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Abstract booklet

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What's next...

PhD Research Showcase

RMIT Europe is delighted to welcome members of the REDI (RMIT European Doctoral Innovators) Program and wider scientific community to the **PhD Research Showcase**, held as part of the REDI Conference (21-23 July 2026).

This abstract booklet showcases the breadth and impact of research being conducted by REDI fellows at partners across Europe and Australia.

During the REDI Conference, REDI fellows will present their research as either a poster, exhibit or online presentation – a demonstration of how applied, interdisciplinary research is contributing to solving real-world challenges across a range of topics.

The REDI Conference is designed as a space for exchange, feedback and collaboration. We encourage you to use the discipline symbols to identify research projects aligned with your interests and to connect with REDI fellows, supervisors and partners during and after the event.

REDI is coordinated by RMIT Europe, the European hub of RMIT University, a global university of technology, design and enterprise with campuses in Australia and Vietnam. Based in Spain, RMIT Europe is the university's gateway for European research, industry, government and enterprise to innovation and talent in Australia and Asia.

RMIT UNIVERSITY

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Editorial note: The abstracts and biographies in this booklet have been published as submitted by the authors.

Discipline key

The abstracts in this booklet have been allocated symbols to indicate the most relevant discipline areas related to the research presented, as selected by the REDI fellows.


Advanced Manufacturing and Materials


Artificial Intelligence, Machine Learning and Data Science


Information and Communication Technologies (ICT)


Urban Studies, Architecture and Built Environment


Sustainability, Circular Economy and Environmental Innovation


Aerospace, Mobility and Transport Systems


Natural Sciences, Chemistry and Physics


Health, Bioengineering and Life Sciences


Business, Management and Innovation Studies


Social Sciences, Culture and Humanities

Abstracts

Eslam Salaheldin Abdelhady
University of Twente (UT) and RMIT University
Exhibit

Eslam Salaheldin Abdelhady[1,2], Niklas Libke[3,4], Tatiana Mishurova[5], Ignatius Andre Setiawan[1], Tom Vaneker[1], Mirko Boin[5], Andrey Molotnikov[2], Gabi Schierning[3,4], Ian Gibson[1], Mehrshad Mehrpouya[1]*

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Engineering functional gradients for NiTi shape memory alloy fabricated by LPBF

Laser powder bed fusion (LPBF) is emerging as a promising Additive Manufacturing (AM) technique for fabricating smart materials, where significant research efforts have focused on optimizing LPBF scanning parameters of NiTi-based shape memory alloys (SMA). Nevertheless, NiTi-based alloys remain challenging in terms of manufacturability due to the compositional sensitivity and the dependence of functionality on the transformation temperature and stress intervals. Correlating the microstructure features with the scanning parameters of the LPBF process poses itself as a promising path to further tune and control the functionality of the alloy. This study demonstrates the engineering of functional gradients of NiTi-based SMA via LPBF. Two complementary gradient strategies were implemented: a Rising Volumetric Energy Density (VED) approach (increasing laser power at constant speed), and a Dropping VED approach (increasing scanning speed at a constant power), called group A and B, respectively. The grading was inspected in orthogonal directions relative to the build direction, where the microstructure experienced systematic evolution from coarse columnar, twinned martensite grains at elevated VED to refined, textured austenitic phases at reduced VED, with critical microstructural transitions occurring at the interfaces. The geometric fidelity of the gradient structures was characterised along with internal pore distribution, where cyclic compression testing demonstrated tunable superelastic damping (5.0-6.9 MJ/m^3) and residual strain behaviour (2.3% -6.3%). Transport properties of the electronic properties demonstrated build-orientation-dependent martensitic transformation, where the geometrical grading in combination with scanning parameters optimisation provides an opportunity to attain both Shape memory effect and Superelasticity in the same LPBF print.

Key words	Additive Manufacturing; Laser Powder Bed Fusion; Shape Memory Alloys; NiTi; Gradient Structures; Volumetric Energy Density; Transport measurements.

Abstracts

Nabi Agzamov
5th Studio and RMIT University
Online presentation

A New Hansa: Toward a Water Architecture

This research examines the North Sea watershed as a testing ground for water-based design approaches to architecture, urban design, and climate adaptation. The North Sea region embodies contemporary contradictions at multiple scales: ecological richness alongside energy extraction, cultural and historical connections fragmented by national borders, and shared dependencies undermined by border politics. At a time when climate consensus has been fractured by political polarisation and inward-looking policy agendas, the research argues that water-based design can transcend these divisions by operating through cross-boundary, cross-disciplinary, and multi-scalar logics rooted in ecology.

Through three case studies in the Thames Estuary, the Seine Estuary, and the Øresund Strait, the research explores water-based design approaches that work across scales, sectors, and national boundaries. Furthermore, this research explores the role of communication and knowledge dissemination, arguing that current challenges require not only spatial propositions but also fundamental shifts in how complexity is communicated, how publics are engaged, and what cultural foundations for transformation are necessary.

The greatest barriers to adaptation are not technical but cultural and political: the orthodoxies that fragment our systems, the disciplinary silos that isolate expertise, and the lack of public understanding of why radical change is both urgent and beneficial.

Key words	Water-based design, North Sea region, Climate adaptation, Cross-border governance, Urban design

Abstracts

Stefano Ascione
French National Centre for Scientific Research (CNRS) and RMIT University
Conference poster

Advective mixing in fracture networks plays a central role in many environmental and geological processes by influencing contaminant dispersion, dilution, and mixing-driven biogeochemical reactions [1]. While longitudinal dispersion in fracture networks has received considerable attention, the dynamics of mixing, which governs the creation of fine concentration scales and reactive outcomes, are less understood. In particular, previous research has often focused on intersection-scale processes and flow partitioning [2,3], and it remains unclear how complex network topology and extreme fracture aspect ratios impact mixing at the network scale.

Here we develop a theoretical framework for advective mixing and uncover two distinct mixing mechanisms at vastly different length scales, termed fracture mixing and intersection mixing, that respectively arise due to streamline routing within fractures and at their intersections. We show that the large fracture aspect ratio effectively enforces discontinuous mixing, involving cutting and shuffling (CS) of fluid elements due to streamline routing [4]. This mixing is controlled by a combination of CS and fluctuating fluid deformation, forming a piecewise-smooth transform that leads to weak ergodic mixing.

We will present an efficient graph-based representation via a mixing graph G_M that extends standard graph representations of fracture networks [5] and encodes the fracture-network topology and mixing mechanisms as a sequential dynamical system on concentrations. The local maps defining G_M are parameterized from high-fidelity streamline-routing ensembles obtained from fully resolved DFN simulations. Numerical predictions of mixing from G_M agree to high precision with direct simulation of discrete fracture networks. We also find that a simplified piecewise-isometric description remains in fair agreement at substantially reduced computational cost, enabling rapid screening of mixing efficiency from network architecture and intersection statistics.

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Key words	Advective mixing, Fracture network, Cutting and shuffling, Graph-based modelling, Streamline routing

Abstracts

Milad Bemani
Technical University of Catalunya (UPC) and RMIT University
Exhibit

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Rapid Fatigue and Fracture Assessment of Additively Manufactured Metals Using the Stiffness Method: From Material Qualification to Component Design

Additive manufacturing (AM) enables the production of complex metallic components with high material efficiency and design freedom. However, process-induced defects, surface roughness, residual stresses, and microstructural heterogeneity significantly affect fatigue and fracture performance, while conventional fatigue testing remains costly and time-consuming.
This work adapts, validates, and applies the stiffness method as a rapid fatigue testing approach for additively manufactured metals. The method was modified to account for AM-specific characteristics and evaluated on stainless steel 316L, maraging steel C300, 17-4PH steel, AlSi10Mg, and Ti-6Al-4V produced by powder bed fusion, metal binder jetting, and powder metallurgy under various surface conditions.
Novel analysis procedures were developed to determine fatigue limits in specimens containing different defect types. Validation against conventional staircase fatigue testing showed excellent agreement, with deviations below 6% across all investigated materials and manufacturing routes. The influence of material microhardness on prediction accuracy was also established, enabling estimation of the expected reliability of fatigue limit predictions.
The stiffness method was subsequently employed to investigate fatigue-critical aspects of AM. In PBF-LB/M 316L stainless steel, contour scanning optimisation significantly improved fatigue performance and reduced testing time and cost by up to 90%, offering an alternative to post-process polishing. The method was further extended to component-scale assessment using a topologically optimised AlSi10Mg demonstrator, where fatigue limits obtained from a single rapid test differed by less than 10% from conventional results. A framework combining rapid fatigue testing with finite-element analysis predicted component fatigue strength within 3% of experimental values.
Finally, the effect of specimen thickness on the fatigue and fracture behaviour of stainless steel 316L specimens was investigated, leading to a rapid methodology for estimating short-crack thresholds and providing guidance for lightweight design. Overall, the results demonstrate that the stiffness method is a reliable and efficient tool for fatigue and fracture assessment of additively manufactured metals.

Key words	Additive manufacturing, fatigue behaviour, fracture mechanics, rapid fatigue testing, the stiffness method

Abstracts

Adam Biegański
École Centrale de Lyon (EC Lyon) and RMIT University
Conference poster

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On-chip mid-infrared reconfigurable supercontinuum source via low-loss phase-change material integration

Mid-infrared (MIR) integrated photonics holds great promise for gas sensing devices across a variety of applications, such as health analysis or drug detection. These devices would greatly benefit from integrated supercontinuum (SC) sources, which combine a low footprint with high brightness and broad spectral bandwidth. Since the underlying physics of this process can be dominated by distinct effects, SC sources often exhibit vastly different characteristics. In spite of it, most existing devices do not allow post-fabrication modification of the spectral properties, therefore severely constraining their versatility.
A common strategy to achieve reconfigurability in photonic devices is to leverage intrinsic material properties via electro-optic or thermo-optic effects. Nonetheless, this comes at the cost of high power consumption due to the volatile nature of these phenomena. The integration of phase-change materials (PCMs) offers a compelling alternative, as they can be reversibly switched between two structurally distinct states with vastly different optical properties. Their use in the MIR frequency range remains challenging due to poorly characterized material properties and large waveguide dimensions, which render classical integration strategies unfeasible.
To overcome this limitation, we demonstrate a new hybrid design, in which a thin Sb_2S_3 layer is sandwiched between a waveguide core and a high-index top cladding. This architecture allows us to significantly boost the tunability while keeping the propagation loss moderate thanks to the low optical overlap with the PCM. The concept is implemented on the SiGe-on-Si photonic platform, which has previously proved exceptional performance for SC generation in the MIR range. We fabricate the device using CMOS-compatible techniques and, for the first time, demonstrate SC generation with very distinct spectral features for different Sb_2S_3 phases.

Key words	integrated photonics, mid-infrared, supercontinuum, SiGe-on-Si, phase-change materials, Sb_2S_3

Abstracts

Milica Božić
Polytechnic University of Milan (POLIMI) and RMIT University
Exhibit

Milica Božić, Suzie, Attiwill [1], Annunziata Maria, Oteri [2], Maria Cristina, Giambruno [3]

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Encountering Heritage Coexistence through Architectural Exhibitions and Events

This PhD investigates architectural exhibitions as sites for encountering heritage in relation to contemporary architectural and design practices and audiences. Through exploring the plurality of heritage as a social, cultural, and political process and focusing on three sites (the Venice Biennale of Architecture, Triennale Milano, and MPavilion), it examines how curatorial strategies and site-specific interventions engage with heritage through restorations embedded within exhibitions, the production and reactivation of pavilions, and programming.

Through integrating archival inquiry, expert interviews, diagramming, and curatorial experimentation, the concept of *heritage coexistence* emerged. It describes a condition in which multiple temporalities, materialities, and understandings of heritage can be perceived and engaged with simultaneously and held together within exhibition spaces, while acknowledging the layered, often contradictory ways in which heritage exists.

heritage coexistence has translated into a generative curatorial practice that engages critically with the multilayered heritage environments in which it occurs. It positions architectural exhibitions and events as spaces where plural, experimental engagement with heritage becomes possible. The research contributes to contemporary architectural practices and discourses by developing and testing *heritage coexistence* as a concept and curatorial approach that produces plural encounters within architectural exhibitions and events.

Key words	Architectural exhibitions, Heritage coexistence, Curatorial practice, Critical heritage studies, Venice Biennale

Abstracts

Juan Pablo Cavalieri
Autonomous University of Barcelona (UAB) and RMIT University
Conference poster

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Excision of organic macrocycles from covalent organic frameworks

Synthetic organic chemistry has long focused on the design and construction of new molecules for societal benefit, driven by the continuous development of innovative synthetic methodologies that challenge conventional approaches to molecular assembly. Traditionally, small organic molecules are obtained through stepwise reactions involving simple precursors.[1] However, such strategies often prove inadequate for the efficient synthesis of structurally complex architectures -such as organic macrocycles, cages, catenanes, or intricate polymers- whose formation typically requires high selectivity and precise control over connectivity.

Here, we introduce a paradigm shift in the synthesis of functional organic molecules through a strategy we term “Clip-off Chemistry”, in which molecules are selectively excised from ordered, extended organic structures, namely Covalent Organic Frameworks (COFs). COFs are crystalline, two- or three-dimensional materials that not only embody their molecular building blocks but can also act as precursors to more complex entities - macrocycles, cages, catenanes, or polymers- that form spontaneously during framework assembly. These intricate architectures can be released with remarkable selectivity and yield through the controlled cleavage of bonds strategically incorporated within the framework.

In this communication, we demonstrate the power of this approach for the selective synthesis of functional organic macrocycles, overcoming long-standing challenges such as poor selectivity, low yields, unwanted side products, and laborious purification steps. Clip-off Chemistry enables the gram-scale, selective preparation of macrocycles -structures that typically demand precise control to avoid the formation of linear oligomers or smaller rings.[2] Specifically, we report the synthesis of nine hexagonal polyamide- and polyimide-linked macrocycles featuring peripheral aldehyde and carboxylic acid groups. Moreover, we show that this method can be seamlessly integrated with isoreticular chemistry to fine-tune both macrocycle size and functionality. This strategy grants access to progressively larger macrocycles -including 114-, 138-, and 162-atom rings- and allows for the incorporation of functional groups such as fluorine.

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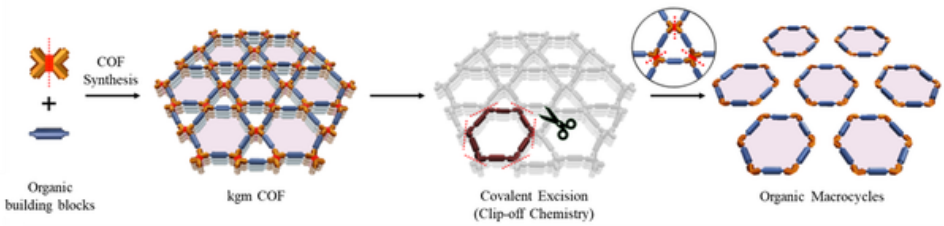

Fig. 1. Schematic of the Clip-off Chemistry synthesis of organic macrocycles from excision of a COF.

Key words Organic macrocycles, clip-off chemistry, covalent organic frameworks

Abstracts

José Manuel Crego Lozares
Hamburg University of Technology (TUHH) and RMIT University
Conference poster

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Multi-material PBF-LB/M of IN718/CuCrZr for Aerospace applications

The rapid increase in space launches over the past decade has intensified the demand for high-performance, cost-efficient rocket propulsion systems. Combustion chambers, responsible for converting thermal energy into thrust, account for a significant fraction of total rocket engine cost. Modern designs rely on bimetallic architectures combining a Cu-based liner for efficient heat dissipation with a Ni-based superalloy jacket for structural integrity. Although additive manufacturing has reduced production time and cost compared to conventional routes, current hybrid strategies still require multiple processing steps and remain susceptible to interfacial defects, residual stresses, and cracking. Multi-material Powder Bed Fusion using Laser Beam of Metals (PBF-LB/M) presents a promising pathway toward manufacturing bimetallic combustion chambers in a single process with controlled spatial material distribution. However, fundamental scientific gaps hinder its industrial implementation.Interfacial cracking mechanisms in CuCrZr/IN718 systems remain unexplored in PBF-LB/M, despite the strong thermophysical mismatch between these alloys. Furthermore, no systematic investigation has addressed the formation of sharp interfaces with controlled intermixing for both deposition configurations: Cu-on-Ni and Ni-on-Cu. This thesis proposes that controlled redistribution of energy density through Laser Beam Shaping (LBS) can reduce melt pool temperature, limit substrate penetration, and enable metallurgical bonding with reduced intermixing. By promoting less invasive deposition while preserving bonding integrity, LBS is hypothesized to mitigate crack formation driven by steep thermal gradients and residual stresses.vThe research addresses melt pool formation mechanisms in both deposition directions, cracking behavior, and microstructural evolution of the intermixing region. Results establish optimized process windows for defect-minimized deposition, provide new insight into interfacial microstructure, and demonstrate the feasibility of producing sharp, mechanically robust transitions in multi-material PBF-LB/M, — closing critical knowledge gaps in Cu/Ni-based bimetallic systems and laying the groundwork for single-process fabrication of complex multi-material aerospace components.

Key words	Additive Manufacturing; PBF-LB/M; Multi-material; Cracking; Laser beam shaping

Abstracts

Michalina Maria Czaplicka
Polytechnic University of Turin (POLITO) and RMIT University
Conference poster

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Enhanced vascularization for organ-on-a-chip models

Organoid models are powerful tools for in vitro tissue modelling, yet their utility remains constrained by the absence of functional vasculature, leading to necrotic cores, restricted growth, and impaired maturation.[1] Existing co-culture approaches typically produce immature, non-perfusable vessels that poorly integrate with the organoid microenvironment, and rarely combine the biochemical and mechanical cues essential for stable vessel formation.[2]

We developed a modular vascularization-on-a-chip platform in which blood vessel organoids (BVOs) and brain organoids are individually trapped in two separate yet interconnected hydrodynamic chambers, enabling the BVO to actively vascularize the adjacent brain organoid under continuous perfusion. Unlike single-chamber approaches, this dual-chamber architecture maintains structural independence between organoids while permitting controlled biochemical and mechanical crosstalk, supporting physiologically relevant vascular integration.

Chemical optimization of endothelial support was performed using human umbilical vein endothelial cells (HUVECs) cultured with platelet lysate (PL) at concentrations of 0%, 2%, 5%, 7%, and 10%. PicoGreen DNA quantification revealed a dose-dependent increase in cell proliferation over three days, with 5% PL yielding the most significant endothelial expansion. CellTiter metabolic assays showed a concentration-dependent shift in metabolic activity with increasing PL, indicative of changes in proliferative state. These results supported the selection of optimal biochemical conditions for endothelial support within the platform.

Platform validation confirmed successful dual organoid trapping and sustained perfusion within a fibrin matrix. Light-sheet microscopy verified intact organoid morphology prior to co-culture initiation. Ongoing work investigates shear stress modulation to promote endothelial alignment and vessel stabilisation, with broader applications in disease modelling, drug screening, and regenerative medicine.

Key words	Organoids · Microfluidics · Vascularization · Tissue engineering · Perfusion · Co-culture

Abstracts

Nithya D S
Polytechnic University of Milan (POLIMI) and RMIT University
Conference poster

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Wind Disturbance Levels Identification for the Certification and Operation of Urban Air Mobility Vehicles

The Urban Air Mobility (UAM) market, encompassing Vertical Take-Off and Landing (VTOL) aircraft and Uncrewed Aerial Vehicles (UAVs), is projected to expand rapidly beyond its estimated USD 6.54 billion valuation in 2025. Manufacturers such as Joby, Archer, and Vertical Aerospace are advancing toward certification by the Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA), while China's EHang has already achieved type and production certification for selected operations. Similar phased deployment strategies are emerging in the UAV sector, where operations in lower-risk environments enable manufacturers to accumulate operational experience before large-scale urban integration.

However, flight data collected in such environments may not adequately represent the challenges of dense urban areas. Urban airflow is strongly influenced by buildings and terrain, generating vortices, wake regions, recirculation zones, flow acceleration, and multi-scale turbulence. These complex wind phenomena can significantly affect aircraft performance, stability, and controllability, particularly during low-altitude operations near structures.

This creates a certification paradox: realistic urban flight testing is necessary to establish operational limits and demonstrate environmental robustness, yet the very wind disturbances that must be characterized make testing difficult, costly, and potentially hazardous. Current certification and operational frameworks, including EASA's Special Condition for VTOL Aircraft (SC-VTOL) and the Joint Authorities for Rulemaking on Uncrewed Systems Specific Operations Risk Assessment (JARUS-SORA), primarily rely on deterministic wind envelopes and predefined operating limits that inadequately capture the stochastic and spatially heterogeneous nature of urban wind fields. Although EASA's Means of Compliance for SC-VTOL (MOC-SC-VTOL) introduces Atmospheric Disturbance classifications, these remain largely qualitative and heuristic.

To address this gap, this research proposes a simulation-based flight testing framework that integrates a realistic microscale wind database, generated using a quasi-non-stationary Stochastic Wind Model (SWM), with a high-fidelity flight simulator within a Monte Carlo framework. The proposed approach enables systematic quantification of urban wind disturbances to support certification, operational safety assessment, and vertiport design for future UAM deployments.

Key words	Urban Air Mobility, eVTOL certification, Urban wind field, Stochastic wind modelling, Monte Carlo simulation

Abstracts

Maadh Hmosze
University of A Coruña (UDC) and RMIT University
Exhibit

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LLM-based Counterfactual Explanations for Anomaly Detection in Multivariate Time Series

Counterfactual explanations identify the minimal perturbations to the input that would change model's prediction, offering actable insight into anomalous behavior and enhancing model explainability. Generating counterfactuals in multivariate time series data remains challenging as existing methods typically rely on training and finetuning specialized model that require access to the original training data which limits their scalability and practical deployment. We propose an agentic approach prompt-guided large language model (LLM) framework for counterfactual generation that performs anomaly repair directly through structured natural-language prompting. Guided by prompt and anomaly scores, interacting with the environment by iterative steps, the LLM reconstructs anomalous segments while preserving temporal and contextual consistency—without any model training. This makes the approach fully model-agnostic and easy to apply across domains. We evaluate the method on three real-world multivariate time-series datasets using four formal properties of explainability: overall improvement, similarity, localized improvement, and non-degradation. Experimental results show that our method outperforms existing diffusion-based baseline. These findings highlight the potential of foundation models as zero-training, interpretable agents for counterfactual generation and anomaly repair in multivariate time-series systems.

Key words	Multivariate timeseries , Anomaly Explainability ,model explainability,LLM,Explainable AI

Abstracts

Doina Huso
University of Agder (UIA) and RMIT University
Exhibit

Crossing Boundaries for Sustainable Innovation: A Multi-Level Framework Across Teams, Organizations, and Knowledge Systems

Firms in the Arctic and coastal Norway navigate sustainable innovation under climate, geopolitical, and cultural pressures that bring different knowledge systems into contact, Indigenous and non-Indigenous, scientific and place-based, sustainability-oriented and feasibility-oriented, yet how boundary work operates across these divides remains poorly understood. This work asks how actors perform boundary work across epistemic, organizational, and methodological divides in sustainable innovation. Comprising four papers, three qualitative empirical studies in the Arctic and coastal Norway, and one article commentary, the research work draws on boundary work theory, paradox theory, and the concept of epistemic translation. The contribution of this work aims at two levels: empirically, it shows that boundary work in sustainable innovation operates through bridging across knowledge systems and navigating paradoxes within interdisciplinary teams; methodologically and conceptually, it develops epistemic translation as a practice for cross-epistemic research and as a generative concept for the field. The findings offer theoretical implications for boundary work and open innovation literatures, methodological implications for research engaging with diverse knowledge systems, and practical implications for firms, policymakers, and communities navigating sustainable innovation in Arctic and Indigenous contexts.

Key words	Boundary work, sustainable innovation, cross-epistemic innovation, paradoxical tensions, epistemic translation

Abstracts

Mazhar Iqbal
Catalan Institute of Nanoscience and Nanotechnology (ICN2), Autonomous University of Barcelona (UAB) and RMIT University
Online presentation

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Solvent-Induced Behavior of Copper Corrosion Inhibitors at the Oxide/Inhibitor/Water Interface

Corrosion prevention using organic corrosion inhibitors (CI) is an efficient, green, and cost-effective method. Atomistic understanding of inhibitor adsorption and film stability in corrosive medium aids in the design of novel CI, and computational simulations can provide an excellent and less expensive alternative as compared to experiments in this regard. Here, we propose using frontier molecular modeling (MM) methods to evaluate the inhibitor's adsorption and film stability under aqueous solvent (realistic) conditions. The CI molecule chose to showcase our approach is 2-mercaptobenzimidazole (MBI) since it is experimentally well-known that its protective film prevents Cu corrosion. Previous theoretical studies used density functional theory (DFT) to investigate the MBI adsorption on oxidized Cu surfaces under vacuum (non-realistic) conditions, mainly due to computational time limitations. However, solvent molecules can influence interactions (charge redistribution) at the inhibitor-adsorbate interface, which is a dynamic process that requires ab-initio molecular dynamics simulations and still needs to be understood. To tackle precisely this problem, we have employed DFT as implemented in the SIESTA code to run relatively long ab-initio molecular dynamics for systems containing nearly one thousand atoms. Our results show that the solvent stabilizes the N-H bond of MBI, which keeps breaking and forming during simulations performed in a vacuum. Moreover, the oxidized Cu layer shows a strong chemical interaction with water, with a significant charge transfer and a strong hydrolysis activity. The presence of the MBI film acts as a physical barrier to water, reducing the chemical interactions and the charge transfer from the oxidized Cu surface. Hence, these studies provide a basic understanding of the corrosion protection mechanism and will help in the design of more effective inhibitors.

Key words	Corrosion Inhibition, DFT, AIMD

Abstracts

Ridhima Kaul
FH Aachen University of Applied Sciences (FH Aachen) and RMIT University
Online presentation

1 Ridhima Kaul (RMIT University and FH Aachen)

Mid-Fidelity Numerical Analysis of Dynamic Loads for Lift-Cruise eVTOL Configurations during Hover and Cruise Maneuveur

Accurate prediction of critical load cases and maximum dynamic loads is crucial to ensuring structural integrity, reducing safety margins, and minimizing structural weight in novel electric Vertical Take-Off and Landing (eVTOL) aircraft. Due to a broad basis of knowledge for conventional aircraft configurations, the accurate analysis of this type of aircraft particularly in early design stages is often possible by using simplified assumptions and reduced physical models, which are also applicable in the frame of time-consuming design iteration loops. On the other side, for novel aircraft configurations such as eVTOLS, only little or even no experience exists, and thus the application of complex analysis methodologies is always required, but the computational effort resulting from their application often excludes them from usage in optimization frameworks. Large parameter studies, as required in early design stages, are therefore not feasible. The proposed project addresses this issue. This research initially applies mid-fidelity numerical aerodynamic tools to analyze detailed dynamic loading characteristics of eVTOL configurations during hover and cruise maneuvers. The results will be used to gain insights which are necessary to identify the most relevant physical effects and influencing parameter, which determine the dynamic response behaviour of novel aircraft configurations, which are characterized by this complex propulsion system arrangements The model facilitates rapid yet accurate predictions of dynamic loads for wing-boom-propeller configuration (a generic lift-cruise precursor) eVTOL design. The overall objective of this research is to facilitate fast and accurate load prediction for this novel configuration to improve performance and safety and to support the multidisciplinary optimization of novel aircraft concepts.

Key words	eVTOLs, potential flow solvers, aerodynamics, Lift-cruise, hover, cruise

Abstracts

Onurcan Kaya
Catalan Institue of Nanoscience and Nanotechnology (ICN2), Autonomous University of Barcelona (UAB) and RMIT University
Conference poster

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An automated workflow for machine learning interatomic potentials

Atomistic simulations require a description of how the energy of a system changes with the positions of its atoms. Density functional theory and related quantum-mechanical methods obtain this from the electronic structure with high accuracy, but their cost scales steeply with the number of atoms and limits them to around a thousand atoms and short timescales. Classical interatomic potentials replace the electronic structure with fixed functional forms of the atomic positions, reaching much larger systems and longer times at the cost of accuracy and transferability. Machine learning interatomic potentials resolve this trade-off. Trained on quantum-mechanical reference data, most often from DFT, they reproduce its energies and forces at a fraction of the cost while reaching far larger systems and longer timescales [1]. This brings the sizes and timescales needed for direct comparison with experiment within reach.
In this poster, I present an efficient automated workflow for generating high-quality machine learning interatomic potentials [2]. The workflow uses the random structure search utilising foundation models [3] to generate diverse atomic configurations, which are then labelled with DFT to obtain forces and energies for the training set. I demonstrate the workflow on amorphous carbon and amorphous boron nitride by training MACE [4] potentials from scratch for each system. Using the resulting models, I generate realistic structural models of these disordered systems and investigate their atomic-scale properties, including short- and medium-range ordering in the disordered networks. Using large-scale simulations inaccessible to DFT, I present the morphology of the amorphous networks and discuss the structure-property relationships. The workflow provides a scalable method to generate accurate atomistic models for complex disordered materials and links their simulated configurations directly to macroscopic experimental data.

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Key words	machine learning interatomic potentials, amorphous boron nitride, amorphous carbon, molecular dynamics, disordered materials, structure-property relationships.

Abstracts

Ali Haji Khamis
Aalto University and RMIT University
Conference poster

Stone Town, the historic centre of Zanzibar City, is renowned for its rich architectural heritage, influenced by African, Arab, Indian and European cultures. This unique blend of cultures has made the town an inscribed UNESCO World Heritage Site since 2000. Currently, Stone Town is facing significant challenges, including hyper-urbanisation and the impacts of climate change. These issues have contributed to the deterioration of historic buildings and the erosion of cultural identity by degrading coral-stone structures. This study underlined the need to integrate urban planning framework and practices into Stone Town's conservation efforts to improve the effectiveness of conservation strategies. The research process comprised three main stages. First, I reviewed theoretical frameworks, including urban conservation theory, sustainable urbanisation and the right to the city theory, and I analysed the specific context of Stone Town. Additionally, I drew lessons from other heritage sites, such as Suomenlinna Fortress in Finland, Marineterrein in the Netherlands, and Cumalıkızık village in Turkey. This analysis informed the development of initial planning principles to address the challenges facing Stone Town. The second stage focused on learning by engaging the community to test the applicability of the initial principles. This included co-design workshops and expert interviews. The first round of data collection activities aimed to strengthen the credibility of the proposed initial planning principles by turning them into second-draft principles that could serve as potential solutions to the existing issues. In the final stage, I validated the second draft of the planning principles through further co-design workshops, focus group discussions and expert interviews. This second round of data collection aimed to assess the feasibility and desirability of the proposed frameworks, leading to their refinement and formulation. The study's results demonstrate that well-developed planning framework are vital for conserving and enhancing Stone Town's built cultural heritage. Adopting these frameworks can ensure Stone Town's built heritage remains safe, resilient and sustainable for future generations.

Key words	Built heritage conservation; Hyper-urbanisation; Climate change impacts; Participatory urban planning process; Stone Town, Zanzibar City, Planning frameworks

Abstracts

Björn Komander
Artificial Intelligence Research Centre (IIIA), Autonomous University of Barcelona (UAB) and RMIT University
Conference poster

Björn Komander[1,2], Jesús Cerquides[1], Jeffrey Chan[2], Azadeh Alavi[2]

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2 School of Computing Technologies, RMIT University, Melbourne, Australia

Automated Monitoring of Online Communities

Online communities are central venues for communication, coordination, and information sharing, generating large volumes of text and relational interaction data. Such data are valuable for studying online information environments and monitoring harmful dynamics, but their scale and complexity require computational methods. Recent progress in Natural Language Processing (NLP) and Graph Machine Learning (GML) has enabled increasingly capable methods for analyzing these data. However, standard NLP methods typically treat text instances as independent and ignore the relationships between them, while GML approaches don't optimize for the rich semantics of the text modality.
In this thesis we investigate how to leverage the relation between posts and other text instances to build better text representations.
First, we evaluate how network structures commonly found in online communities affect the performance and robustness of GML algorithms through a novel synthetic network generator. Second, we draw on social learning theory to develop a model of how information is aggregated when it is unevenly distributed across a network. Third, drawing on these insights, we design scalable architectures for text-attributed graphs that allow language models to aggregate neighboring texts efficiently.
Taken together, the thesis studies when relational information helps the computational analysis of online communities and how it can be incorporated into text representation learning to support more capable tools for automated monitoring.

Key words	Online communities, Computational social science; Natural Language Processing; Graph Machine Learning; Text-attributed graphs; Social learning;

Abstracts

Yinchu Li
Eindhoven University of Technology (Tu/e) and RMIT University
Conference poster

Yinchu Li[12]

Supervisors:
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1 Eindhoven University of Technology
2 RMIT University

Human Digital Twins and Individuals in Preventive Health: Unpacking the Dimensions of Interaction Design

Human Digital Twins (HDTs) are often envisioned as digital replicas that can mirror, simulate, and predict aspects of a person's health. Existing work has largely approached HDTs through technical and clinical lenses, focusing on body modelling, data integration, and health prediction. What remains underexplored is how HDTs may be encountered, interpreted, and designed in preventive health contexts by individuals outside controlled medical settings.

This thesis repositions HDTs through an HCI and design lens. Rather than treating them solely as technical and computational models, it reconceptualizes HDTs as relational counterparts and investigates how they could be presented, interpreted, embodied, and shaped through interactions with individuals over time. Thethesis combines multiple approaches: speculative explorations of HDT roles as a design vocabulary, a large-scale survey of people's perceptions of these roles, multisensory and material explorations of how predictive health information may be physically encountered, and design fictions with supportive design tools that examine long-term relational change and inform future design practice.

The thesis argues that the interaction design of HDTs in preventive health is inherently multi-dimensional. Beyond technical capability, it is shaped by relational, interpretive, embodied and material, and temporal considerations. By reconceptualizing HDTs from a design perspective, contributing design resources for imagining and shaping them, and providing empirical insight into how people perceive and engage with them, this research offers a broader foundation for future researchers and designers to build on in this field.

Key words	Human Digital Twin; Preventive Health; Interaction Design; Relational Technology; Digital Health Technology

Abstracts

Caterina Manfrini
University of Copenhagen (UCPH) and RMIT University
Conference poster

Caterina Manfrini 1

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Innovation as a practice of care. Exploring employee-driven innovation and the 'human side' of innovation processes in Italian and Danish public healthcare

The COVID-19 pandemic exposed both the fragility and resilience of public healthcare systems, underscoring the pivotal role of healthcare professionals in sustaining care under extreme pressure. During the crisis, frontline workers devised practical and often frugal solutions to emerging challenges, revealing innovation as a dynamic, context-dependent process rooted in everyday practice and shaped by interactions among diverse actors beyond formal R&D structures.

This thesis examines these processes through the lens of employee-driven innovation (EDI), focusing on how healthcare professionals experience, enact, and sustain innovation within public healthcare systems. Adopting a qualitative, interpretive approach, it draws on five interconnected studies conducted in Denmark and Italy, combining interviews, observations, and document analysis with both managerial and non-managerial professionals.

The analysis begins by exploring innovation during the COVID-19 crisis through the lens of social suffering. As pressures intensified, professionals were driven to develop new solutions to urgent care challenges. When their initiatives were recognised and supported, innovation fostered solidarity and collective resilience; when overlooked, tensions deepened and innovation remained informal and reactive.

Building on these insights, the thesis investigates the human dimension of EDI through four analytical lenses: (1) tensions between top-down innovation strategies and bottom-up practices, revealing gaps between organisational discourse and lived experience; (2) controversies among actors as generative forces that reshape innovation trajectories; (3) care and compassion as key motivators sustaining innovation despite structural constraints; and (4) the interplay between EDI and open innovation through engagement with external actors.

Overall, the thesis shifts attention from formal structures to the relational, human-centred dynamics of innovation. It demonstrates that in public healthcare, innovation emerges through everyday practices, relationships, and problem-solving efforts, rather than primarily from managerial strategies or formal R&D initiatives.

Key words	Employee-driven innovation; Public sector innovation; Healthcare innovation; Human side of innovation; Care relations.

Abstracts

Noopoor Misal
LUT University and RMIT University
Exhibit

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The Engagement Illusion: Responsibility Framing and Behaviour Change on Sustainability-Oriented Digital Platforms

Digital Platforms (DPs) designed to promote pro-social and pro-environmental behaviour are typically judged successful when users engage with them frequently. At the same time, the Fogg Behaviour Model holds that behaviour requires motivation, ability, and a prompt: DPs optimise ability and supply the prompt, so where motivation is low, behaviour persists only as long as the platform continues to prompt it. The proposed study introduces the *engagement illusion* to denote the divergence between engagement and genuine change. Since organisations rely on engagement metrics for evidence of success, if metrics fail to track real behaviour, organisations may scale and report impact that has not occurred, while participation continues to register as success.

This is more visible in Sustainability-Oriented Digital Platforms (SODPs), which embed a sustainability goal within everyday transactions. SODPs are a distinctive and under-examined setting, because their value proposition rests on the premise that ordinary participation produces collective impact, yet preliminary evidence suggests the goal is frequently marginal to how users engage. They are therefore a strong test of whether platform-mediated behaviour persists once the platform is removed. This study manipulates responsibility framing, namely whether the interface positions the user or the platform as the agent of the outcome. A platform-as-agent framing (for example, “your search planted a tree”) may raise engagement while transferring responsibility away from the user, whereas a user-as-agent framing locates the outcome in the user´s own action.

The research proposes a randomised A/B experiment that compares the two framings and measures behaviour both during the intervention and after it is withdrawn. This extends the standard A/B test, which captures behaviour only while an intervention is live, by separating two outcomes that engagement metrics usually conflate: how much users participate, and whether the ‘sustainable’ behaviour persists once the platform stops prompting it. The central prediction is a dissociation between them. Platform-as-agent framing is expected to perform as well or better on engagement while leaving behaviour less durable, so that the framing that appears most successful in the A/B test produces the least lasting change.

The contribution is twofold. For SODP research, the study identifies responsibility framing as a feature that may shape not only whether users act but whether the behaviour persists once the platform is removed. For behavioural science, the implication is potentially broader: if behaviour produced by shifting perceived agency toward the platform proves less durable than behaviour framed as the user’s own, persistence may distinguish action supported by intention from action sustained only by external design.

Key words	digital platforms, user behaviour, sustainability-oriented digital platforms, behaviour change, A/B testing

Abstracts

Aezid-Ul-Hassan Najmi
FH Aachen University of Applied Sciences (FH Aachen) and RMIT University
Conference poster

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Development of an energy-efficient thermal management system to enhance the performance of hybrid fuel cell-battery systems under cold climate conditions

The global transition toward sustainable and zero-emission transportation has accelerated the development of hybrid fuel cell-battery electric powertrains as a promising alternative to conventional fossil fuel-based systems. However, the widespread commercialization of such systems, particularly in cold-climate regions, remains hindered by several critical challenges, including prolonged fuel cell cold-start, battery performance degradation, high auxiliary heating demand, thermal instability, and reduced overall system efficiency. Addressing these limitations is essential for improving the reliability, energy efficiency, and economic feasibility of next-generation hydrogen-powered mobility systems. In this context, this PhD research presents an integrated and energy-efficient thermal management framework as one of the key enabling solutions for overcoming major barriers associated with the commercialization of hybrid fuel cell-battery powertrains under sub-zero ambient conditions. The research combines experimental investigations, high-fidelity system-level modelling, and intelligent control strategies to enhance thermal and energy performance under realistic operating conditions. A novel phase change material (PCM)-based waste heat recovery (WHR) concept was developed and experimentally validated using a fuel cell test bench. The validated concept was subsequently integrated into a comprehensive dynamic 1D system model of a hybrid fuel cell-battery powertrain, incorporating the fuel cell system, battery pack, thermal loops, cabin heating, and auxiliary subsystems under transient operating conditions.

Furthermore, advanced thermal management strategies based on deep reinforcement learning (DRL) were developed and benchmarked against conventional control approaches. The proposed framework demonstrated substantial reductions in cold-start duration, auxiliary heating demand, and overall energy consumption while improving thermal stability, operational reliability, and system efficiency under severe cold-climate conditions. Overall, this research provides a holistic and practically applicable pathway toward improving the commercial viability, operational resilience, and energy efficiency of hybrid hydrogen-powered powertrains, contributing significantly to global zero-emission initiatives and the United Nation's Sustainable Development Goals related to clean energy, sustainable mobility, industrial innovation, and climate action.

Key words	Hybrid Powertrains; Fuel Cell Systems; Thermal Management; Waste Heat Recovery; Energy Efficiency

Abstracts

Charu Negi
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Conference poster

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Self-Healing Organic Coatings: The Delaminated Interface

Corrosion costs are estimated at 3-4% of the world's GDP. Improved corrosion management could reduce greenhouse gas emissions from steel-making. While organic coatings provide effective corrosion protection, any damage or defects can result in corrosion beneath the coating, leading to the failure of the organic coating. Organic coating delamination is an important degradation mechanism, initiated and driven by corrosion at the defect site or at the interface, resulting in the loss of adhesion between the organic coating and the metal substrate. A deeper understanding of the underlying processes is crucial for further advancements in coating performance. Additionally, the underlying mechanisms of self-healing by corrosion inhibitors is not fully understood. Recently, novel insights were gained on the fundamental processes of cathodic delamination for weak model and resistive coatings on steel. The presented work aims to develop a more detailed understanding of the underlying mechanisms of the delaminated interface for industrial coatings with a reasonable complex formulation and a reasonably high corrosion resistance. We employ the Scanning Kelvin-Probe (SKP) and surface analytical techniques such as X-Ray Photoelectron Spectroscopy (XPS) to elucidate the correlated corrosion processes taking place at the interface during delamination and self-healing of the organic coatings on galvanized steel. This facilitates an understanding about the interplay between the interface of the coating systems and the substrate materials in governing the kinetics and mechanisms of delamination and performance of the coatings in cabinet corrosion testing.

Key words	Corrosion, Organic Coatings, Corrosion Protection, Cathodic Delamination, Electrochemistry, Self-Healing Organic Coatings

Abstracts

Shuxian Pan
Artificial Intelligence Research Centre (IIIA) and Autonomous University of Barcelona (UAB)
Conference poster

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Automated Extraction of Online Community Norms

As large language models (LLMs) are increasingly integrated into multi-agent systems (MAS) to translate natural language norms into formal representations, ensuring translation fidelity remains a critical challenge. In the context of this research, we treat this LLM-driven formalisation process as the critical engine of automated norm extraction, bridging the gap between human-readable conventions and formal logic intended for agent reasoning. Current evaluation methods primarily focus on syntactic validity or execution status, often failing to evaluate if the generated logic accurately preserves intended semantics. This gap leaves systems vulnerable to misinterpretations and potentially unsafe agent behaviour.

To address this, we propose a novel composite similarity metric designed to assess both the semantic and structural fidelity of LLM-generated formal rules. Our methodology translates natural language conventions—specifically, the H-Group Conventions from the cooperative board game Hanabi—into a customised, quantifier-free higher-order logic mapped into DNF-like tree structures. This representation enables a systematic, fine-grained comparison of syntax and lexicon-level predicate content against a logician-reviewed gold standard. Furthermore, the translation pipeline is optimised via targeted prompt engineering that incorporates domain-specific ontologies and Theory of Mind representations to instruct the LLM on generating nested beliefs. We validated our proposed metric on the human-verified MALLS dataset, demonstrating that it provides more comprehensive and reliable assessments than established baselines like BLEU and Logical Equivalence (LE). Ultimately, this work establishes a robust pipeline for extracting and evaluating community norms. While live MAS integration remains future work, applying this framework to Hanabi demonstrates its capability to generate reliable, machine-readable rules that prepare agents for complex, cooperative scenarios.

Key words	Norm Extraction, Multi-agent Systems, Large Language Models

Abstracts

Leonie Paul
LUT University (LUT) and RMIT University
Exhibit

Leonie, Paul1

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And Here I Am, Wondering If I Will Ever Feel Connected (Again): Exploring Sustainability Through the Senses

She has been walking for hours.
Dropping to the ground, she leans against the big oak right next to the path.
Luckily, the weather is mild, and she has brought enough water to restore herself.
She has walked this path before. Many times. Sometimes even daily.
But for a few months now, things have changed. Well, not really. But she wants them to.
This walk is now part of her homework, a silent agreement she made with herself.
Sitting on the ground, she whispers, “How are you today?”
No answer.
She tries again. “Can you hear me?”
She sighs. Will she ever receive answers?
She takes a deep breath in. Today, she can smell the umami-sweet trace of factory smoke drifting from a distance, mingling with the soft scent of canola fields, which are in full bloom.
In The Work That Reconnects, Joanna Macy shares an exercise during which participants shall envision the gases they exchange with plants.
She tries to imagine the CO_2 leaving her body, making its way into the oak’s leaves.
Rationally, this makes sense. She learned about the oxygen cycle in middle school, or even earlier.
The difficult part is to feel it.
She places her hand on the tree’s bark.
She studies the fine lines forming mosaics across her fingers.
The folds of skin above her knuckles.
The trunk’s surface feels rough against her palm.
She looks closer.
“We’re not that different.”

Scholarship in sustainable development increasingly advocates for a “reconnection” with the more-than-human world, framing humans as embedded within, rather than separate from, ecological systems. Yet this reconnection is often approached as a matter of intellectual understanding. What if we try to find ourselves in nature - with all our senses? This interactive setup invites an exploration of sustainability as a full-body experience.

Key words	Sustainable Development, Embodiment, More-Than-Human Relations, Experiential Sustainability, Senses

Abstracts

Viet Hung Pham
Eindhoven University of Technology (Tu/e) and RMIT University
Conference poster

Viet Hung Pham[1 2], Malte Wagenfeld[1], Regina Bernhaupt[2],

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2 Eindhoven University of Technology

Walking the Digital Street: A VR Tool for Assessing Urban Walkability

Walkability is essential for creating sustainable, liveable, and inclusive cities, yet it is often assessed through static planning tools that do not fully capture pedestrians' lived experiences. This research investigates how Digital Twin, Virtual Reality, and Generative Design can support more human-centred walkability evaluation and pedestrian-oriented urban planning. The study adopts a mixed-methods and design-oriented approach in Eindhoven, the Netherlands. It begins with sit-down and go-along interviews with pedestrians to understand how people experience walking in urban environments, focusing on factors such as safety, pathway quality, comfort, shade, greenery, accessibility, route directness, public transport connections, and supporting facilities. These findings are then used to inform the development of a VR-based urban walkability prototype. The prototype is tested with professionals in urban planning, urban design, and landscape architecture. Through immersive first-person exploration, participants assess the virtual street environment and identify walkability issues that may be difficult to detect through conventional plans, maps, or 2D visualisations. Their feedback highlights the value of VR for understanding scale, spatial relationships, safety, comfort, and the overall pedestrian experience. The next stage of the research extends the VR prototype into a one-to-one Digital Twin of an Eindhoven street and integrates generative design to create alternative walkability-oriented scenarios. These scenarios allow professionals to compare different design interventions related to lighting, pathways, greenery, and pedestrian facilities. The expected contribution of this research is a practical and methodological framework for combining pedestrian experience, immersive evaluation, and generative design within a Digital Twin environment. By connecting technical urban assessment with embodied pedestrian experience, the study supports more iterative, participatory, and human-centred approaches to future walkable urban design.

Key words	Urban Planning, Virtual Reality, Walkability, Digital Twin, Generative Design

Abstracts

Runeal Ramma
The International Centre for Numerical Methods in Engineering (CIMNE), Universitat Politècnica de Catalunya (UPC) and RMIT University
Online presentation

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Application of Machine Learning for Optimization Prospects in Metal Additive Manufacturing Technology

Laser-based Direct Energy Deposition (DED-LB) is a key technology in both the manufacturing and repair of components within metal Additive Manufacturing (AM). However, challenges such as heat accumulation and insufficient dynamic process control restrict its broader adoption. This work proposes a novel strategy to stabilize the deposition process by integrating a Machine Learning (ML) model as a ML-based surrogate controller, coupled to a Finite Element (FE) solver for run-time process control of the deposition process. The FE framework performs thermal analysis of the DED-LB process and generates high-fidelity (HF) synthetic data through an offline optimization approach for the training of the ML model. The architecture of the ML model is optimized via a hyperparameter tuning and validated thoroughly using independent cases excluded from the training dataset.The resulting ML-based surrogate controller, coupled to the FE solver, analyzes the melt pool morphology and thermal profiles in run time and outputs corrective laser power adjustments to maintain a constant melt pool morphology. This closed-loop system enables autonomous control and rapid dynamic response, ensuring consistent thermal management throughout the deposition process. Several scanning-sequence scenarios, ranging from simple thin walls to complex infill cubic depositions, are used to evaluate the run-time control system. The results show that the proposed framework maintains a stable melt pool morphology and thereby enhances geometric precision and reliability in DED-LB through tailored time-series power profiles, while reducing computation time to approximately one-third of that required by an offline optimization approach. The ML-based surrogate control framework was evaluated on scanning sequences excluded from the training dataset. Its ability to accurately control these scanning sequences highlights the robust generalization capabilities of the framework, further validating its effectiveness in delivering precise and scalable control for metal AM processes. These findings also motivated a real-time implementation in which the ML-enhanced controller is adapted with experimental data and integrated with a DED-LB printer, enabling real-time control of processing parameters to stabilize the printing process and improve buildability.

Key words	Metal Additive Manufacturing, Laser-based Direct Energy Deposition, Finite Element Modelling, Machine Learning-based Surrogate Modelling, Process Parameter Optimization.

Abstracts

Ananthakrishna Sajithkumar
Eurecat Centre Tecnològic de Catalunya, Technical University of Catalunya (UPC) and RMIT University
Conference poster

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Development of sustainable aluminium alloy powder for metal additive manufacturing

Laser-based directed energy deposition (DED-LB) relies on metal powder feedstocks with suitable particle size distribution, morphology, flowability, and internal quality. While gas atomization is the dominant industrial route for feedstock production, rotating disc atomization (RDA) offers a potential alternative with reduced gas consumption and the ability to produce highly spherical powders, but the relationship between RDA process parameters, feedstock characteristics, and DED-LB performance remains insufficiently understood.

This research investigates low-silicon aluminium alloy feedstocks produced by RDA and develops a powder-to-part framework linking powder production, feedstock characterization, additive manufacturing processability, and build quality. Synchrotron X-ray computed tomography (SXCT) was used to establish a three-dimensional powder-characterization methodology capable of quantifying particle morphology and internal porosity. The RDA process was subsequently studied using a central composite design combined with Gaussian process regression, SHAP-based model interpretation, and multi-objective desirability analysis to identify operating conditions that balance powder yield and feedstock-relevant powder characteristics.

The influence of feedstock characteristics on DED-LB processability was evaluated by comparing gas-atomized reference powders with RDA-produced aluminium alloy feedstocks. Although equivalent sieve classifications were employed, the investigated RDA powders exhibited a coarser particle-size distribution within the selected size fraction. Under transferred DED-LB processing conditions, RDA feedstocks showed increased occurrence of lack-of-fusion-type features and unmelted-particle-related defects, indicating that direct transfer of processing conditions between the investigated feedstocks was not successful. Additional studies on custom Al-Si-Mg-Fe alloys revealed complex interactions between feedstock characteristics, solidification behaviour, and defect evolution.

Overall, the work demonstrates how powder production, three-dimensional feedstock characterization, data-driven atomization process optimization, and DED-LB process development can be integrated within a traceable powder-to-part framework for aluminium alloy additive manufacturing.

Key words	Rotating disc atomization; Aluminium alloy feedstocks; Directed energy deposition; Synchrotron X-ray computed tomography; Process optimization

Abstracts

Daniel Stabler
LUT University (LUT) and RMIT University
Conference poster

Daniel Stabler

Supervisors: Professor Henri Hakala, Professor Anne-Laure Mention, Dr. Ahmad Alaassar

Repairing the Circular Economy: Institutional Pressures, Market Configurations, and Circular Business Model Innovation

The transition toward a Circular Economy (CE) has become an increasingly important response to growing concerns surrounding waste generation, resource scarcity, and unsustainable consumption. Practices for repair and product longevity are considered important mechanisms for reducing material throughput, and thereby reducing overall waste. However, stakeholders across circular value chains, such as manufacturing interests, independent businesses, governments, and civil society actors, often advance competing visions for how repair and longevity systems should be organized and governed.

This doctoral research examines how emerging Right to Repair and longevity initiatives influence circular business model design and the governance of repair markets, primarily within the consumer electronics sector. The research is motivated by the rapid growth of electronic waste and ongoing policy developments across Europe aimed at improving repairability, durability, and consumer access to repair services.

The study adopts a multi-method research design combining qualitative interviews, document analysis, computational text analysis, and integrative literature review methods. Empirical research focuses on manufacturers, policymakers, repair businesses, advocacy organizations, and community repair initiatives, with particular attention to developments within Europe and Denmark.

The findings suggest that repair and product longevity do not produce a single pathway toward circularity. Instead, they generate competing approaches to value creation, market organization, and sustainability. While some actors seek to integrate repair into centralized service ecosystems and controlled business models, others advance more decentralized, community-based, or market-liberal approaches. These competing configurations shape how circular business models emerge, how value is captured, and how transitions toward a sustainable future are managed and distributed across society.

The research contributes to discussions on CE transitions, sustainable business model innovation, and market governance by demonstrating that repair is not simply a technical solution to waste reduction. It represents a contested arena in which different actors seek to shape the future organization of production, consumption, and sustainability.

Key words	Repair, circular economy, institutionalism, market-shaping, business model, right-to-repair

Abstracts

Joey Tallon
Conservatoire National des Arts et Métiers (CNAM) and RMIT University
Conference poster

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3: Institut Universitaire de France (IUF)

Polyurethane infiltration for damage containment in AlSi10Mg lattice structures: Debris mitigation with preserved mechanical response

Metallic lattice structures offer high stiffness and strength but typically generate significant quantities of detached debris during compressive collapse, posing risks to surrounding components and personnel. This communication demonstrates that infiltration with a compliant polyurethane elastomer provides effective damage-containment functionality in AlSi10Mg simple cubic (SC) and face-centred cubic with vertical struts (FCCZ) lattices. Complete infiltration was achieved without vacuum assistance across all topologies and volume fractions (10–20%). While polyurethane infiltration produced only modest changes in conventional mechanical properties—preserving the underlying load-bearing response—it fundamentally altered failure behaviour. Metallic lattices generated debris mass fractions up to 76% during quasi-static compression, whereas polyurethane-filled lattices exhibited debris mass fractions below 5%. Fractured struts remained embedded within the elastomeric matrix due to polymer bridging and mechanical interlocking, and damaged structures maintained geometric integrity despite extensive internal fracture. These results establish that hybridization can introduce failure-control functionalities beyond conventional mechanical property enhancement, enabling safer structural collapse through fragment containment.

Key words	Lattice structures; Polymer infiltration; Damage containment; Debris mitigation; AlSi10Mg; Hybrid composites

Abstracts

Harry Tracey
Eurecat Centre Tecnològic de Catalunya, Girona University and RMIT University
Conference poster

Harry Tracey[1,2,3,4], Joan Teichenne Jané[1], Oliver A.H. Jones[3], Thi Thu Hao Van[3], José Manuel Fernández-Real[4,5], Jordi Mayneris-Perxachs [2,5], and Josep M Del Bas[1,6]

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Human cognitive performance-associated gut microbiota influences learning and memory in mice

With a growing ageing population, promoting health and preserving cognitive function in later life is beneficial for society. The human gut microbiome undergoes changes across the lifespan and has been implicated in age-related decline. In a cohort of older adults (IMAGEOMICS; n= 867), we investigated associations between cognitive performance, measured using the Symbol Digit Modalities Test (SDMT), and gut microbial composition and function. To assess whether microbiota associated with cognitive performance could influence brain function in regions involved in learning and memory, we transferred gut microbiota from human donors with high or low SDMT scores into mice using faecal microbiota transplantation (FMT). Recipient mice underwent cognitive testing using the Morris Water Maze. In recipient mice we analysed neuronal density, gut microbial composition and function, brain metabolites and gene expression. In the human cohort, we observed that both microbial composition and function were associated with cognitive performance. Mouse recipients receiving FMT from high-SDMT donors demonstrated improved learning and increased neuronal density compared to mice receiving FMT from low-SDMT donors. Across both human and mouse datasets, higher cognitive performance was associated with microbial pathways involved in the metabolism of amino acids and enzyme cofactors. Consistent with these findings, recipient mice receiving microbiota from high-SDMT donors exhibited altered expression of genes involved in dopamine signalling within the brain regions associated with learning and memory. Together, these findings support a role for the gut microbiome in health and cognitive performance during ageing.

Key words	human microbiome, ageing, cognition, gut-brain axis, health

Abstracts

Abid Ullah
Hamburg University of Technology (TUHH) and RMIT University
Exhibit

Abid Ullah [1,2,*], Dirk Herzog [1,3], Alexander Medvedev [2], Andrey Molotnikov [2], Ingomar Kelbassa [1,3], Milan Brandt [2,*]

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Advancing PBF-LB/M of Ti-6Al-4V through Laser Beam Shaping: From Melt-Pool Stability to Mechanical Performance

Laser powder bed fusion of metals (PBF-LB/M) enables the fabrication of complex Ti-6Al-4V components, but process reliability remains limited by sensitivity to laser power, scan speed, hatch spacing, layer thickness, and thermal history. This study investigates laser beam shaping as a process-control strategy to improve melt-pool stability, defect formation, surface integrity, microstructure, texture, and mechanical performance. Gaussian, core-ring, and ring-dominated beam profiles were examined through single-track experiments, bulk fabrication, porosity and surface analysis, microstructural characterisation, mechanical testing, and numerical simulation. Single-track results showed that spatial energy distribution strongly affects melt-pool geometry and stability. Gaussian beams produced deeper melt pools and became more susceptible to keyhole instability, spatter-related imperfections, and rougher surfaces at high energy input. In contrast, shaped beams redistributed energy laterally, forming wider and shallower melt pools, improving track continuity, and supporting more stable conduction-mode melting. Increased layer thickness further reduced stability and promoted roughness and discontinuity, particularly during Gaussian processing. In bulk specimens, densification depended on energy input, hatch spacing, melt-pool overlap, and inter-track remelting. Gaussian beams achieved high density at relatively lower energy input but showed greater keyhole-type porosity at elevated input. Shaped beams required sufficient energy and overlap to suppress lack-of-fusion defects but produced near-full density and improved surface quality once adequate remelting was achieved. Near-full density of about 99.9% was obtained at areal energy densities of approximately 2.8-3.0 J/mm^2. Geometric descriptors, including hatch spacing relative to beam diameter and melt-pool width-to-hatch spacing ratio, provided more meaningful densification criteria than volumetric energy density alone. Simulations showed that ring-dominated conditions may lose density due to insufficient remelting depth despite apparent lateral overlap. The microstructure was mainly martensitic alpha-prime, with hardness around 360-400 HV. Tensile testing at room temperature, 200 °C, and 400 °C showed temperature-dependent softening and beam-profile-dependent ductility, while fractography linked Gaussian defects to pore-assisted cracking and optimised ring-dominated processing to more uniform ductile tearing. Overall, this work establishes a beam-shape-aware framework for optimising PBF-LB/M Ti-6Al-4V toward improved stability, quality, productivity, and reliability.

Key words	Laser beam shaping; PBF-LB/M; Ti-6Al-4V; melt-pool stability; defect formation; process optimisation.

Abstracts

Francesca Vanelli
Polytechnic University of Milan (POLIMI) and RMIT University
Exhibit

Francesca Vanelli[1,2], Monica Lavagna[2], Paul Minifie[3]

1 RMIT University and Politecnico di Milano
2 Politecnico di Milano
3 RMIT University

Fluid Governance: Commoning Systemic Flood Adaptation

Flooding presents complex challenges, particularly in peri-urban areas where development pressures, environmental fragility, and fragmented governance intersect. Conventional flood management approaches remain largely siloed, efficiency-driven, and focused on large-scale interventions. Participatory decision-making is often marginal, limiting legitimacy and constraining the emergence of distributed adaptation actions. Infrastructure-led responses are primarily assessed through hydraulic performance, while private adaptation measures, although increasingly widespread, remain fragmented, unregulated, and poorly integrated into public strategies.

This PhD argues that addressing these limitations requires participatory decision-making processes capable of orchestrating public and private adaptation actions to support a systemic approach to flood adaptation. To conceptualise this perspective, flood adaptation is framed through the lens of the Commons, as a co-produced system of negotiated actions in which adaptation becomes a process of collective responsibility and multi-agent governance. Building on this understanding, the research explores Fluid Governance as a practice-in-the-making operating at the intersection of Flood Risk Management and Flood Risk Governance. Within this perspective, Flood Adaptation Design Actions are understood as materialisations of values and priorities rather than neutral technical solutions.

The research combines theory-driven inquiry with practice-based reflection. A bricolage of methods—including literature reviews, interviews, storytelling, context exploration, cataloguing, governance design, participatory activities, and strategic design propositions—converges into four Research Actions: Infrastructuring, Anchoring, Activating, and Revealing. Through these Actions, the designer-researcher assumes the role of instigator, operating upstream of design outcomes through synthesis, mediation, and proposition.
The research produces the FLOODS.ACT Toolkit, tested in the Seveso River Basin (Italy) and the Maribyrnong River Basin (Australia). The Toolkit comprises the FLOODS.ACT Framework, a participatory decision-support process; the FLOODS.ACT Value Protocol, a multidisciplinary assessment method; and the Atlas of Flood Adaptation Design Actions, a co-design tool for negotiating adaptation interventions. Together, these outputs demonstrate how design-led decision-making can support more coordinated, inclusive, and context-responsive flood adaptation.

Key words	Flood Adaptation; Flood Risk Management; Flood Risk Governance; Built Environment; Decision-Making; Fluid Governance

Abstracts

Mateus Vidaletti Costa
École Centrale de Lyon (EC Lyon) and RMIT University
Conference poster

Mateus Vidaletti Costa[1,2], Mauricio Gomes de Queiroz[1], Raphael Cardoso[1], Ian O'Connor[1], Arnan Mitchell[2]

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Zeros, Negatives, and Fewer Bits: Stress-Testing a Photonic Convolutional Neural Network

Photonic hardware has emerged as a promising platform for accelerating neural networks, offering massive bandwidth and parallelism. Yet, its analog nature makes performance vulnerable to noise and quantization. In this work, we study a photonic architecture that can operate either as a convolution accelerator (CA) or as a photonic convolutional neural network (PCNN). For the CA, we conduct a large-scale analysis of 3×3 kernels with varying sparseness (amount of zeros) and negative density (amount of negative values), showing that highly sparse kernels with balanced positive and negative values are the least robust, with convolution quality degrading rapidly under high levels of noise. At the accuracy level, the CA demonstrates strong resilience, with less than 0.5% accuracy reduction even at 1-bit quantization. By contrast, the PCNN suffers larger drops—about 15% at 1 bit and 2% at 2 bits. Based on these results, we estimate that lowering digital-to-analog converter (DAC) resolution can reduce the DAC's power consumption by 98.44% in the CA and 96.88% in the PCNN while maintaining the same accuracy as higher quantization levels. These findings provide quantitative insights into how kernel design, quantization, and circuit-level choices shape the robustness and efficiency of photonic neural networks.

Key words	Silicon Photonics, Convolutional Neural Networks, Kernel, Noise, Quantization

Abstracts

Abdul Wahab
FH Aachen University of Applied Sciences (FH Aachen) and RMIT University
Conference poster

Abdul Wahab [1,2], Hans Kemper [2], Hamid Khayyam [1]

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[2] Faculty of Aerospace and Automotive Engineering, FH Aachen University of Applied Sciences, Aachen, Germany

Mitigating Thermal Runaway Propagation in Lithium-Ion Battery Packs using Immersion Cooling for Future Transport Electrification

Thermal runaway propagation remains one of the most critical barriers to the safe electrification of road and air transport, particularly as battery packs move toward higher power, faster charging, and tighter packaging. Indirect cooling and passive barriers remain insufficient during severe faults. This study presents a new forced-flow immersion-cooling safety concept in which the battery pack is not only thermally managed during normal operation, but actively protected against thermal runaway propagation by a continuously renewed dielectric coolant boundary. A single-cell thermal-abuse experiment using DF7 dielectric fluid was first used to validate a high-fidelity three-dimensional COMSOL conjugate heat-transfer model. The validated model was then extended to an 18-cell lithium iron phosphate battery pack to quantify thermal propagation under abnormal-cell conditions and to identify design parameters that control pack-level safety.

The results demonstrate that forced-flow immersion cooling provides an advanced and highly effective solution for next-generation electric vehicles, heavy-duty electrified platforms, and future electric aircraft. Under 100% state of charge, the validated single-cell experiment limited the peak cell temperature to 188.98 °C, maintained the coolant outlet temperature below 48.42 °C, and prevented flame and visible smoke despite a 12.379 kJ thermal event. At pack level, propagation severity was strongly governed by abnormal-cell position, with maximum temperature increasing from 176.53 °C at an edge cell to 204.62 °C at an interior cell. However, increasing coolant flow rate from 2 to 10 liter-per-minute reduced the critical interior-cell temperature from 204.62 °C to 123.22 °C, while decreasing inlet temperature from 35 °C to 15 °C reduced it to 112.24 °C. Increasing inter-cell spacing further weakened thermal coupling and suppressed neighboring-cell heating. Overall, the study establishes forced-flow immersion cooling as a tunable, scalable, and pack-integrated thermal safety architecture capable of transforming battery fire protection from passive containment to active propagation prevention for future electrified transportation systems.

Key words	Lithium-ion batteries; immersion cooling; dielectric coolant; thermal runaway; battery thermal management; electric transportation

Abstracts

Qing Yu
Polytechnic University of Milan (POLIMI) and RMIT University
Online presentation

Qing Yu[1], Luisa Collina[2], Suzie Attiwill[3]

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Acting as a Critical Agent in Cultural Institutions: Curatorial and Spatial Practices for Social Innovation

In the 21st century, the role of cultural institutions is shifting. They are being called to be responsive to contemporary agendas, leading them to redefine their place in society. This research considers cultural institutions in architecture and design to have the potential to become social institutions that bring together diverse voices to confront increasingly complex social issues, thereby fostering social innovation.

Conducted in collaboration with Triennale Milano between 2023 and 2025, this research contextualises its inquiry within the spatial and curatorial practices for the 24th International Exhibition, titled *Inequalities*. Informed by my background in interior design, the concept of the Critical Agent has emerged as a conceptual framework and an outcome of this research. The Critical Agent is an embedded spatial researcher-practitioner who continuously navigates the dynamic between the inside and the outside of the institution. The Critical Agent's practice involves scaffolding spaces for social dialogue in cultural institutions through the design and rearrangement of the space and curatorial elements. Alongside this persona, a specific toolkit was developed that includes the Social Innovation Compass, Social Listening and the spatial strategy of scaffolding. These tools enable visitors to engage in the collective deconstruction and reconstruction of socially focused exhibitions.

This PhD research contributes to the architecture and design field by providing cultural institutions with a reference role for developing socially innovative exhibition practices.

Key words	architecture and design, cultural institutions, social innovation, the Critical Agent, spatial and curatorial practice, practice research

Abstracts

Yaxin Zheng
Eindhoven University of Technology (Tu/e) and RMIT University
Conference poster

Yaxin, Zheng[1,2], Harm, van Essen[1], Scott, Mitchell[2], Liam, Fennessy[2], Laurene, Vaughan[2], Regina, Bernhaupt[1]

1 Eindhoven University of Technology (RMIT University and European host institution)
2 RMIT University

Design of Temporality and Shared-Agency for Digital Twin-User Interaction in Smart Homes

Digital Twins (DTs) are digital representations of products, processes, systems, or services that support analysis, prediction, and optimization across a range of domains. Domestic DT-enabled systems bring automated decision-making into everyday home life through sensors, algorithms, and interactions in ways that challenge meaningful user experience over time. This PhD thesis examines how designers might approach domestic DT interfaces through two primary research threads: temporality and agency.

The first thread examines temporality, as domestic DT-enabled systems operate across time, drawing on historical data, monitoring ongoing states, and generating future predictions. Exploratory studies with domain experts, designers, and end-users demonstrate how different stakeholders understand and engage with DT-enabled systems in domestic settings. How people relate to past, present, and future information shapes their experience in smart homes. Building on these insights, a 'Time Machine' analogy is introduced as a conceptual lens for domestic DT interactions, leading to a temporal interaction framework describing how users interact with domestic DT-enabled systems differently across past, present, and future orientations.

The second thread examines agency, as domestic DT-enabled systems increasingly take the initiative on users' behalf, raising questions about how the initiative and agency can be meaningfully shared between user and system. A user's experiential agency shifts with their engagement styles across context and time. The thesis proposes a multi-axis engagement framework—DT Engagement Style (Visibility × Proactivity) and User Engagement Style (Intentionality × Activeness)—that enables the distribution of experiential agency between user and system to become designable.

These two threads each shape the other. As users move between reflecting on the past, monitoring the present, and planning for the future, their interaction and engagement styles shift, influencing how agency is shared between user and system. The combination of frameworks offers designers of domestic DT interfaces a new model for enabling shared agency over time.

Key words	Digital Twin, Temporal Interaction, Temporal Interface, Shared-agency, Smart Home

REDI fellows

Eslam Salaheldin Abdelhady

University of Twente (UT) and RMIT University

Eslam Salaheldin Abdelhady is a committed and dedicated global citizen, who is passionate about materials research for a positive societal, commercial, and environmental impact. Having earned his B.Sc. in Metallurgical and Material Eng.at Suez University in Egypt, Eslam was awarded the AVSA grant from EIT raw materials to conduct dual M.Sc. in Sustainable Materials Engineering (SUMA) at University of Milano-Bicocca and KU Leuven through which he obtained research and development experience at Empa in Switzerland and Holmen Iggesund AB in Sweden. He joined the REDI program to work on additive manufacturing of shape memory alloys.

Nabi Agzamov

5th Studio and RMIT University

Nabi Agzamov is trained as an architect and urban designer with research interests in urban ecology, resilience and sustainability. His work focuses on the multiscalar relationship between water, ecology, and cities. Further areas of interest are climate adaptation and mitigation, environmental justice, bioregionalism, flood resilience, and water management.

Agzamov holds a Bachelor's in Architecture from the New York Institute of Technology and a Master's in Architecture and Urban Design from Columbia University, where he was awarded with the Lucille Smyser Lowenfish Memorial Prize. He is also an alumnus of The New Normal post-graduate research program at Strelka Institute for Media, Architecture and Design.

Between 2019–2022 Agzamov was the Head of the Center for Urban Resilience and Ecology at Strelka KB, the largest urban consultancy in the CIS region. Before Strelka KB, Agzamov worked at a landscape architecture firm SCAPE in New York, where, among other projects, he worked on the design of the Ecological Citizens exhibition for the US Pavilion at the Venice Biennale Architettura (2018).

Stefano Ascione

French National Centre for Scientific Research (CNRS) and RMIT University

After his Bachelor's in physics at TorVergata University in Rome, Italy, Stefano Ascione developed an interest in both theoretical and computational physics which led him to achieve his master's degree in theoretical statistical physics.

Fascinated by systems in which constituents' simple behavior generates complex phenomena, Stefano has concentrated his efforts on the study of fluid dynamics and phase transitions. His passion for statistical physics was also supported by a strong interest in computer science, thus during his master's studies he studied computational physics, machine learning, complex and neural networks and optimiaation and statistical mechanics.

Stefano approached the statistical physics field from both theoretical and computational points of view, developing a wide range of numerical simulations.

REDI fellows

Sabrina Albiez

LUT University (LUT) and RMIT University

Sabrina researches how business function and processes can be replaced through the use of the Internet of Things in servitised business models. Originally from a small town from the south of Germany, Sabrina moved to Oak Ridge, NC (USA), Venlo (the Netherlands), Plymouth (UK) and Lappeenranta (Finland) over the past 10 years. She obtained a Bachelor of Business Administration in International Business and a Master of Science in Business and Management (Marketing). She is now pursuing a co-tutelle doctorate from RMIT and LUT in Business and Management.

Milad Bemani

Technical University of Catalunya (UPC) and RMIT University

Milad Bemani Lirgeshas is a PhD candidate jointly affiliated with RMIT University and the Universitat Politècnica de Catalunya (UPC), and a researcher at Eurecat and RMIT Europe. His research focuses on additive manufacturing, fatigue behavior and life assessment, mechanical characterization of materials, and microstructural analysis. His current work centers on Design for Additive Manufacturing (DfAM), with a particular emphasis on integrating artificial intelligence and machine learning techniques to enhance design optimization, improve resource efficiency, and reduce the environmental impact of additively manufactured components.

Adam Biegański

École Centrale de Lyon (EC Lyon) and RMIT University

Adam is a PhD student, working across science and business . Adam received his Bachelor in Applied Physics (2020) at Warsaw University of Technology and Master in Nanophysics (2022) at Grenoble Alpes University, following an internship performed at CNRS Institut Neel, where his research topic was the fabrication and electro-optical characterization of top-down GaN nanowires for UV photodetection application. In 2021 he carried out an engineering internship at VIGO Photonics. His main scientific interests concern semiconductor photonics and infrared technology.

Milica Božić

Polytechnic University of Milan (POLIMI) and RMIT University

Milica Božić is an architect, researcher and curator from Belgrade. She is a Marie Skłodowska-Curie PhD Fellow at Politecnico di Milano and RMIT University through the double-degree REDI program. Her research and curatorial practice focus on transdisciplinary, open-ended and experimental encounters with heritage.

REDI fellows

Juan Pablo Cavalieri

Autonomous University of Barcelona (UAB) and RMIT University

Born in Buenos Aires (Argentina), Juan Pablo graduated in chemistry at Universidad de Buenos Aires (UBA) achieving a Licenciatura (Bachelor + Master equivalent) in 2021. Prior to becoming a PhD student he was part of a research group in INQUIMAE (CONICET – UBA), where he worked from 2020 to 2022. During his first year, he performed Density Functional Theory (DFT) calculations for the prediction of the electronic spectroscopy of Ruthenium complexes. Since 2021 to 2022 he worked on synthesis of novel Ruthenium cyanide bridged complexes under an UBACyT stimulus scholarship.

Currently, he is a PhD student involved in the development of selective disassemble of reticular materials to obtain novel molecules and materials. Juan Pablo's research interests include -but are not limited to- Metal-Organic Frameworks, Covalent-Organic Frameworks, organometallic chemistry, synthesis of novel catalysts and their applications for water splitting, artificial photosynthesis and pollutants and warfare agents degradation.

José Manuel Crego Lozares

Hamburg University of Technology (TUHH) and RMIT University

José Manuel is a Spanish mechanical engineer with a master's in material science & engineering with a research interest in additive manufacturing and its applications in the space sector. His Ph.D. research focuses on understanding the mechanisms and phenomena that take place in multi-material additive manufacturing (MMAM) for its future applications in the biomedical, aerospace, and energy sectors. This will be his fourth AM-based project after completing his master's thesis on the use of Electron Beam Melting (EBM) for manufacturing bipolar plates for Hydrogen fuel cells, completing a bachelor thesis focused on the development of 3D printed nanocomposite for Tribo-corrosive applications and collaborating as CAD Lead in Hypernova Solar, the first 3D printed Solar-powered race car in Fairfax (VA).

He is Marie Skłodowska-Curie's fellow under the REDI Program currently based in TUHH in Hamburg (Germany). His master's thesis, which is framed under the Marie Curie grant #101023266, received funding from Comunidad de Madrid (Spain) ADITIMAT-CM program. He received the Undergraduate Research Scholars Program (URSP) for funding his Bachelor thesis at George Mason University (VA, US), where he received the 2020 GMU Audience favorite award.

REDI fellows

Michalina Maria Czaplicka

Polytechnic University of Turin (POLITO) and RMIT University

Misia is currently engaged in works on the development of a vasculature model using cutting-edge organ-on-chip and microfluidics technology. Her research focuses on harnessing the potential of this model as a versatile and functional unit for progressive 3D solutions, including applications in pathology monitoring, drug screening, and integration into Lab-on-a-chip systems.

Trained as a biomedical engineer, Misia's research interests are centred around tissue engineering and space biology. Her academic journey includes the pursuit of a double Master of Science degree in Molecular Medicine, achieved through the esteemed Erasmus Mundus International Master in Innovative Medicine (IMIM) program at the University of Groningen and Uppsala University.

Misia's academic journey is shaped by her research experiences. While at the Universidad Carlos III de Madrid in Spain, she had the opportunity to broaden her knowledge in biomaterials and regenerative medicine, along with exploring 3D Bioprinting and micro/nanofabrication techniques. Subsequently, during her Master's thesis at the Department of Microgravity and Translational Regenerative Medicine at Otto von Guericke University, she engaged in in-depth research, exploring the simulated microgravity-aided generation of scaffold-free 3D tissue constructs.

Nithya D S

Polytechnic University of Milan (POLIMI) and RMIT University

Nithya is a REDI PhD student, MSCA research fellow and an aerospace systems engineer with research interests in the field of Advanced Air Mobility (AAM), Urban Air Mobility (UAM), air traffic management, UAS systems, flight testing, and interplanetary aerial systems. Her research is aimed at supporting the generation of certification standards and identifying the safety design criteria/critical operation safety limits of eVTOLs for the safe operation/integration of UAM in low-altitude urban airspace.

Nithya has more than three years' of industrial and international work experience as a systems engineer working in diverse fields such as UAS Traffic Management (UTM), engineering software development and spacecraft systems. She holds a Bachelor's degree (B.Tech) in Aerospace engineering from Hindustan University, Chennai, India, and a joint master's degree (M.Sc) in Aerospace Engineering from the Technical University of Munich, Germany, and Nanyang Technological University, Singapore. Her masters thesis title is Oxidizer flow control system for throttling an experimental hybrid rocket engine.

She is a STEM practitioner and a passionate researcher who is keen on effectively contributing to the research and development of aerial systems technology that can be used for the betterment of exploration, safety, and sustainability.

REDI fellows

Maadh Hmosze

University of A Coruña (UDC) and RMIT University

Maadh Hmosze, is a PhD candidate currently working at University of A Coruna (UDC) and RMIT University under the REDI program. Maadh's research project is focusing on Anomaly Detection in Multivariant time series data. He holds a B.Sc. degree in Computer Science from Kufa University, Iraq and a Master of Science from University of Colorado Colorado Springs, USA, focusing on machine learning and deep learning algorithms in time series data.

Maadh also has contributed to two peer reviewed papers during his work as an intern at Bently systems. Maadh is now working on developing more robust deep learning model to better represent and understand dynamic temporal and intrametric dependencies in timeseries data to report anomalous behaviour timely and accurately by using the recent advancement in knowledge the field of artificial intelligence.

Doina Huso

University of Agder (UIA) and RMIT University

Doina is an experienced digital strategist and innovation management expert who is currently researching open innovation and digital transformation strategies for BlueTech firms.
She has previously worked in international development and policy research with CGIAR, USAID, JICA, and EU-funded projects in Japan, Malaysia, the USA, and globally. In addition, she has worked as a strategic communications consultant for private companies and volunteered in several NGOs.

In her work, she combines digital transformation strategies and cross-functional teamwork with rigorous data analysis and communications skills to deliver online platforms, multimedia products, and global marketing campaigns.

With a unique understanding of business development, innovation, and digital transformation, Doina has been able to implement and study strategy, design thinking, and knowledge management in several fields including BlueTech, transportation systems, tourism, law, and ICT. She holds an M.B.A. from Kyoto University in Japan, a Postgraduate Diploma in Digital Strategies from Columbia University in the USA, and an integrated Bachelor & Master's degree in Business Informatics from the University of Tirana. Doina is fluent in English, Japanese, Italian, Spanish, French, and Portuguese besides her native Albanian.

Mazhar Iqbal

Catalan Institute of Nanoscience and Nanotechnology (ICN2), Autonomous University of Barcelona (UAB) and RMIT University

Mazhar is a doctoral student in the Theory and Simulation group at the Catalan Institute of Nanoscience and Nanotechnology (ICN2), Autonomous University of Barcelona (UAB), Spain and an MSCA fellow under the REDI program.

He is from Bahawalpur, a small city in the Pakistani state of Punjab. Mazhar completed a master in chemistry in 2022. His research experience is in the field of Computational Chemistry and research interests include Classical Molecular Dynamics Simulations and DFT. In his spare time, Mazhar enjoys watching movies, Turkish drama serials, reading novels, walking and singing.

REDI fellows

Ridhima Kaul

FH Aachen University of Applied Sciences (FH Aachen) and RMIT University

Ridhima is a PhD student in Aerospace Engineering at FH Aachen and RMIT University. She did her Master of Aerospace Engineering with specialisation in Propulsion from École Centrale de Lyon, Écully France. She was an exchange student at École d'Ingenieurs en Aeronautique et Spatial, Institut Polytechnique des Sciences Avancées, Paris France, as a Charpak Scholarship holder from the French Embassy and Campus France. Her Bachelor in Aerospace Engineering was from Chandigarh University, India.

She did her master thesis as an Acoustics Intern in Laboratoire des Ecoulements Geophysiques et Industriels, Grenoble, France. She also worked as an engineer in Quality Engineering at Tata Advanced Systems Limited, Hyderabad, India.

Onurcan Kaya

Catalan Institue of Nanoscience and Nanotechnology (ICN2), Autonomous University of Barcelona (UAB) and RMIT University

Onurcan Kaya received his B.S. in Mechanical Engineering at Istanbul Technical University in 2018 and M.S. in Mechanical Engineering at Bogazici University in 2021, with his theses focused on the thermal properties of thin films and 2D/3D heterostructures using classical MD simulations and DFT calculations. Onurcan's current work is on revealing the material properties of aBN films fabricated under different environmental conditions using atomistic simulation tools.

Ali Haji Khamis

Aalto University and RMIT University

Trained as an urban planner, Ali's research focuses on the role of planning in conserving urban cultural heritage amid rapid urbanisation, with a case study of Stone Town in Zanzibar City. His work examines how rapid urban expansion, the transformation and loss of open spaces, and the impacts of climate change affect the city's built cultural heritage, which underpins both social cohesion and economic development in Stone Town and Zanzibar City more broadly.

As part of his doctoral research, Ali has presented at several international conferences, including the Cities' Identity Through Architecture and Arts (CITAA) conference. In 2023, Ali and two colleagues received the UNESCO Youth Grant to conduct research on 'Swahili Urbanism under the Influence of Global Trade – Exploring the Historic Urban Landscape of Zanzibar's Coastal Settlements as Part of the Silk Road'. The study was successfully published in a UNESCO Youth publication.

Björn Komander

Artificial Intelligence Research Centre (IIIA), Autonomous University of Barcelona (UAB) and RMIT University

Björn Komander is researching the automated monitoring of online communities. His research project aims at analysing these online communities through combining recent methodological advances in Natural Language Processing (NLP) and Graph Neural Networks (GNN). His interests include Natural Language Processing as a whole, Graph Theory, Causal Inference for Machine Learning, but also areas from Development Economics as well as Philosophy, like the study of migration and philosophical anthropology.

REDI fellows

Yinchu Li

Eindhoven University of Technology (Tu/e) and RMIT University

Yinchu is a doctoral student in the Industrial Design department at TU/e and RMIT University, with research interests in the intersection of healthcare, human-data interaction, and materiality. Her doctoral project aims to explore the application of Digital Twins in healthcare domain with interactive materials. Currently she is investigating the potential of physical data representations (data physicalization) to facilitate better comprehension of individual's health data.

With a background in intelligent information systems and human-computer interaction, Yinchu has engaged in prior research during her master program on playful assistive technology for children with mobility difficulties, designing personalized home rehabilitation solutions, and creating new forms of body maps. These experiences inspired her to pursue research in HCI and investigate new ways of using design for better health and wellbeing.

Caterina Manfrini

University of Copenhagen (UCPH) and RMIT University

Caterina Manfrini has an interdisciplinary background in humanities and social sciences. Her previous research has investigated institutional caregiving for the vulnerably ageing during the Covid-19 pandemic in Italy. Caterina's current project has her focusing on bottom-up approaches to innovation within the Danish healthcare system.

Noopoor Misal

LUT University and RMIT University

Noopoor is an Innovation Management enthusiast with a keen interest in Sustainability implications that innovation brings. Her research is focused on Cross-Border Digital Business Models and the kind of sustainability impact they can achieve in the future. Other areas of interests include sustainability on a macro-level in the platform economy, including policies, tensions, paradoxes, and the role of stakeholders pertaining to sustainable practices in digital platforms.

Aezid Ul Hassan Najmi

FH Aachen University of Applied Sciences (FH Aachen) and RMIT University

Aezid's research interests lie within the scope of the global energy transition to a clean and sustainable environment in the context of UN Sustainable Development Goals (SDGs) via Hydrogen and Fuel Cell Technologies. His doctoral research is intended to develop and investigate the integration of fuel cell systems for industrial applications. This research is designed to be a valuable contribution to the automobile and aviation sector. Before joining as MSCA (REDI) fellow, he remained involved in multidirectional and interdisciplinary funded projects comprising electrochemical energy and hydrogen fuel cell technologies for achieving net-zero emissions by hydrogen-powered EVs and energy systems. Further, he also served as Research Associate at The Hong Kong Polytechnic University, Hong Kong. He received his postgraduate degree in Mechanical Engineering from Tianjin University, China, and a Bachelor of Engineering from the University of Agriculture, Faisalabad, Pakistan.

REDI fellows

Charu Negi

Max-Planck-Institut für Nachhaltige Materialien GmbH. (MPI-SusMat), Ruhr University (RUB) and RMIT University

Charu is a research enthusiast with a strong interest in interdisciplinary research. Born in the Himalayan state of Uttarakhand in India, she has always found nature and the mountains as her biggest source of inspiration. She has a masters and bachelors (honours) degree in chemistry from Doon University, India. Since her graduation she has been associated with the Homi Bhabha Centre for Science Education (HBCSE), a National Centre of the Tata Institute of Fundamental Research (TIFR), Mumbai as a NIUS fellow. Her masters thesis was based on stimuli-responsive materials. She has been associated with the Polymer Laboratory at CSIR-Central Scientific Instruments Organization (2020-2021) and the Surface Science and Technology Laboratory at CSIR- Indian Institute of Petroleum (2022).

Charu is also a member of the American Chemical Society. Her scientific interests include nanomaterials, surface science, stimuli-responsive materials, and catalysis. She is passionate about the scientific and industrial research to tackle the current global challenges and work on a sustainable solution which can help a greater community of people along with the research community.

Shuxian Pan

Artificial Intelligence Research Centre (IIIA) and Autonomous University of Barcelona (UAB)

Shuxian is a PhD student and researcher at Artificial Intelligence Research Centre (IIIA) from the Spanish National Research Council (CSIC) under REDI Program. She has a Master of Arts degree in Theoretical and Applied Linguistics and a Master of Science degree in Artificial Intelligence. Her research interests are natural language processing, symbolic artificial intelligence and multi-agents system.

Leonie Paul

LUT University (LUT) and RMIT University

Leonie is a junior researcher in management and business studies, with a specific research interest in sustainable development and the necessary cognitive shifts required to implement sustainability in organisational settings.

Leonie is pursuing her doctoral degree with a focus on the micro-foundations of sustainable development. Her research links cognitive processes with hands-on sustainable decision-making and organisational actions while exploring opportunities to overcome the knowledge-behaviour gaps in sustainable development. Further areas of interest include regeneration, inner transformations, female thinkers and creative research methodologies.

Prior to joining the doctoral programme, Leonie has been working as a junior educator aiming for transformative learning experiences, particularly in sustainable development. She has presented alternative and innovative teaching approaches on several occasions and developed pedagogical course materials for university students, for example, addressing climate anxiety, sustainable entrepreneurship, Design Thinking for Sustainable Development, etc. She will continue this work throughout her doctoral journey and beyond.

REDI fellows

Viet Hung Pham

Eindhoven University of Technology (Tu/e) and RMIT University

Hung is a PhD student in the REDI program at RMIT and Eindhoven University of Technology. He is a member of the Systemic Change Group at TU/e, which aims to use design and technology to study socio-technical systems at a community level by designing technology-enabled interventions that address societal challenges and analysing their effects on the ecosystem. His research mainly focuses on applying Digital Twin and Mixed Reality in urban planning to improve the design process and citizens' quality of life.

Runeal Ramma

The International Centre for Numerical Methods in Engineering (CIMNE), Universitat Politècnica de Catalunya (UPC) and RMIT University

Runeal is an aerospace engineer by formation, and he completed his bachelor's degree at RMIT University in Australia. During his bachelor's degree, his research was focused on carbon fibre reinforced polymers for the aerospace sector which was presented during the Smart Materials and Surfaces conference in Athens, Greece in 2022. Being an enthusiast about advanced manufacturing and materials for engineering applications, he is currently completing his PhD in Additive Manufacturing for metal-metal composites using laser-based direct energy deposition (DED). His research work aims at developing thermomechanical models and simulating the complex process to optimise the processing parameters in an attempt to make DED technology more reliable and reproducible for the industrial sector.

Ananthakrishna Sajithkumar

Eurecat Centre Tecnològic de Catalunya, Technical University of Catalunya (UPC) and RMIT University

Ananthakrishna pursued his master´s studies in Material Science and Engineering from KTH Royal Institute of Technology in Sweden and bachelor's studies in Mechanical Engineering from Amrita Vishwa Vidyapeetham in India. Mechanisms involved in metal powder production especially in the atomization, is his area of interest. Addition to this, he is interested in investigating the relation between the process of metal powder production, structure and property of the produced powders. He believes that results from such kind of investigations helps in optimising the metal powders for metal additive manufacturing, making it less expensive. By doing research he likes to make creative impacts in this domain.

Daniel Stabler

LUT University (LUT) and RMIT University

Daniel is originally from Brighton, in the south of England. He has, however, lived in Denmark, Scotland, Germany and now Finland over the last 7 years. He has an MSc in Public Policy and Management from the University of Glasgow, as well as an MSc in Global Studies and International Development Studies from Roskilde Universitet. Additionally, he has worked in both the research sphere in sustainable development, and project based roles in local government in the UK.

REDI fellows

Joey Tallon

Conservatoire National des Arts et Métiers (CNAM) and RMIT University

Joey is currently pursuing his PhD in Mechanical and Manufacturing Engineering under the REDI MSCA Fellows program with a specialization in 3D modeling and simulation of additively manufactured hybrid architectured lattice materials. Joey completed his Bachelor of Applied Science in Mechanical Engineering (BASc. ME) at the University of Ottawa in 2018 and his Master of Science in Engineering in Mechanical Engineering (MScE. ME) at the University of New Brunswick in 2021.

At CNAM/RMIT, Joey is researching design optimization for additively manufactured hybrid lightweight microlattice structures for energy absorption in cyclic loading situations. During his time in the program, Joey hopes to develop the necessary skills required to apply the knowledge gained to other areas of interest, mainly the defence industry. Outside of academics, Joey's hobbies include a nice balance between gaming indoors and adventuring outdoors.

Harry Tracey

Eurecat Centre Tecnològic de Catalunya, Girona University and RMIT University

Harry is a biologist and researcher with a specialisation in microbiology. He has previous academic and professional experience across the United Kingdom, Malaysia, the Netherlands and Sweden. Currently, he is a dual PhD candidate at the University of Girona and RMIT, and a member of the Nutrition and Health Unit at Eurecat, Centre Tecnològic de Catalunya. Harry's research explores the microbiota-gut-brain-axis with the aim of promoting healthy aging.

Abid Ullah

Hamburg University of Technology (TUHH) and RMIT University

Abid Ullah, is a researcher and engineer specializing in Mechanical Engineering, with a primary focus on materials manufacturing processes. He works on a Marie Skodowska-Curie Actions (MSCA) funded project as a research associate at the Institute of Laser and System Technology (iLAS) and is perusing a dual PhD. in Mechanical Manufacturing and Mechatronics Engineering from RMIT University in Australia and TUHH in Germany under the umbrella of the RMIT European Doctoral Innovators (REDI) Program. Prior to joining the REDI program, he worked and contributed to an EU and Tübitak -funded project in Türkiye.

Abid's current research project aims to unravel the intricate relationship between processes, microstructure, and properties in Additive Manufacturing (AM). The project seeks to advance AM processes and improve understanding of material behavior through the development of a material model for a specific metal alloy.

Abid's research interests include -but are not limited to laser-materials interaction, microstructure characterization, parameters optimization, the application of Multiphysics simulation, and artificial intelligence in AM processes. Abid has made significant contributions to the field, having published over 10 research articles in prestigious, peer-reviewed Q1 journals. He has established some innovative approaches for overcoming issues with laser-printed parts of ceramic and metal alloys.

REDI fellows

Francesca Vanelli

Polytechnic University of Milan (POLIMI) and RMIT University

Francesca is an Architect, Urban Planner, and Land Specialist. Her thematic interests include land and water management and policies, peri-urban areas, spatial planning, adaptive governance, social cohesion, and disaster and conflict risk management. She is a passionate early-stage researcher with a multi-faceted experience across scales and a published author.

Before starting her PhD, she worked for the Institute for Housing and Urban Development Studies (IHS), Erasmus University, Rotterdam (NL) following research, training and consultancy activities in the field of urban land governance. Previously, she was involved with NGOs and architecture companies. She graduated cum laude from the MSc. in Urban Management and Development at IHS in 2019, specialising in Urban Land Governance, with a thesis on the land titling policy in Tirana, Albania, and its social impact on informal settlers. In 2016 she obtained an MS. in Architecture at the University of Ferrara (IT), with awarded research on the climate-sensitive regeneration of the seafront of Havana, Cuba.

Mateus Vidaletti Costa

École Centrale de Lyon (EC Lyon) and RMIT University

Mateus is a PhD student at both École Centrale de Lyon and RMIT University, researching about large-application of Photonics Convolutional Neural Networks. A physics engineer, he graduated from UFRGS with solid foundations in mathematics, physics and engineering solutions. During graduation, Mateus worked for just under two years with superhydrophobic nanoparticles and developed an RPA algorithm for XAS deglitching as his final thesis project. Mateus has also work for 2 years as a data scientist.

Abdul Wahab

FH Aachen University of Applied Sciences (FH Aachen) and RMIT University

Abdul Wahab is pursuing his PhD. in Mechanical, Manufacturing and Mechatronic Engineering at RMIT, Australia in cooperation with FH Aachen University of Applied Sciences, Germany. His areas of research are thermal management and techno-economic analysis of renewable energy systems. Furthermore, he has expertise in exergy analysis and environmental impact analysis.

His current work examines thermal management of batteries for heavy machines to prevent thermal runaway which cascade over and cause battery pack failure. His research supports the UN's Sustainable development goal, in particular SDG 7 (Clean and Affordable Energy). His work has been appeared in Springer Nature, Journal of Cleaner Production, and Renewable Energy, among other publications.

Abdul holds a Master of Science degree with Distinction in New and Renewable Energy from University of Durham, United Kingdom and a Bachelor of Science degree in Mechanical Engineering from University of Engineering and Technology Taxila, Pakistan. He was awarded a prestigious Commonwealth Scholarship to pursue his master's from UK. Before starting his PhD, he worked as a Product Mechanical Engineer at vivo Communications Technology, Pakistan where he was particularly involved in new product introduction and development.

REDI fellows

Qing Yu

Polytechnic University of Milan (POLIMI) and RMIT University

Qing Yu is an interior design professional with a strong academic background. She graduated with a first-class bachelor's degree from Sichuan Fine Art Institute (China) in 2016, followed by a master's degree with distinction from the University of Portsmouth (UK) in 2018, both specialising in interior architecture and design. Notably, during her master's programme, she undertook an interesting dissertation project in a village in Fiji. She immersed herself in the local community for a month, conducting ethnographic research focusing on post-disaster architectural construction.

In November 2022, Qing started her PhD research as a Marie Skłodowska-Curie Actions (MSCA) Fellow, where the research topic is situated in relation to the design of the future space of cultural institutions. This opportunity allows her to collaborate with RMIT University, Politecnico di Milano and Triennale di Milano to achieve the research objective. This collaboration not only provides her with a remarkable perspective to explore a series of curatorial undertakings, in particular the 24th Triennale Milano International Exhibition in 2025, but has also led to the merging of her role as an interior designer with that of a curator and researcher.

Yaxin Zheng

Eindhoven University of Technology (Tu/e) and RMIT University

Yaxin studied and worked in China, the UK, and Singapore. She got her Bachelor of Engineering in Digital Media Technology from Shandong University, China, and her Master of Arts in Service Design from the Royal College of Art, UK. She is doing her dual-PhD at the Eindhoven University of Technology and RMIT University. She is honored to be a Marie Skłodowska-Curie Actions (MSCA) Fellow.

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