digital planning of cities for urban sustainability (involving EDP and NOS) and the digitalization of industry (with TMG and EFACEC).

MPP2030 fostered advanced education, networking, and idea sharing through a series of initiatives. Four MPP2030-FCT calls for PhD grants were opened in the current phase of the Program, allowing the training of 120 PhD candidates. The program continued to facilitate and host inspiring meetings, workshops, and opportunities to promote community networking. An additional value of the program is the MPP community (with hundreds of students, faculty, researchers, and industry members) and the bonds created connecting people and institutions across the Atlantic.

MIT Portugal is a model partnership, being one of the oldest and most successful partnerships of MIT (considered the most innovative university in the world). MPP is also a shining example of what can be achieved when we work together, across borders, to tackle the most pressing challenges of our time.

Even with some uncertainty, one thing is certain: if possible, MPP will continue reinforcing its position as an active player in bringing together the right stakeholders to take on the challenge of asserting Portugal as a competitive scientific and economic ecosystem.


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