



L-Università
ta' Malta



UM
RESEARCH
EXPO
2025

PROGRAMME & ABSTRACTS

WEDNESDAY
28 MAY 2025



20
25

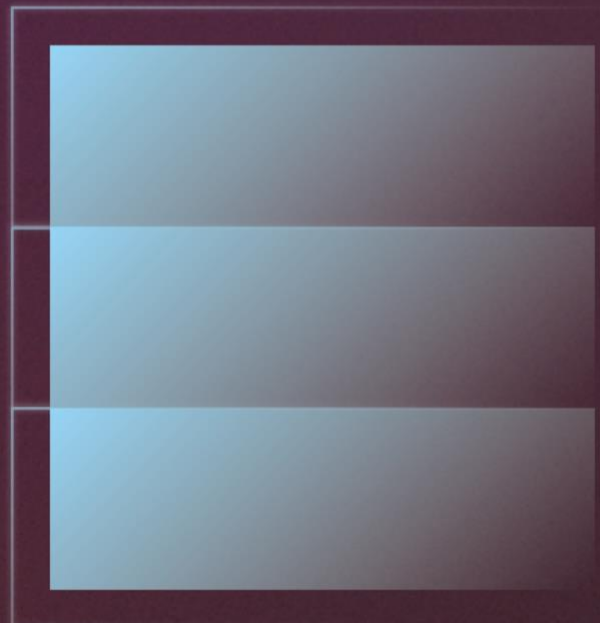
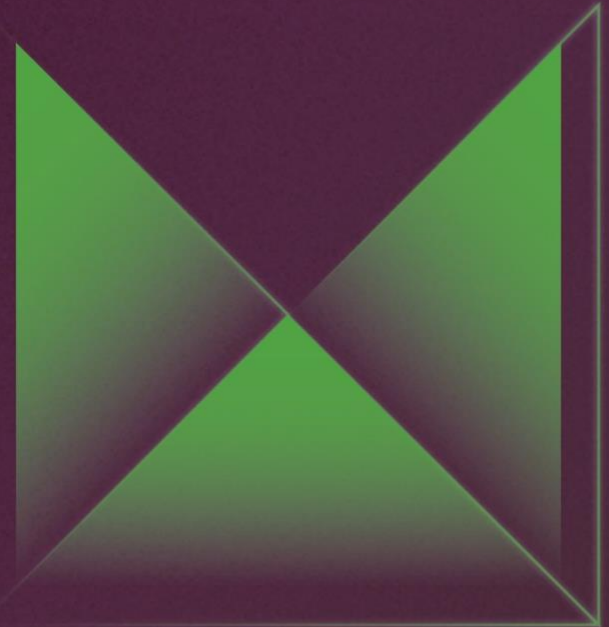
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UM Research Expo 2025

An unprecedented amount of research is being carried out at the University of Malta (UM) across many areas, yet this research rarely gets the exposure it deserves. Research Expo 2025 (UMRE 2025) is intended to give UM researchers the opportunity to showcase their research activities to the wider UM community, to encourage the sharing and cross-pollination of ideas, and to celebrate the success we have achieved thus far. Additionally, UMRE 2025 incorporates the traditional Doctoral School Symposium – allowing us to also celebrate the up-and-coming research of doctoral students.

Organising Committee

Prof. Ing. Simon G. Fabri (*Chair*)
Prof. Mario Aquilina
Dr Christian Bonnici
Ms Lucienne Bugeja
Mr Pierre Cassar
Mr Clive E. Ferrante
Prof. Melissa Marie Formosa
Ms Maronia Schembri
Ms Dorianne Tabone
Prof. Nicholas Vella
Ms Rebekah Zammit

Scientific Committee

Prof. Ing. Simon G. Fabri (*Chair*)
Prof. Mario Aquilina
Prof. Leonie Baldacchino
Prof. Melissa Marie Formosa
Prof. Josanne Vassallo
Prof. Nicholas Vella

Event and Programme

Coordination

Ms Noeleen Mifsud

Design and Layout

Marketing, Communications and Alumni Office



Programme

08:00 – 08:45

WELCOME COFFEE + REGISTRATION

08:45 – 09:10

INTRODUCTION + WELCOME SPEECHES

VENUE: Aula Magna

Prof. Alfred J. Vella (Rector)

Prof. Ing. Simon G. Fabri (Pro-Rector for Research and Knowledge Transfer)

09:10 – 10:10

PLENARY SESSION

CHAIR: Prof. Ing. Simon G. Fabri | **VENUE:** Aula Magna

09:10 – 09:20

The Affordances Made Available Through Preti's St Paul Conquering the Moors: A Pedagogical Model for Interacting with Cultural Artefacts

Prof. Adrian-Mario Gellel (Faculty of Education)

09:20 – 09:30

A Consensus Blood Transcriptomic Framework to Advance Precision Medicine in Sepsis

Dr Brendon Scicluna (Faculty of Health Sciences)

09:30 – 09:40

Too Much or Too Little But Never Enough: Informational Blind Spots in Preventing and Investigating Child Trafficking for Sexual Exploitation

Dr Aitana Radu (Faculty of Media and Knowledge Sciences)

09:40 – 09:50

NotaryPedia: Advancing AI for Knowledge Management in Historical Notarial Archives

Dr Charlie Abela (Faculty of Information and Communication Technology)

09:50 – 10:00

A Comparative Discourse Analysis of Online Reactions to Environmental Issues in Maltese, French and German Media

Dr Anne-Marie Bezzina Busuttil (Faculty of Arts)

10:00 – 10:10

The Invention of Music History

Dr Jeremy Coleman (School of Performing Arts)

10:10 – 10:35

KEYNOTE ADDRESS

CHAIR: Prof. Nicholas Vella | **VENUE:** Aula Magna

Mental Health in Academia: Toward a More Sustainable Future

Prof. Stefan Mol (Assistant Professor in Organisational Behaviour and Research Methods at the Amsterdam Business School, University of Amsterdam)

10:35 – 10:55

DOCTORAL AWARDS CEREMONY

CHAIR: Prof. Nicholas Vella | **VENUE:** Aula Magna

Address by the Hon. Keith Azzopardi Tanti (Parliamentary Secretary for Youth, Research and Innovation) and presentation of awards

Recipients: Dr Simone Azzopardi (Faculty of Arts) and

Dr Karl Fiteni (Institute of Space Science and Astronomy)



10:55 – 11:25 | **NETWORKING COFFEE**
VENUE: Level 1 & Level 2

11:25 – 13:05 | **PARALLEL SESSIONS 1**
Presentations – Doctoral Candidates

Doctoral Stream 1.1 – 1.5

CHAIR: Prof. Leonie Baldacchino | **VENUE:** Aula Prima

- 11:25 – 11:45 | **Senior Entrepreneurship: Late Call or New Beginning?**
 Mr Sandro Pinto Sant Anna (The Edward de Bono Institute for Creative Thinking and Innovation)
- 11:45 – 12:05 | **Employee Sensemaking During Organisational Innovation Adoption**
 Mr Oliver Saliba (The Edward de Bono Institute for Creative Thinking and Innovation)
- 12:05 – 12:25 | **Individual and Community Growing Your Own Food Programmes: Motivations, Challenges and Strategies**
 Ms Cynthia Caruana (Centre for Environmental Education and Research)
- 12:25 – 12:45 | **Valuing Ecosystem-Based Fisheries Management in Malta: A Discrete Choice Experiment to Elicit Preferences and Willingness to Pay**
 Mr Gilmour Camilleri (Faculty of Economics, Management and Accountancy)
- 12:45 – 13:05 | **Retargeted Advertisements and FOMO: Shaping Young People's Attitudes and Behaviour**
 Dr Ivan De Battista (Faculty of Economics, Management and Accountancy)

Doctoral Stream 2.1 – 2.5

CHAIR: Prof. Joanne Cassar | **VENUE:** Meeting Room 101

- 11:25 – 11:45 | **Mirror Mirror on the Wall: The Effects of Virtual Reality Exposure Therapy on Body Image and Occupational Performance in People Experiencing Body Image Disturbances**
 Ms Stacy Debono (Faculty of Health Sciences)
- 11:45 – 12:05 | **Why and How Are Maltese Adult Women with ADHD Seeking Empowerment?**
 Ms Sarah Cilia Vincenti (Faculty for Social Wellbeing)
- 12:05 – 12:25 | **Motherhood Penalty? Using Data Diffraction to Analyse Findings from a Mixed Method Research Study**
 Ms Vania Tabone (Faculty for Social Wellbeing)
- 12:25 – 12:45 | **Intersecting Identities in the Heat of the Kitchen: An ethnographic Study of Diversity, Microaggressions and Resilience in Commercial Kitchens**
 Ms Carmenrita Bugeja (Faculty of Economics, Management and Accountancy)
- 12:45 – 13:05 | **Using Images to Stimulate Narrative Reasoning in Children**
 Ms Amanda Maria Morales (Faculty of Education)



Doctoral Stream 3.1 – 3.5

CHAIR: Prof. Andrew Azzopardi | VENUE: Meeting Room 2

11:25 – 11:45	<p>To Enhance Spirituality and Spiritual Care in the Care of the Older Adults in Rehabilitation Hospitals Using the Appreciative Inquiry (Ai) Approach</p> <p>Mr Godfrey Cutajar (Faculty of Health Sciences)</p>
11:45 – 12:05	<p>Doing What is Right: Exploring Processes of Ethicalisation of Social Workers</p> <p>Ms Maria Mangion (Faculty for Social Wellbeing)</p>
12:05 – 12:25	<p>Community, Safe Spaces and Activism in Malta: Narratives from Moviment Graffiti</p> <p>Ms Julia Alegre Mouslim (Faculty of Education)</p>
12:25 – 12:45	<p>The Performance of Neurotypical Maltese Bilingual Adults on the Maltese – English Aphasia Assessment</p> <p>Ms Lorraine Vassallo (Faculty of Health Sciences)</p>
12:45 – 13:05	<p>Ecologically Valid Face Identity Processing: Combining Behavioural Performance and Neural Markers</p> <p>Ms Tram Nguyen (Faculty of Media and Knowledge Sciences)</p>

Doctoral Stream 4.1 – 4.5

CHAIR: Prof. Joseph M. Cacciottolo | VENUE: Meeting Room 6

11:25 – 11:45	<p>Investigating the Molecular Mechanisms of Combination Therapy on Drug-Resistant Chronic Myeloid Leukaemia</p> <p>Mr Antonio Polidano Vella (Faculty of Medicine and Surgery)</p>
11:45 – 12:05	<p>Overcoming Hurdles in Lung Cancer Treatment: Novel Antibody Sequences and Tumour Targeting Strategies</p> <p>Ms Mariana Grima (Faculty of Health Sciences)</p>
12:05 – 12:25	<p>Incidence and Survival of Neuroendocrine Neoplasia in the Maltese Islands – A Population-Based Study</p> <p>Dr Jessica Mangion (Faculty of Medicine and Surgery)</p>
12:25 – 12:45	<p>Optimisation in CT Using Tin Filtration: A Systematic Review</p> <p>Mr Andrea Bellizzi (Faculty of Health Sciences)</p>
12:45 – 13:05	<p>The Development of a Digital Health Tool for Patients with Inflammatory Bowel Disease on Monoclonal Antibody Treatment</p> <p>Ms Mariella Mercieca (Faculty of Health Sciences)</p>

Doctoral Stream 5.1 – 5.5

CHAIR: Prof. Melissa Marie Formosa | VENUE: Meeting Room 5

11:25 – 11:45	<p>Genomics of Idiopathic Hypogonadotropic Hypogonadism in the Maltese Islands</p> <p>Mr Clayton John Axiak (Faculty of Health Sciences)</p>
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- 11:45 – 12:05** | **Decoding D-Amino Acid Oxidase Gene Damage in Maltese ALS Patients**
Ms Sylvana Tabone (Faculty of Medicine and Surgery)
- 12:05 – 12:25** | **A Novel Gene Therapy Combination for Non-Small Cell Lung Cancer**
Mr Nathan Vella (Faculty of Medicine and Surgery)
- 12:25 – 12:45** | **Differentially Expressed Genes of Human Lens Epithelial Cells in Different Stages of Diabetic Retinopathy**
Dr Muhaiyo Bartolo Khodjayeva (Faculty of Health Sciences)
- 12:45 – 13:05** | **Pituitary Neuroendocrine Tumours – Insights from Single-Cell Transcriptomics and Spatial Biology**
Ms Emma Jayne Spiteri (Faculty of Medicine and Surgery)

Doctoral Stream 6.1 – 6.5

CHAIR: Prof. Jean Calleja Agius | VENUE: Meeting Room 3

- 11:25 – 11:45** | **A Missed Window in Early Pregnancy: What Bleeding Tells Us and What We're Not Hearing**
Ms Lara Sammut (Faculty of Medicine and Surgery)
- 11:45 – 12:05** | **Genomic and Proteomic Biomarkers of Preeclampsia in the Maltese Population**
Ms Celine Ann Grech (Faculty of Medicine and Surgery)
- 12:05 – 12:25** | **Outsmarting Endometriosis: AI and the Future of Diagnosis**
Ms Martina Haber (Faculty of Health Sciences)
- 12:25 – 12:45** | **Mother-Infant Video Interaction Guidance for Women with Perinatal Mental Health Illness: A Pilot Randomised Controlled Trial**
Dr Rachel Buhagiar (Faculty for Social Wellbeing)
- 12:45 – 13:05** | **The Acute Stroke Pathway in Malta. A Systematic Evaluation and Recommendations on the Optimisation of the Local Acute Stroke Pathway**
Ms Lara Marie Deguara (Faculty of Medicine and Surgery)

Doctoral Stream 7.1 – 7.5

CHAIR: Prof. Janet Mifsud | VENUE: Meeting Room 4

- 11:25 – 11:45** | **Medicines Accessibility in a National Health Service**
Mr Michael Cini (Faculty of Medicine and Surgery)
- 11:45 – 12:05** | **Development and Validation of an HPLC-UV Method for Quantification of Cannabinoids in Commercial Oil-Based Products**
Ms Karolina Szyrner (Faculty of Medicine and Surgery)
- 12:05 – 12:25** | **Transmission of Carbapenemase-Producing Enterobacterales in the Intensive Therapy Unit at Mater Dei Hospital**
Ms Sarah Pace (Faculty of Medicine and Surgery)



- 12:25 – 12:45 | **Development of a Predictive Model of Treatment Outcomes for Patients Suffering from Lumbar-Related Leg Pain**
Mr Emanuel Schembri (Faculty of Health Sciences)
- 12:45 – 13:05 | **Effectiveness of High-Volume Injection in Mid-Portion Achilles Tendinopathy (HighIMPACT): A Randomised Trial**
Ms Tiziana Mifsud (Faculty of Health Sciences)

Doctoral Stream 8.1 – 8.5

CHAIR: Prof. Sebastiano D'Amico | VENUE: Lecture Room 203

- 11:25 – 11:45 | **Analysing Malta's Laws That Address Marine Pollution from Land-Based Single-Use Plastics and Microplastics Sources**
Ms Jyothi Thomas (Faculty of Laws)
- 11:45 – 12:05 | **The Impact of Changing Values on the Management of Malta's Built Heritage**
Perit Charlene Jo Darmanin (Faculty for the Built Environment)
- 12:05 – 12:25 | **Advancing Microwave Ablation: Precision in Dielectric Property Measurement and Real-Time Monitoring**
Ing. Federico Cilia (Faculty of Science)
- 12:25 – 12:45 | **Changing the Way We Track Eyes – Fusing the Electrooculogram and a Webcam for Robust Eye-Gaze Tracking**
Ing. Matthew Mifsud (Faculty of Engineering)
- 12:45 – 13:05 | **Impact of Thermal Effluent on Posidonia Oceanica Meadows and Associated Fish Assemblages: Insights into Biodiversity and Functional Groups**
Mr Alessio Marrone (Faculty of Science)

Doctoral Stream 9.1 – 9.5

CHAIR: Prof. Ing. Carl James Debono | VENUE: Lecture Room 201

- 11:25 – 11:45 | **Bridging the Domain Gap: Leveraging Monolingual Data for Low Resource Machine Translation Systems**
Mr Kurt Abela (Faculty of Information and Communication Technology)
- 11:45 – 12:05 | **Explainability of Graph Neural Networks for Fraud Detection**
Mr Gabriel Calleja (Faculty of Information and Communication Technology)
- 12:05 – 12:25 | **Online Critic Guided Decision Transformer in Gym-MicroRTS**
Mr Benjamin Bugeja (Faculty of Information and Communication Technology)
- 12:25 – 12:45 | **A Comparative Study of Information Reconciliation Schemes for Continuous Variable Quantum Key Distribution**
Mr Aaron Abela (Faculty of Information and Communication Technology)
- 12:45 – 13:05 | **Securing the Quantum Future: A Key Rate Framework for Quantum Key Distribution Protocols**
Mr Ryan Debono (Faculty of Information and Communication Technology)



Doctoral Stream 10.1 – 10.5

CHAIR: Prof. Ing. Glenn Cassar | VENUE: Meeting Room 103

11:25 – 11:45	Developing P Type Damage Structural Integrity Assessment Methodologies Based on RCC-MRx for the Design of Nuclear Fusion Reactor Components Mr Kevin Degiorgio (Faculty of Engineering)
11:45 – 12:05	Determining Requirements for a Design Support Framework That Balances Risk Management and Multi-User Experience Within Packaging Ms Alessandra Bianco (Faculty of Engineering)
12:05 – 12:25	Dual Fuel Engines for Marine Application Mr Anthony Theodore Saliba (Faculty of Engineering)
12:25 – 12:45	Development of a Force Measurement System for Cavitating Hydrofoils Ms Mariana Zammit Munro (Faculty of Engineering)
12:45 – 13:05	The Potential of a Novel Switchable Glazing Assembly for Glare Control in a Mediterranean Climate Perit Etienne Magri (Faculty for the Built Environment)

Doctoral Stream 11.1 – 11.5

CHAIR: Prof. Godfrey Baldacchino | VENUE: Lecture Room 202

11:25 – 11:45	Leadership and School Self-Evaluation: Building the Relationship Towards School Improvement Ms Denise Gatt (Faculty of Education)
11:45 – 12:05	Maltese First Language Acquisition: The Noun Phrase & Elements of Morphosyntax Ms Michela Vella (Institute of Linguistics and Language Technology)
12:05 – 12:25	Redefining Liturgical Ritual Music Beyond Sacred Space Maestro Christopher Muscat (School of Performing Arts)
12:25 – 12:45	Health Data Sharing for Scientific Research Purposes in the Digital Age: Legal, Ethical and Practical Challenges in the European Research Area and Beyond Dr Roxanne Meilak Borg (Faculty of Laws)
12:45 – 13:05	Labour Relations and Democratisation in Transitional Tunisia Mr Joseph Matthew Debono (Faculty of Arts)
13:05 – 14:05	LUNCH VENUE: Level 0



14:05 – 15:05

DISCUSSION PANEL

VENUE: Aula Magna

Reimagining the University in the Age of AI: Challenges, Choices and Change

Moderator: Prof. Mario Aquilina

Panellists:

1. Prof. Leonard Busuttil
2. Dr Vanessa Camilleri
3. Prof. James Corby
4. Prof. Matthew Montebello
5. Dr Mireille M. Sant

15:05 – 16:05

POSTER STREAM (VC Theatre) & **COFFEE BREAK** (Level 0)

16:05 – 17:25

PARALLEL SESSIONS 2

Presentations – Academics/Researchers

Expo Stream 1.1 – 1.8

CHAIR: Prof. Josanne Vassallo | VENUE: Lecture Room 201

16:05 – 16:15

Caught in a Cluster: The Impact of Protein Aggregation in ALS

Dr Rebecca Cacciottolo (Faculty of Medicine and Surgery)

16:15 – 16:25

Exploring the Requirements and Challenges for Implementing Supplementary Breast Cancer Screening in Women with Dense Breasts Across Europe: A Quantitative Cross-Sectional Survey

Ms Deborah Mizzi (Faculty of Health Sciences)

16:25 – 16:35

Molecular Exploration of the p53 Landscape in Different Colorectal Cancer Cell Types

Prof. Therese Hunter (Faculty of Medicine and Surgery)

16:35 – 16:45

Changing Cell Fate

Dr Analisse Cassar (Faculty of Medicine and Surgery)

16:45 – 16:55

There's Something Fishy – Using Zebrafish to Understand Muscle, Bone and Wound Healing (Project STRONG)

Ms Margherita Muscat (Faculty of Health Sciences)

16:55 – 17:05

Beyond the Boundaries of the Brain

Dr Claude J. Bajada (Faculty of Medicine and Surgery)

17:05 – 17:15

Conversations with the Human Brain: Closed-Loop Sensory Stimulation

Dr Nowell Zammit (Centre for Molecular Medicine and Biobanking)

17:15 – 17:25

Searching for Biological Motion

Prof. Ian Thornton (Faculty of Media and Knowledge Sciences)



Expo Stream 2.1 – 2.8

CHAIR: Prof. Ruben J. Cauchi | VENUE: Meeting Room 3

16:05 – 16:15	Genomics of Rare Diseases: Identifying Local Disease-Causing Variants Using High Throughput Sequencing Prof. Rosienne Farrugia (Faculty of Health Sciences)
16:15 – 16:25	Improving Genomic Variant Data Retrieval via a Relational Database Approach Mr Andrea Gariboldi (Faculty of Health Sciences)
16:25 – 16:35	miRBench: Novel Benchmark Datasets for microRNA Binding Site Prediction That Mitigate Against Prevalent microRNA Frequency Class Bias Dr Panagiotis Alexiou (Faculty of Health Sciences)
16:35 – 16:45	TargetMI: A Multi-Omics Approach for Novel Drug Targets, Biomarkers and Risk Algorithms for Myocardial Infarction Prof. Stephanie Bezzina Wettinger (Faculty of Health Sciences and Centre for Molecular Medicine and Biobanking)
16:45 – 16:55	Uncovering Novel ALS Genetic Drivers in the Unique Maltese Population: From Gene Discovery to Therapeutic Insights Dr Paul Herrera (Faculty of Medicine and Surgery)
16:55 – 17:05	Spatiotemporal Expression and Control of Haemoglobin in Space Prof. Joseph Borg (Faculty of Health Sciences)
17:05 – 17:15	An in Vitro Study on Prophylactic Doses of Anticoagulants in Coagulation Factors Deficiencies Dr Nicoletta Riva (Faculty of Medicine and Surgery)
17:15 – 17:25	Decoding the Risk Elements of Diabetes and Osteoporosis: The DETERMINE Project Ms Marichela Schembri (Faculty of Health Sciences)

Expo Stream 3.1 – 3.8

CHAIR: Dr Stephen Lungaro Mifsud | VENUE: Aula Prima

16:05 – 16:15	Enhancing Connections in Healthcare Education: The ECHOES Project Dr Jose Guilherme Couto (Faculty of Health Sciences)
16:15 – 16:25	Should Research Start from an Undergraduate Level? A Case Study Among University of Malta Medical Students Dr Sarah Cuschieri (Faculty of Medicine and Surgery)
16:25 – 16:35	The Data Integrity and Stewardship Research Cluster (DISC) Dr Mireille M. Sant (Faculty of Laws)
16:35 – 16:45	The Bio-Psycho-Social Needs of the Aging Population Using Heroin Dr Anna Grech (Faculty for Social Wellbeing)



- 16:45 – 16:55** | **Stakeholder Perspectives on a Hybrid Care Model for Chronic Non-Communicable Diseases: A Qualitative Study Out of the RAPIDE Project**
Mr Andrea Cuschieri (Faculty of Medicine and Surgery)
- 16:55 – 17:05** | **Using Microalgae to Support Agriculture: Findings from the Literature and Farm Trials in Malta**
Dr Jules Siedenburg (Institute of Earth Systems)
- 17:05 – 17:15** | **Monitoring of Imposex and Antifouling Organotins: A Review**
Prof. Victor Axiak (Faculty of Science)
- 17:15 – 17:25** | **A Predictive Occupancy Model for Vascular Plants in Temporary Freshwater Rockpools**
Ms Leanne Camilleri (Faculty of Science)

Expo Stream 4.1 – 4.8

CHAIR: Dr Patrick Camilleri | VENUE: Meeting Room 2

- 16:05 – 16:15** | **Designing Professional Development for Teaching Mathematics Through Problem-Solving**
Dr James Calleja (Faculty of Education)
- 16:15 – 16:25** | **An Investigation into Literacy Practices for Students with Intellectual Disabilities**
Dr Loredana Muscat (Faculty of Health Sciences)
- 16:25 – 16:35** | **Experimentation, Exploration and Boundary Testing in the Narratives of Primary-School Children**
Mr Julian Galea (Faculty of Education)
- 16:35 – 16:45** | **Bridging Language Gaps in Early and Primary Education: A Pre-Service and In-Service Teacher Survey of Linguistically Diverse Practices in Malta**
Prof. Josephine Milton (Faculty of Education)
- 16:45 – 16:55** | **Access Denied: Third-Country Nationals Parents' and Children's Narratives of State-Sanctioned Exclusion from Schooling**
Dr Louise Chircop (Faculty of Education)
- 16:55 – 17:05** | **The Heart of Education: Understanding and Prioritising Educator Wellbeing**
Dr Amanda Bezzina (Centre for Resilience and Socio-Emotional Health)
- 17:05 – 17:15** | **Exploring Teachers' Perceptions of MOOCs Through the Lens of the Technology Acceptance Model**
Dr Michelle Attard Tonna (Faculty of Education)
- 17:15 – 17:25** | **Classics Through Digital Leisure-Learning**
Dr Carmel Serracino (Faculty of Arts)



Expo Stream 5.1 – 5.8

CHAIR: Prof. Conrad Thake | VENUE: Lecture Room 203

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| 16:05 – 16:15 | From Copy to Original: Unveiling the Medieval Origins of a Byzantine Icon
Prof. Charlene Vella (Faculty of Arts) |
| 16:15 – 16:25 | An Exciting Discovery: Scenery at the Royal Opera House
Prof. Vicki Ann Cremona (School of Performing Arts) |
| 16:25 – 16:35 | Notes from Underground: The Project UndergroundMed
Dr Chiara Cecalupo (Faculty of Arts) |
| 16:35 – 16:45 | Uncovering the Medieval Church of St Anne in Fort St Angelo: Using Ground-Penetrating Radar to Explore its Architectural Evolution
Dr Emanuele Colica (Faculty of Science) |
| 16:45 – 16:55 | The Divergent Fates of Wartime Israeli and Gazan (Palestinian) Cultural Heritage: An Analysis of Heritagisation Processes Affecting GLAMs on Separate Sides of the Israel-Hamas War
Prof. Marc Kosciejew (Faculty of Media and Knowledge Sciences) |
| 16:55 – 17:05 | The Pre-1819 Maltese in Corfu
Prof. Arnold Cassola (Faculty of Arts) |
| 17:05 – 17:15 | Why They Tell Their Stories: Exploring the Motivations Behind Migration Narratives in French and Francophone African Literature and Cinema
Dr Anabel Said (Faculty of Arts) |
| 17:15 – 17:25 | Cecil Satariano's Films: The Archival Challenges
Dr Charles J. Farrugia (Faculty of Media and Knowledge Sciences) |

Expo Stream 6.1 – 6.7

CHAIR: Prof. Colin Calleja | VENUE: Meeting Room 101

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| 16:05 – 16:15 | Preserving Traditional Joinery Through Citizen Science Pedagogy: A Model for Engaged Learning
Prof. Russell Smith (Centre for Entrepreneurship and Business Incubation) |
| 16:15 – 16:25 | How Maltese /r/ Changed Over Time and How Listeners Perceive It
Prof. Holger Mitterer (Faculty of Media and Knowledge Sciences) |
| 16:25 – 16:35 | The Changing Face of the Foreign Language Classroom in Malta
Dr Denise Camenzuli (Faculty of Arts) |
| 16:35 – 16:45 | Digital Autonomous Virtual Educator (DAVE)
Mr Benjamin Joseph Spiteri (Faculty of Information and Communication Technology) |
| 16:45 – 16:55 | The Perceptions of University of Malta Academics on the Dual Career of Student-Athletes
Dr Adele Muscat (Institute of Physical Education and Sport) |



16:55 – 17:05 **Researching Children’s Drawings: Developing a Methodological Tool for Data Analysis**

Dr Josephine Deguara (Faculty of Education)

17:05 – 17:15 **Inclusive Leadership in Maltese Childcare Centres: Strategies, Challenges, and Implications for Equity and Inclusion**

Dr Charmaine Bonello (Faculty of Education)

Expo Stream 7.1 – 7.8

CHAIR: Prof. Rebecca Dalli Gonzi | VENUE: Meeting Room 4

16:05 – 16:15 **Buildings and the Urban Heat Island in Historical Centres in Current and Future Climates: A New Methodology Leading to Wider Use of Thermal Satellite Data for Heritage**

Ing. Elizabeth Muscat Azzopardi (Faculty for the Built Environment)

16:15 – 16:25 **CHerISH Coastal Heritage and Safeguards Against Hazards**

Ms Annukka Köppen (Faculty for the Built Environment)

16:25 – 16:35 **The Conservation of Megalithic Temples of Malta: Understanding the Effects of the Open Sided Protective Shelters**

Ms Rosangela Faieta (Faculty for the Built Environment)

16:35 – 16:45 **Development of Advanced Materials for Restoration of Modern Period Heritage Buildings**

Mr Igor Semenov (Faculty for the Built Environment)

16:45 – 16:55 **Automation of Structural Health Monitoring of Concrete Bridges in Malta Using Computer Vision**

Dr Vijay Prakash (Faculty of Information and Communication Technology)

16:55 – 17:05 **Climate Resilient Mediterranean Cities: The ReMED Framework**

Perit Faye Sciberras (Faculty for the Built Environment)

17:05 – 17:15 **Proposing a Multi-Method Phenomenological Approach Exploring the Perceived Daily Life Experience of People with Dementia in their Dementia Care Environments**

Dr Alexia Mercieca (Faculty for the Built Environment)

17:15 – 17:25 **Exploring the Role of Higher Education Institutions in Driving the Transformation of Urban Open Spaces Towards a Resilient Urban Environment**

Dr Sarah Scheiber (Faculty for the Built Environment)

Expo Stream 8.1 – 8.8

CHAIR: Dr Kenneth Scerri | VENUE: Meeting Room 103

16:05 – 16:15 **Advancing the Design of Smart and Autonomous Engineering Systems Through Artificial Intelligence**

Dr Hani Ahmed (Faculty of Engineering)



16:15 – 16:25	<p>DIVE Project – Data-Driven Intelligent Video Evaluation Dr Vanessa Camilleri (Faculty of Information and Communication Technology)</p>
16:25 – 16:35	<p>Anomaly Detection for Spacecraft Telemetry Data Using Deep Learning Neural Networks Dr Asma Fejjari (Faculty of Information and Communication Technology)</p>
16:35 – 16:45	<p>Minds and Machines – Exploring Language Processing Through Computational Approaches Dr Jessica Nieder (Institute of Linguistics and Language Technology)</p>
16:45 – 16:55	<p>Enhancing Flight Deck Decision Support with Distributed GenAI: A Multi-Agent Approach Dr Jose Pacheco de Almeida Prado (Institute of Aerospace Technologies)</p>
16:55 – 17:05	<p>A Neuro-Symbolic Model for Invoice and Receipt Labelling Prof. Adrian Muscat (Faculty of Information and Communication Technology)</p>
17:05 – 17:15	<p>PQ Dashboard – A Smart Gateway to Malta’s Parliamentary Questions Prof. Joel Azzopardi (Faculty of Information and Communication Technology)</p>
17:15 – 17:25	<p>TADA: An AI-Driven Decision Support Tool for Arrival Management in Complex Airspace Mr Samuel Baldacchino (Institute of Aerospace Technologies)</p>

Expo Stream 9.1 – 9.8

CHAIR: Prof. Alexandra Bonnici | VENUE: Meeting Room 6

16:05 – 16:15	<p>Advancing BrainWeb – A Low-Cost Brain-Native Web Browser Prof. Chris Porter (Faculty of Information and Communication Technology)</p>
16:15 – 16:25	<p>Optimal Electrode Design for Surface Functional Electrical Stimulation Prof. Cristiana Sebu (Faculty of Science)</p>
16:25 – 16:35	<p>Automatic Foci Identification Using Deep Convolutional Neural Networks and Vision Transformers Dr Saeed Ullah (Faculty of Information and Communication Technology)</p>
16:35 – 16:45	<p>Natural Fibres in Composites: A Greener Approach to Fibre Reinforcements Dr Brian Ellul Grech (Faculty of Engineering)</p>
16:45 – 16:55	<p>Sustainable 3D Concrete Printing: Utilising Industrial By-Products and Alkali-Activated Materials for Low-Carbon Construction Mr Loai Al-Mawed (Faculty for the Built Environment)</p>
16:55 – 17:05	<p>X-ray Micro-CT Study of Maltese Globigerina Limestone Porosity Dr Gabriel Strugała (Faculty of Engineering)</p>



17:05 – 17:15 | **Detecting the Cosmic Dawn with REACH**
Prof. Alessio Magro (Institute of Space Sciences and Astronomy)

17:15 – 17:25 | **Graph Domination, Graph Isolation and the Art Gallery Theorem**
Prof. Peter Borg (Faculty of Science)

Expo Stream 10.1 – 10.8

CHAIR: Prof. Luciano Mule'Stagno | **VENUE:** Meeting Room 5

16:05 – 16:15 | **Roof Mounted Photovoltaics Equipped with Phase Change Materials for Improved Roof Energy Performance: A Preliminary Numerical Study**
Prof. Ing. Daniel Micallef (Faculty for the Built Environment)

16:15 – 16:25 | **A Review of Compressed Air Energy Storage for Offshore Wind Farms**
Mr Keith Thomas Borg (Faculty of Engineering)

16:25 – 16:35 | **Empowered Consumer-Side Battery Energy Storage Systems for Enhanced Network Reliability**
Mr Muhammad Hussnain (Faculty of Engineering)

16:35 – 16:45 | **Reducing Emissions with Innovative Marine Power and Propulsion Systems Using Alternative Fuels (RIVIERA)**
Prof. Alexander Micallef (Faculty of Engineering)

16:45 – 16:55 | **The EUROfusion Project – Towards the Realisation of Energy Derived from Nuclear Fusion**
Prof. Ing. Martin Muscat (Faculty of Engineering)

16:55 – 17:05 | **Blade-Resolved Computational Fluid Dynamics Simulations of Two Tandem Wind Turbines**
Mr Karl Zammit (Faculty of Engineering)

17:05 – 17:15 | **Leveraging Manufacturing Capabilities Through the Axiomatic Design Model**
Dr Edward Abela (Faculty of Engineering)

17:15 – 17:25 | **Surface Engineering of Wire Arc Additively Manufactured AZ80 Magnesium Alloy**
Mr Danjel Grima (Faculty of Engineering)

Expo Stream 11.1 – 11.8

CHAIR: Dr Marie-Louise Mangion | **VENUE:** Lecture Room 202

16:05 – 16:15 | **The Relationship Between Entrepreneurs' Dark and Light Triad Traits, Coping Strategies, and Psychological Wellbeing**
Prof. Leonie Baldacchino (The Edward de Bono Institute for Creative Thinking and Innovation)

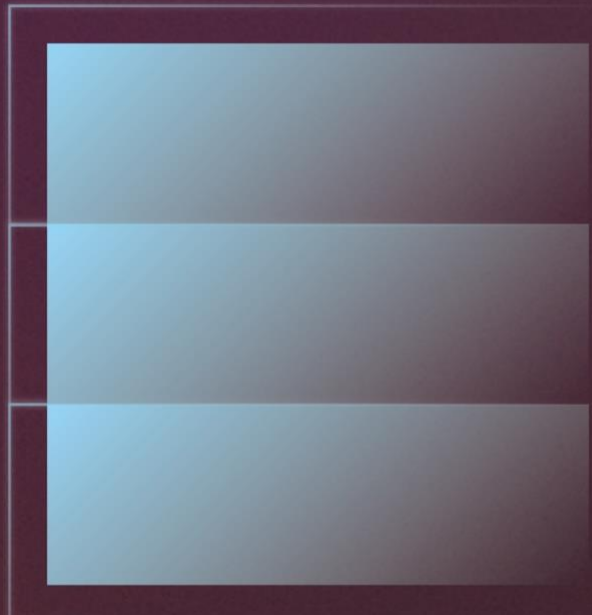
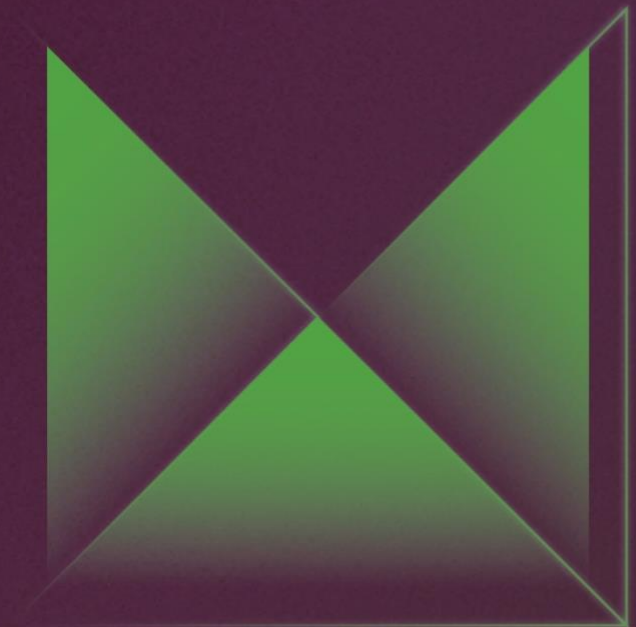
16:15 – 16:25 | **The Interplay of Technological Cooperation and Competition: Insights from Evolutionary Dynamics and Complexity Theory**
Prof. Tanya Sammut Bonnici (Faculty of Economics, Management and Accountancy)



16:45 – 16:55	Exploring Self-Regulation in Human-AI Collaborative Creativity: Implications for Education and Practice Prof. Margaret Mangion (The Edward de Bono Institute for Creative Thinking and Innovation)
16:25 – 16:35	Learning About Individual Foreign Investment in the EU Prof. Hoang Nguyen (Faculty of Economics, Management and Accountancy)
16:35 – 16:45	Beyond Pandemics: Improving Climate Resilience and Health Systems in Small Island States Prof. Stefano Moncada (Islands and Small States Institute)
16:55 – 17:05	The Next Chapter for Academic Libraries as Catalysts of Knowledge Prof. Sandra M. Dingli (The Edward de Bono Institute for Creative Thinking and Innovation)
17:05 – 17:15	Religion and Cognitive Resilience: A Pathway to Wellbeing Prof. John Berry (Faculty of Theology)
17:15 – 17:25	Sense Action: The Role of the Sensorial Body in Sustainable Urban Planning Dr Paula Guzzanti (School of Performing Arts)
17:25 – 17:30	CONCLUSION Prof. Ing. Simon G. Fabri (Pro-Rector for Research and Knowledge Transfer)

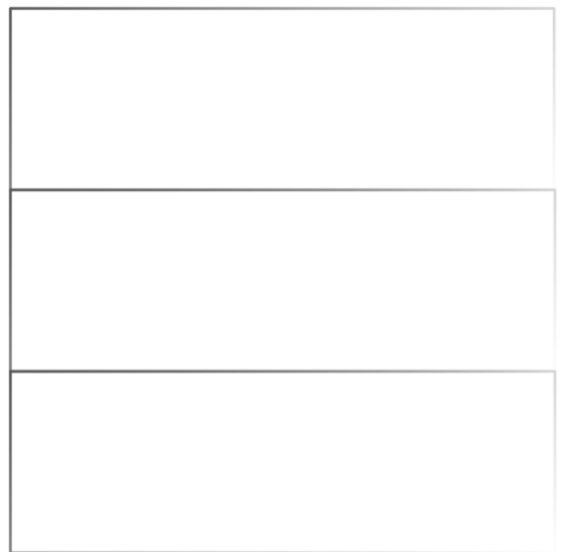
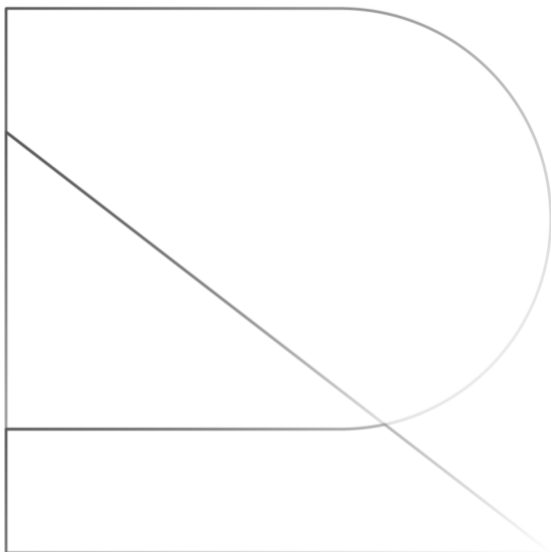
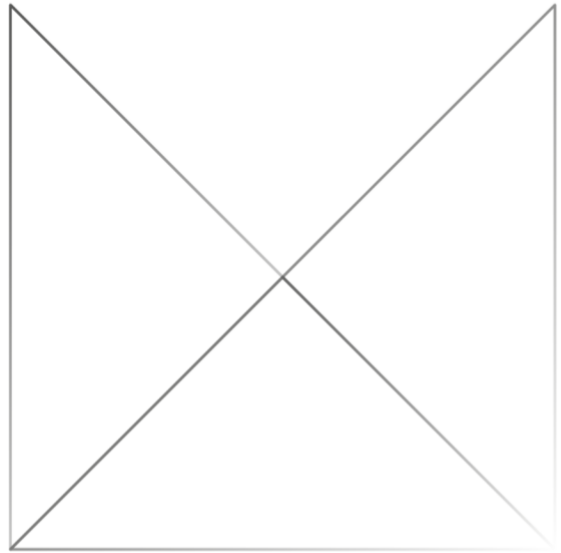
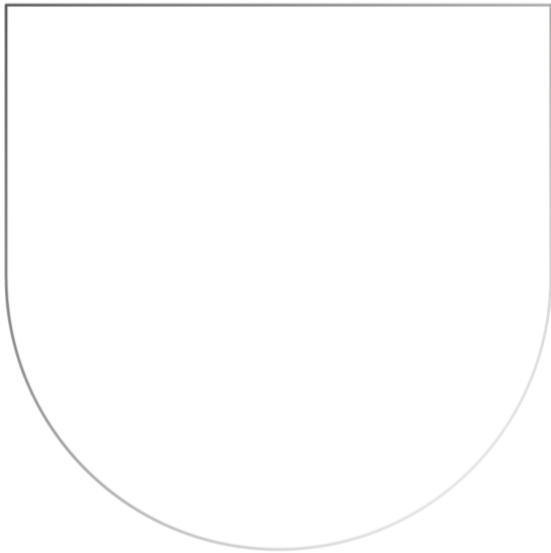


ABSTRACTS



Plenary Session

CHAIR: Prof. Ing. Simon G. Fabri | VENUE: Aula Magna



The Affordances Made Available Through Preti's St Paul Conquering the Moors: A Pedagogical Model for Interacting with Cultural Artefacts

Prof. Adrian-Mario Gellel

Department of Early Childhood and Primary Education, Faculty of Education

All knowledge and perception are mediated through the community and through the environment. The notion of affordances (Gibson, 1979) may prove to be particularly helpful in education. Affordances are what the environment offers to the individual, implying complementarity between the environment and the individual. Yet, the perception of the affordances by the individual is not automatic. The individual will only perceive those affordances that "are meaningful, unitary, utilitarian and continuous over time" (Gibson, 1982, 559). In most instances, the theory has been used to investigate and discuss the physical affordances offered by an object or the environment. However, given that that any object or environment is human adapted and impressed with layers of meaning, it is argued that, if provided the tools to also perceive cultural and social affordances (Costall, 1995; Rietveld & Kiverstein, 2014), the student will be able to engage in deeper learning. While admittedly, this understanding of affordances is not common, it allows for a richer utilisation of the concept in pedagogy, that goes beyond temporal and spatial limitations, providing better tools for critical thinking, imagination and transfer of learning.

The paper aims to make a case for a wider understanding of affordance in pedagogy through the example of Mattia Preti's depiction of St. Paul conquering the Moors, that hangs on the walls of the Mdina Cathedral. This is done by bringing to the fore the visual symbols, narratives and meanings offered by artefacts and narratives, thus setting the foundations for a symbol literacy pedagogy.

A Consensus Blood Transcriptomic Framework to Advance Precision Medicine in Sepsis

Dr Brendon Scicluna

Department of Applied Biomedical Science, Faculty of Health Sciences

Sepsis is a life-threatening medical condition resulting from a maladaptive host response to infection, which causes organ dysfunction and failure. In order to establish a standardised blood transcriptomic subtype model, and to aid in its clinical application, we have assembled an international team of research groups who have contributed significantly to precision phenotyping in sepsis. This consortium is focused on sharing large-scale data, analytics and classification strategies to the aim of resolving heterogeneity in sepsis. Through the aggregation and network analysis of bulk and single-cell blood transcriptomics, and plasma proteomics data from two extensive sepsis patient cohorts (n=1122), we demonstrate a strong interconnection across three separate classification methods, resulting in the identification of three Consensus Transcriptomic Subtypes (CTSs). The distinguishing characteristics of CTS1 include typical inflammatory pathways, including IL-6 signalling, more pronounced endothelial activation, and an overall immature neutrophil theme. CTS2 was characterised by a heme metabolism pathway, WNT/ β -Catenin signalling, fibrinolytic disturbances and a platelet signature. CTS3 was associated with allograft rejection, interferon signalling, DNA repair pathways and anticoagulation functions, together with overarching lymphocyte features. To enhance the use of the CTS classification strategy, we developed a gene expression classifier employing a random forest machine-learning method. Testing the CTS classification method in an independent cohort of patients enrolled in a previously conducted clinical trial for the treatment of septic shock ascertained the robustness of our approach. Analysis of a pseudo-randomised cohort using propensity score matching testing the effect of corticosteroid treatment on 28-day mortality



across CTSs, unmasked a harmful signal in patients assigned to CTS1 and treated with corticosteroids. The CTS classification method aligns diverse previously reported sepsis transcriptomic subgroupings into a single classifier that is robust and reproducible, enabling biological interpretation with potential clinical implications and advancing a precision medicine approach to sepsis.

Too Much or Too Little But Never Enough: Informational Blind Spots in Preventing and Investigating Child Trafficking for Sexual Exploitation

Dr Aitana Radu

Department of Information Policy and Governance, Faculty of Media and Knowledge Sciences

Child trafficking is one of the hardest crimes to prevent, investigate and prosecute, even more so than the online sexual exploitation of children or other related crimes. Part of the difficulties reside in the way national legal framework tackle the 'trafficking' dimension, but mainly the problem resides in the manner in which the crime is committed and the negative impact it has on the victims.

Digital technology facilitates human trafficking across all stages, from recruitment to exploitation making it very difficult for practitioners to take efficient countermeasures. The presentation builds on the findings of the EU-funded project DISRUPT, by exploring informational gaps in the prevention, investigation & prosecution of child trafficking and how these can be addressed through a combination of technology, law and better policy-making.

Building on a number of interviews and focus groups with Maltese stakeholders the presentation will also describe some of the vulnerabilities faced by Maltese society to child trafficking and examples of how these are/can be exploited by criminals.

NotaryPedia: Advancing AI for Knowledge Management in Historical Notarial Archives

Dr Charlie Abela | Co-researchers: Dr Joan Abela, Ms Charlene Ellul

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The NotaryPedia Knowledge Management Platform is an ambitious collaboration between the University of Malta and the Notarial Archives Foundation and is funded by the Ministry for the National Heritage, the Arts, and Local Government. This project bridges Artificial Intelligence and the Humanities to unlock over 20,000 notarial manuscripts, spanning centuries and written in Latin, Italian, and vernacular languages. These documents provide a unique lens into Malta's legal, social, and cultural heritage but present challenges such as linguistic complexity, handwriting variability, and a lack of standardised frameworks for organising knowledge.

The research addresses critical challenges in digitising and analysing these historical archives. Key efforts include the development of an automatic transcription system, capable of overcoming the complexities of scribal styles, linguistic inconsistencies, and document degradation to produce accurate textual representations. Advanced transformer-based models and Large Language Models will be employed to perform knowledge extraction, addressing the linguistic and contextual intricacies of multilingual texts and code-switching. The work on knowledge representation involves the design and implementation of the NotaryPedia ontology, comprehensive catalogue, and specialised vocabularies for critical domains such as conservation, disinfestation, and manuscript movement, creating a standardised semantic layer



for integrating notarial records. Additionally, knowledge completion will explore graph representation learning, knowledge graph embeddings, and a continuous learning mechanism to dynamically refine the Knowledge Graph as new data becomes available.

This platform highlights the transformative role of AI in digital humanities, enabling unprecedented access to historical archives and fostering global innovation in the study and preservation of cultural heritage.

A Comparative Discourse Analysis of Online Reactions to Environmental Issues in Maltese, French and German Media

Dr Anne-Marie Bezzina Busuttil

Department of French, Faculty of Arts

This study will evaluate whether the mentality portrayed by Maltese, French and German members of the public expressing their opinion on environmental issues on online media as a reaction to ecology-related journalistic articles can be said to pertain to local or universal knowledge in each of the three contexts. The criteria for the discourse analysis conducted within the framework of this study will be an analysis of the argumentative structures, the lexical and syntactic choices and the style. The interrelation between the texts that will be studied in the different contexts will be gauged. The jargon used will be analysed since “environment words” may reveal an ecological agenda, connoting viewpoints and expressing arguments and beliefs, which will be gauged against the eco-sophy or the normative ecological philosophy (Naess 1995a, Stibbe 2021, Viridis, 2022) that the authors adhere to. Using Stibbe’s (2021) terminology, discourses about nature will be categorised as being beneficial (totally and truly in favour of protecting the environment), ambivalent (only partially encouraging people to protect the planet), or destructive (encouraging exploitation and destruction of nature). The descriptions obtained will help to draw a portrait of the mentality of the Maltese, French and German readers about pressing environmental challenges and to understand whether sustainable development is truly a concern in the minds of the readers. This would possibly contribute to understanding the need to change the ways of thinking and the ways of life of a society as may be necessary, upholding the values of the wellbeing of all.

The Invention of Music History

Dr Jeremy Coleman

School of Performing Arts

This oral presentation gives a brief summary of my current monograph project for which research was undertaken in Brussels and in Vienna during a recent sabbatical (in 2024). As I shall explain in the presentation, my study examines the emergence of a modern understanding, and experience, of music history in Western Europe c. 1770 to 1848. What distinguishes my approach from previous studies on the topic is that it seeks to bring together music historiography (i.e. music-history surveys in narrative prose) and historical performance practice (i.e. the practical revival of music of the distant past) to examine the manifold relationships between them and the ways in which they combined to instil a consciousness of the musical past that was itself – somewhat paradoxically – one of the most experimental and most progressive features of the musical culture of the time. Ultimately, this study offers at once a ‘metahistory’ of music



(adopting Hayden White's infamous term) focused on music-history writing around the turn of the nineteenth century, and a critical interpretation of the performance practices that contributed to a historical consciousness of music – practices that existed alongside, and sometimes in tension with, historical surveys presented in literary form.



Keynote Address

Mental Health in Academia: Toward a More Sustainable Future

Prof. Stefan Mol

Assistant Professor in Organisational Behaviour and Research Methods at the Amsterdam Business School, University of Amsterdam

With what has been dubbed 'the mental health crisis in academia', and mounting evidence that mental health issues such as depression and burnout are more prevalent amongst academics than in the general population (with PhD candidates and postdocs most affected), it is time for the research community to introspect and to break the silence around researcher psychological wellbeing and ill-being. In his keynote address, Stefan Mol will talk about the state of mental health in academia, introduce a number of manifestos he collaborated on, and present the initial outcomes of the Sustainable Working Conditions in Academia Survey (STAIRCASE). This was the result of the Researcher Mental Health Observatory (ReMO) Cost Action project, focused on creating the largest ever European Benchmark of the contextual antecedents of Mental Health across more than 30 countries. In addition, some training opportunities that early career researchers may benefit from in nourishing and sustaining their own mental health, will be introduced.

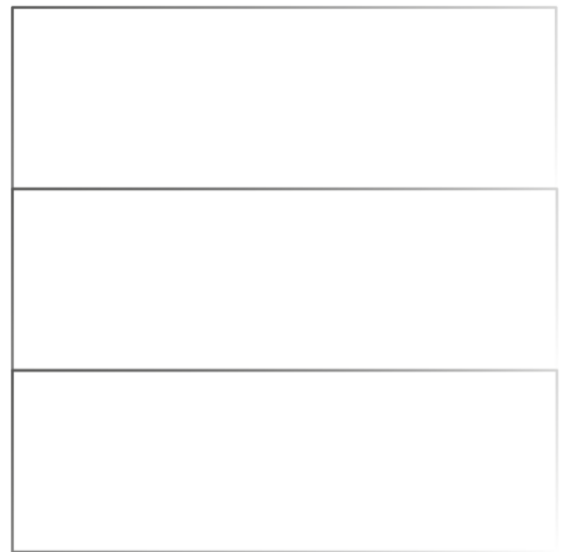
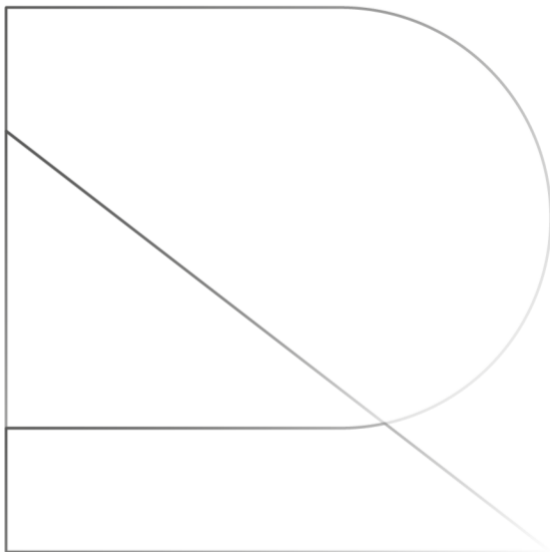
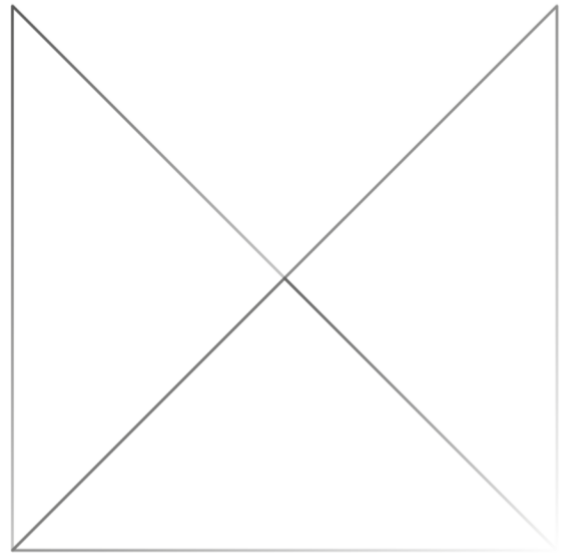
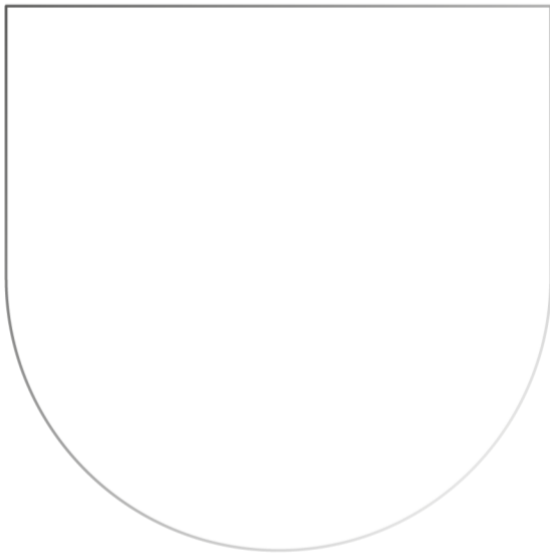
Bionote

Stefan T. Mol is an Assistant Professor in Organisational Behaviour and Research Methods at the Amsterdam Business School of the University of Amsterdam and co-founder and chair of the Scilink foundation, a non-profit organisation focused on researcher transversal skills training. He received his Master's degree in Psychology from the University of Amsterdam in 2000, and was awarded a PhD in Psychology in 2007 from the Institute of Psychology of the Erasmus University Rotterdam. Stefan has (co-)authored over 25 peer-reviewed articles and book chapters on topics such as career shocks, refugee integration, learning analytics, text mining, recommendation of open educational resources, person-environment fit, and researcher mental health. In addition, Stefan is involved in a number of EU-funded projects focused on researcher mental health and on optimising the match between individual, education, and the labour market.



Parallel Sessions 1

Presentations – Doctoral Candidates



Doctoral Stream 1.1 – 1.5

CHAIR: Prof. Leonie Baldacchino | VENUE: Aula Prima



Senior Entrepreneurship: Late Call or New Beginning?

Mr Sandro Pinto Sant Anna

The Edward de Bono Institute for Creative Thinking and Innovation

The importance of senior entrepreneurship is attracting increasing attention from scholars and policymakers. This trend is driven by several factors, including longer life expectancy, reduced retirement pensions, and enhanced wellbeing in older age, which allow individuals to stay active in the workplace until later in life. While some studies have explored senior entrepreneurship, the field remains underdeveloped with several gaps yet to be addressed. One such gap concerns the intentions and motivations of senior entrepreneurs, which are plausibly different from those of younger entrepreneurs, but which are not yet adequately understood. This study addresses this gap by exploring the motivations and intentions underlying older individuals' decisions to pursue senior entrepreneurship. This study developed an initial theoretical framework from which an empirical qualitative study was launched. The fieldwork involved 28 interviewees (14 senior and 14 younger entrepreneurs for comparison), on the basis of which the research proposes a final refined conceptual framework. Four themes were identified: (i) 'Autonomy and Aspirations'; (ii) 'EI and Trigger Events'; (iii) 'Hierarchy of Constructs'; and (iv) 'Entrepreneurship as "Therapy"'. The study contributes to the senior entrepreneurship literature by proposing, empirically testing, and refining a comprehensive model of intentions and motivation. In so doing, it reveals insights into the complex journeys of senior individuals who decide to become entrepreneurs by shedding light on the different roles played by motivations and intentions and how they relate to one another in the senior entrepreneurial journey.

Employee Sensemaking During Organisational Innovation Adoption

Mr Oliver Saliba

The Edward de Bono Institute for Creative Thinking and Innovation

This research explores the role of employee sensemaking in organisational innovation adoption, addressing the research question: What are the key stages and processes of sensemaking during innovation adoption? Using a critical realist approach, two studies were conducted to confirm and extend a theoretical model created by the author which integrates sensemaking and innovation implementation. The first, a qualitative case study, examined employee sensemaking, leadership sense giving and peer interactions during a process innovation in a medium-sized Maltese mental health organisation. This study confirmed the model's relevance, highlighting how trust, communication, and framing shape sensemaking processes across the innovation adoption lifecycle.

The second study employed a mixed-methods survey to test the model on a broader scale, while also investigating relationships between personality traits, organisational factors, and employee sensemaking. The analysis of the second study is ongoing; however, preliminary analysis suggests that some personality traits and organisational variables might have a relationship to how employees make sense of an innovation.

The research aims to provide actionable insights into the cognitive and social processes that drive employee engagement and inform strategies for effective organisational change management. To advance understanding of the interplay between individual and organisational factors in fostering innovation adoption, and to propose practical recommendations for managing change effectively, contributing to interdisciplinary discussions and offering guidance for organisations navigating complex innovation processes.



Individual and Community Growing Your Own Food Programmes: Motivations, Challenges and Strategies

Ms Cynthia Caruana

Centre for Environmental Education and Research

On a global level, food systems need to be urgently transformed so that more people may have regular access to healthy, clean and fair food while at the same time reducing the direct and indirect costs to health and the environment. An emerging trend which may partly solve this dilemma is to grow one's own food.

There are various benefits when growing your own food including physical and mental health benefits, food production reconnection with consumers in urbanised areas, attainment of gardening skills, increased self-sufficiency in food production especially in times of a pandemic as well as improved social interactions in group settings. Data is however currently lacking for the number of people engaging in home-growing activities.

The aim of this research was to find out what are the motivations and challenges that might be encountered when growing one's own food as well as the opportunities and strategies that may be available to address these challenges. Furthermore, the role of Education for Sustainable Development (ESD) in supporting people and communities was investigated in this regard.

Survey Research was first carried out to gain background information, followed by semi-structured interviews with a smaller sample of participants for both individual and community gardeners. Following analysis of the data, a training programme based on ESD practices was piloted in different settings. The participants filled out a pre- and post-training survey. Narrative analysis was carried out on a journal that was compiled by the participants. Data was also obtained from semi-structured interviews on the gardening site to monitor the implementation process and outcome of the training programme.

Interest in growing food activities is high but individuals tend to stop growing when faced with obstacles such as poor growth and lack of resources and mentoring from an experienced grower. At a community level, where there is a structure and information readily available growing food is much more successful. Food production from these activities may be low and comprise no additional economic value to the individual but the sense of empowerment outweighs other disadvantages. Health reasons have more impact on the motivation as opposed to environmental concerns.

The training programme emerging from this research has a long-lasting positive effect as it can be utilised by other community members. Furthermore, the importance of a network that was established through this research may increase food growing activities that will effectively enable the state to reach health and environmental targets.

Valuing Ecosystem-Based Fisheries Management in Malta: A Discrete Choice Experiment to Elicit Preferences and Willingness to Pay

Mr Gilmour Camilleri

Department of Economics, Faculty of Economics, Management and Accountancy

Ecosystem-based fisheries management (EBFM) is widely recognised as a promising solution for mitigating anthropogenic pressures on marine ecosystems. Its effective implementation depends on whether people attribute a value to the kind of practices it espouses. However, quantifying the economic value of EBFM is challenging, partly due



to contested definitions of EBFM and partly due to the absence of market prices for many of its elements.

This study aims to quantify the economic value of EBFM in Malta by identifying and evaluating four key EBFM attributes, namely: (i) sustainable harvesting, (ii) reduced impact on other marine life, (iii) adherence to climate goals, and (iv) inclusive management. Using a discrete choice experiment (DCE) replicating real-life shopping scenarios, respondents are presented with a common fish species (dolphinfish) sold in Malta carrying different labels corresponding to key EBFM attributes. Participants are asked to evaluate nine choice cards, each offering three fish options with varying combinations of EBFM attributes and associated prices and select their preferred option.

With a representative sample of data of over 500 Maltese respondents, the study finds that four out of five participants are willing to pay a premium for fish which carried one or more labels. They demonstrated a marginal willingness to pay (WTP) premium ranging between €0.44 and €1.32 for fish carrying EBFM labels compared to unlabelled alternatives. This study represents one of the few applications of a DCE to evaluate EBFM and the first in the Mediterranean context of Malta, providing critical insights for fisheries managers and policymakers.

Retargeted Advertisements and FOMO: Shaping Young People's Attitudes and Behaviour

Dr Ivan De Battista

Department of Marketing, Faculty of Economics, Management and Accountancy

The ubiquitous use of the Internet, social networking sites, and smartphones amongst young people parallels the significant advancements in programmatic advertising, particularly retargeted advertisements. These advertisements target individuals who have previously interacted with certain products on a website to influence them. This study investigates the influence of retargeted advertisements on young people by employing the Advertising Value Model and the Theory of Planned Behaviour while incorporating the concept of Fear of Missing Out (FOMO) as a marketing appeal.

A systematic literature review identified six key factors influencing young people's attitudes towards online advertising: entertainment, informativeness, irritation, credibility, personalisation, and interactivity. Two focus groups explored four FOMO-driven marketing constructs: scarcity, urgency, social proof, and loss aversion. Data were then collected from 480 Maltese respondents aged between 13 and 24 using a self-administered questionnaire. Partial Least Squares Structural Equation Modelling (PLS-SEM), including multi-group analysis, was employed for evaluation.

The findings revealed that entertainment and interactivity strongly influenced values and attitudes, whereas informativeness, personalisation, and credibility positively affected advertising value. Advertising value fully mediated these relationships. Conversely, irritation negatively influenced attitudes, with men more affected than women. FOMO significantly impacted attitudes, subjective norms, and intentions to click on advertisements, with men being more susceptible to FOMO-driven intentions. Women, particularly minors, were more affected by attitude.

This study offers valuable academic, practical, and social insights. It advocates for engaging, personalised, and non-annoying advertisements to effectively shape young people's attitudes. It highlights the need for responsible advertising strategies and provides various avenues for future research.



Doctoral Stream 2.1 – 2.5

CHAIR: Prof. Joanne Cassar | VENUE: Meeting Room 101



Mirror Mirror on the Wall: The Effects of Virtual Reality Exposure Therapy on Body Image and Occupational Performance in People Experiencing Body Image Disturbances

Ms Stacy Debono

Department of Mental Health, Faculty of Health Sciences

Body image disturbances impact the perceptions, emotions, thoughts, behaviours towards the body, and engagement in daily activities of people experiencing eating disorders. The participatory, mixed-methods study aims to utilise co-designed treatment through Virtual Reality (VR) and Artificial Intelligence in health care. Similarities and differences will also be explored between the traditional Mirror Exposure Therapy (MET) and the co-designed VR body exposure therapy in view of body image and occupational performance. Participants shall be between 13 and 30 years of age who experience body image disturbances. The study will include a research advisory group (RAG) to test and discuss the developed VR body exposure therapy software. This shall include AI to create a representation of each participant, detect gaze, movement and heart rate through a VR headset with eye trackers, hand controllers and a smartwatch, respectively. Baseline and outcome measures will be piloted in Maltese and English for validity and reliability to the Maltese population. This will lead to 3 MET sessions with people in the control group and VR Body Exposure Therapy with participants in the experimental group. The baseline and outcome measures will be utilised in the first and last session of exposure therapy. Lastly, focus groups will be conducted by the RAG with participants from the control and experimental groups to highlight positive and negative experiences, as well as suggestions pertinent to both therapies. Qualitative data will be analysed thematically while quantitative data will be utilised for statistical analysis. The study can be of value to the general public, people with experiences of body image disturbances, healthcare professionals and academia.

Why and How Are Maltese Adult Women with ADHD Seeking Empowerment?

Ms Sarah Cilia Vincenti

Department of Counselling, Faculty for Social Wellbeing

Under-recognition of female ADHD has significant public health repercussions. The University of Malta partnered with ADHD Malta to empower local women with ADHD through photovoice. The study is banking on public exhibition of photographs taken by participants to sensitise society to community concerns. Academic and community partners met in July 2024 to agree on a set of themes to guide picture-taking fieldwork.

This presentation reports findings from this first research phase. Inductive analysis of focus group interview data determined what this community wants society to know. Moreover, an indication of participants' empowerment level at baseline was required to allow the longitudinal study to chart its emancipatory trajectory. Accordingly, the data set was analysed deductively using theoretical categories inspired by Freirean consciousness-raising stages.

Vernacular storyline at project launching revolved around the kairotic potential of an ADHD diagnosis. Two broad themes, each relating temporally to diagnosis, were constructed as key messages: (1) "We are still existing—layer upon layer of invalidation" and (2) "Drawing a line—setting limits to better our lives.". Moreover, community voice was already imbued with critical awakenings, although introjected ableist values persevered. Earlier ADHD recognition in girls may arrest the development of maladaptations to invalidation trauma and emerged as a policy change priority.

Presently, social media is inundated with an information cacophony surrounding this topic. Despite this being a consequence of historical epistemic injustice, it is nevertheless disconcerting. Thus, findings from this academic



community partnership should interest those intrigued or alarmed by this emerging phenomenon.

Motherhood Penalty? Using Data Diffraction to Analyse Findings from a Mixed Method Research Study

Ms Vania Tabone

Department of Gender and Sexuality, Faculty for Social Wellbeing

Aims: The objective of this research study is to find out whether there exist any junctures that prove to be detrimental to the University of Malta staff being academic, managerial, administrative, technical and industrial, specifically to those who partake family-friendly measures. These may be the root cause to the motherhood penalty that many women in many organisations are confronting on becoming mothers.

Methods: This research study will adopt a triangulation mixed method approach which is debated by many but offers solutions when gaps in information presented by one method may be addressed by the other. The triangulation research method involves textual analysis which will be able to construct both a survey and an interview guide. Quantitative data will give percentages while the qualitative will give interpretations. All the findings from the three methods will be entangled and analysed through data diffraction. We assume that mixed methods in this research is possible and although they produce “cuts” that may not always cohere, can be successfully explained and analysed through diffraction. This is because “diffraction pays attention to the ways in which data produced through different methods can both splinter and interrupt the object of study. As such, it provides an explicit way of empirically capturing the mess and complexity intrinsic to the ontology of the social entity being studied” (Uprichard & Dawney, 2019, p.19).

Results: Data diffraction will be able to respond to the details and specifications of the relations and importance within their difference. While the metaphor of reflection reflects on the sameness of texts, diffraction illustrates the patterns of difference.

Conclusions: It is important to keep in mind that when the research conclusions depend only upon the researchers' point of view, it raises questions about biases of the researchers' themselves.

Intersecting Identities in the Heat of the Kitchen: An Ethnographic Study of Diversity, Microaggressions and Resilience in Commercial Kitchens

Ms Carmenrita Bugeja

Department of Tourism Management, Faculty of Economics, Management and Accountancy

The focus of this paper is the diversity and intersectionality in commercial kitchens, drawing on ethnographic research to explore the lived experiences of workers in these high-pressure environments. Grounded in the theoretical frameworks of intersectionality (Crenshaw, 1991) and workplace diversity, the research investigates how race, nationality, gender, and religion intersect to shape labour hierarchies, social dynamics, and experiences of inclusion or exclusion. Through participant observation and in-depth interviews, the study interrogates how workplace microaggressions and systemic inequities manifest in daily interactions, contributing to the marginalisation of workers with intersecting minority identities (Nadal et al., 2014; Ghumman et al., 2013).

The study situates commercial kitchens as critical sites where power dynamics and structural and systemic inequities



are both reproduced and resisted. It explores how labour hierarchies are informed by nationality (Portes & Zhou, 1993), how gendered expectations perpetuate exclusionary practices (Lewis et al., 2013), and how religious practices are often dismissed or inadequately accommodated (Ghumman et al., 2013). These intersectional dynamics contribute to unique vulnerabilities, while simultaneously creating opportunities for acts of resilience, solidarity, and resistance among marginalised workers (Martin, Y.C. 2010).

By centring the voices and experiences of kitchen workers, this ethnographic study contributes to a growing body of literature on workplace diversity and intersectionality, providing critical insights into how systemic inequities can be addressed to foster more inclusive and equitable work environments.

Using Images to Stimulate Narrative Reasoning in Children

Ms Amanda Maria Morales

Department of Early Childhood and Primary Education, Faculty of Education

It is through engagement with cultural discourse, verbal or otherwise, that we are able to develop and re-negotiate our identity of 'self' and shape our reality. This is also true for children, who are inevitably caught in the web of images, expressions, rituals, and narratives developed over the millennia to make sense of reality (Hengl & Sluneko, 2006). Our dependence on images and language to make meaning of reality has become more accentuated by the media. Bombarded by a torrent of discourse and imagery, our sensemaking skills have had to adapt to keep up with these two intertwining symbol systems (Snow, 1992).

With the intent of gaining insight on the way children weave meaning from images, this study proposes a method that employs a collage of stereotypical images from fairy-tales and mythology. This methodology, framed by Bruner's theory of narrative thought (1996, 2006), proposes to investigate how children may interact, assimilate and weave the collective's cultural memory (Assmann, 2011). This leads to a closer review of how images are used to construct or challenge canonicity (Bruner, 1996), and how violation of canonicity contributes to the regeneration of socio-cultural repertoires of meaning. These reflections aim to uncover the mechanism that children use when tapping upon cultural repertoires in their own process of meaning making.



Doctoral Stream 3.1 – 3.5

CHAIR: Prof. Andrew Azzopardi | VENUE: Meeting Room 2



To Enhance Spirituality and Spiritual Care in the Care of the Older Adults in Rehabilitation Hospitals Using the Appreciative Inquiry (AI) Approach

Mr Godfrey Cutajar

Department of Nursing, Faculty of Health Sciences

Background: International research demonstrates that spirituality and spiritual care are important aspects of patient-centred care. For older persons in rehabilitation care, patient-centred care addresses not only the physical recovery but also emotional, psychological, and existential needs which help the patient endow the ability to accept their new way of being and explore life's new meaning and purpose in their new life situation.

Aim: The study is part of a larger study in progress. Hence, this scoping review aims to analyse existing knowledge of evidence-based literature, identify gaps, and provide a better understanding of the spiritual and religious needs, interventions, and outcomes of older adults in rehabilitation hospital settings to enhance patient-centred care.

Design: A scoping review using the PRISMA-ScR checklist.

Method: Searches in the databases Ageline, CINAHL, MEDLINE, PubMed, Scopus, Web of Science, QAR@UM, and SIGLE were conducted for papers spanning January 2001 to September 2024.

Results: Forty-five quantitative, qualitative, and mixed methods studies from 18 countries were included for review. Using thematic analysis, four themes emerged: namely; Spiritual care in person-centred care, Spiritual care competencies, Barriers in spiritual care, and Sustainability of spiritual care in hospitals.

Conclusions: Spirituality plays a crucial role for hospitalised older adults. Addressing patients' spiritual needs is essential for effective healing, as it encompasses both the body and the spirit. Engaging with the deeper aspects of a person's identity, meaning, and values can significantly influence their motivation to recover and cope with the challenges of rehabilitation in a hospital setting. Furthermore, healthcare workers should incorporate spiritual care into the patient's therapeutic plans.

Doing What is Right: Exploring Processes of Ethicalisation of Social Workers

Ms Maria Mangion

Department of Social Policy and Social Work, Faculty for Social Wellbeing

The study explores how social workers employed in Child Protection, Mental Health, Migration, Gender Based Violence and Domestic Violence develop the ethical component in their practice, a process also known as ethicalisation. This process is influenced by different features of the social work context that include the code of ethics and organisational practices such as the ethical climate, amongst others (Hugass, 2010; Romani & Szkudlarek, 2014; Banks 2016).

To explore the processes of ethicalisation a mixed methods approach was adopted. The ethical climate of the local social work organisations was explored through the CEVM-Short Version by DeBode et al. (2013). The development of the local code of ethics was also incorporated given its significance to ethicalisation. This was done through face-to-face retrospective elite interviews with past chairs of the Social Work Profession board. Social workers' individual ethicalisation processes were also explored retrospectively through face-to-face interviews that focused on how their ethical practice evolved, identifying milestones that impacted this development and reflecting on resources that support this component throughout their career.

The research concludes that ethicalisation is influenced by work experiences, life experiences, leadership, supervision and features of the context such as legislation and organisational procedures. This calls for ethically consistent practice



by social workers and management alike. The study ends with client and worker-centred recommendations aimed at strengthening the ethical component in the individual social worker and the profession. The study also recommends its replication within other social work fields whose processes may differ from those explored in this research.

Community, Safe Spaces and Activism in Malta: Narratives from Moviment Graffiti

Ms Julia Alegre Mouslim

Department of Education Studies, Faculty of Education

This presentation delves into the experiences of three activists within Moviment Graffiti, the left-wing NGO fighting against the oppression and exploitation of people, the environment, and animals. The first narrative focuses on finding a home in feminist activism, the second one delves into protest music, and the last one explores the intimate moments in queer safe spaces.

From these narratives, at least two reflections emerged, that is, a critical discussion on organisational struggles and an emphasis on solidarity in activism. Firstly, these narratives give way to critical questions regarding the relation between organisation and community: how can an organisation balance intimacy and efficiency? How can one prevent activist burnout? And how can a community hold space for negative experiences amongst its members? At the same time, these lived experiences emphasise the importance of intimate and situated solidarities in activism.

In short, through narrative storytelling, feminist theory, and lived experiences, this presentation reflects on the relation between organisation and community and shows how the creation of activist and intimate spaces can strengthen one's commitment towards one's fellow activists and towards a radical vision of solidarity and justice.

The Performance of Neurotypical Maltese Bilingual Adults on the Maltese – English Aphasia Assessment

Ms Lorraine Vassallo

Department of Human Communication Sciences and Disorders, Faculty of Health Sciences

Translated and adapted from the Brisbane Evidence-Based Language Test (B-EBLT), (Rohde et al, 2020), the Maltese – English Aphasia Assessment (MEAA) tool for the assessment of Maltese bilinguals with stroke, aims to be a psychometrically robust and linguistically and culturally equivalent (Maltese/English) instrument. The research project is divided into three phases: (1) the translation/adaptation phase (2) the pilot and neurotypical studies (3) the main study with bilinguals with stroke without aphasia (BPwS) and bilinguals with post-stroke aphasia (BPwSA). This presentation will focus on the MEAA performance of neurologically healthy individuals. MEAA's 49 tasks are divided into 5 subtests: Perceptual, Auditory Comprehension, Verbal Expression, Reading and Writing. Neurotypical study data establishes typical performance for healthy bilinguals and contributes additional information on linguistic and cultural equivalence previously gathered in phase one and the pilot study. Preliminary analysis of the ongoing neurotypical study indicates that neurologically healthy participants scored significantly higher in English on Verbal Expression, Writing and the total MEAA score (p -values ≤ 0.05). Together with the effects (if any) of the demographic variables of age, gender, years of education, and locality, the correlations between language proficiency and daily language use (dominance) on the MEAA performance will be investigated.



Ecologically Valid Face Identity Processing: Combining Behavioural Performance and Neural Markers

Ms Tram Nguyen

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

Previous research highlights a wide range of individual differences in face identity processing (FIP) abilities, spanning from prosopagnosic patients (Rossion, 2018) to Super-Recognisers (Ramon, 2021). Yet, so far, individuals' position on the FIP ability continuum has been determined solely based on behavioural measures. Given well established differences in behavioural test sensitivity, responsible for at best modest correlations between different FIP performance measures (Bobak et al., 2023), this purely behavioural approach to ability assessment is suboptimal.

In this study, we aimed to identify objective neural correlates of FIP ability differences in a sample of neurotypical observers with average-range FIP abilities. Inspired by the FPVS oddball paradigm (Rossion et al., 2020), which successfully captures automatic object and face categorisation and discrimination (i.e., perception), we introduced a novel adaptation to probe identity discrimination and recognition (i.e., memory) using mugshots and CCTV images as ecologically valid stimuli.

First, we identified frequency-tagged neural responses to oddball identity indexing perceptual discrimination as well as recognition. Second, and critically, in all conditions, these neural responses correlated strongly and positively with behavioural FIP performance. Finally, background neural activities within the alpha/early beta band (11-18 Hz) strongly and positively correlated with FIP ability across all experimental conditions. This novel finding warrants further investigation into how background neural activities might contribute to individual FIP.

These preliminary findings demonstrate the potential of FPVS-EEG to investigate individual differences in implicit face discrimination and recognition. Given the potential implications for cognitive neuroscience and applications in forensics, we will extend our analyses to include data from Super-Recognisers and developmental prosopagnosics.



Doctoral Stream 4.1 – 4.5

CHAIR: Prof. Joseph M. Cacciottolo | VENUE: Meeting Room 6



Investigating the Molecular Mechanisms of Combination Therapy on Drug-Resistant Chronic Myeloid Leukaemia

Mr Antonio Polidano Vella

Department of Anatomy, Faculty of Medicine and Surgery

The project aims to enhance treatments for chronic myeloid leukaemia (CML) using combination therapy and intends on expanding knowledge on cellular drug-effects and drug resistance. CML involves the hyperproliferation of myeloid cells in the bone marrow following the formation of the Philadelphia chromosome. The standard clinical practice involves treating the leukaemia with mono-therapeutic tyrosine kinase inhibitors, namely imatinib, however, drug resistance is an escalating clinical challenge. In a preliminary in vitro project using imatinib-resistant CML cells (K562-IR) (Polidano Vella, 2020), epigenetic modifying drugs in combination with imatinib increased susceptibility to the imatinib, hence re-sensitising cells to the drug. K562-IR cells were grown as genetically unique clonal populations and were subjected to various drug combinations, including FDA-approved epigenetic modifiers, differentiating agents, and imatinib, to determine the most effective treatments for different colonies. Genetic sequencing of each colony identified the retention of the BCR-ABL fusion gene, and further regions are being sequenced to identify resistance-inducing genetic mutations. Following combination treatments, viability assays expose anti-proliferative effects while differentiation studies, including analysis of Cluster of Differentiation (CD) markers, indicate haematopoietic differentiation. Notably, different cell colonies exhibited varied responses to the treatments, implying variations in drug-resistant mechanisms. Most treatments have potential for clinical applicability considering their low lethality when administered to non-cancerous leukocytes. Quantitative polymerase chain reactions (qPCR) and Chromatin immunoprecipitation (ChIP) are being employed to elucidate mechanistic pathways and epigenetic modifications, respectively. This comprehensive approach will provide valuable insights on the cancer and give new hope to drug resistant CML patients.

Overcoming Hurdles in Lung Cancer Treatment: Novel Antibody Sequences and Tumour Targeting Strategies

Ms Mariana Grima

Department of Applied Biomedical Science, Faculty of Health Sciences

Lung cancer remains the leading cause of cancer mortality globally, with non-small cell lung cancer (NSCLC) accounting for approximately 85% of cases. Antibody therapies targeting tumour associated antigens and immune checkpoints are increasingly being used in the clinic to treat different cancers. Chief amongst biological NSCLC immunotherapies are antibodies that selectively target cancer cells with minimal effect on healthy cells. Nonetheless, some important hurdles persist, particularly regarding the response rates amongst NSCLC patients. An urgent need exists to identify both novel antibodies and NSCLC-specific targets to better guide precision oncology therapeutic approaches and effectively address tumour heterogeneity. Our research aims at identifying unique antibody sequences that target antigens overexpressed in NSCLC and mesothelioma. By employing both target-biased and target-agnostic approaches using in vitro phage display biopanning we have identified antibodies that specifically bind to tumour associated antigens. We envisage that this collection of antibodies will contribute to the development of more effective therapeutic strategies for these challenging malignancies.



Incidence and Survival of Neuroendocrine Neoplasia in the Maltese Islands – A Population-Based Study

Dr Jessica Mangion

Department of Medicine, Faculty of Medicine and Surgery

Our study aims to analyse the incidence and survival of neuroendocrine neoplasia (NEN) in the Maltese Islands by conducting a retrospective analysis of patients diagnosed histologically or radiologically with NEN at Mater Dei Hospital between 1st January 2015 and 31st December 2020.

A total of 435 patients were identified, of which 237 (54.48%) were males. The median age at diagnosis was 68 years (IQR 59-74). The overall age-adjusted standardised incidence rate (SIR) was 8.78/100,000/year, with a male-to-female ratio of 1.2:1. The age-adjusted SIR of bronchopulmonary NEN (BP-NEN) was 2.77/100,000/year whilst that of gastroenteropancreatic NEN (GEP-NEN) was 4.02/100,000/year.

The most frequent location of GEP-NEN was the pancreas (11.26%) followed by the appendix (7.13%) and rectum (5.98%). Well-differentiated Grade 1 GEP-NEN prevailed at 63.74%, followed by Grade 2 at 8.24% and Grade 3 at 7.69%. Poorly differentiated neuroendocrine carcinoma was found in 7.14%. Most tumours were localised (57.59%) with 28.02% having disseminated disease at presentation. Distant metastasis was most commonly observed in NEN of the jejunum and ileum (27.45%) and the rectum (21.57%).

Two hundred and forty-five patients (56.32%) passed away during the study period. The standard mortality ratio (SMR) of all NEN was 4.59 (95% CI 4.02-5.17). A higher mortality was observed in BP-NEN, which had an SMR of 6.52 (95% CI 5.35-7.68), compared to GEP-NEN, which had an SMR of 3.68 (95% CI 2.3-4.56). Univariate analysis revealed a statistically significant association between mortality and male gender ($p < 0.001$), age at diagnosis ($p < 0.001$), primary site ($p < 0.001$), grade ($p < 0.001$), stage ($p < 0.001$) and Ki67 ($p < 0.001$).

Optimisation in CT Using Tin Filtration: A Systematic Review

Mr Andrea Bellizzi

Department of Radiography, Faculty of Health Sciences

Purpose: To identify which non-contrast CT examinations benefit from image quality and radiation dose optimisation using tin filtration (TF) and which optimisation strategy is best suited for this purpose.

Methods: The review was registered in PROSPERO, and used PICO to create the research question, and exclusion/inclusion criteria. From the research question, MeSH search terms were obtained and inputted into five electronic databases: PUBMED, Scopus, CINAHL complete, Cochrane Central Register of Controlled Trials and Health & Medical Collection. Studies identified from the search were loaded into Covidence and reviewed by a team of 3 experts using PRISMA guidelines. The Joanna Briggs Institute (JBI) critical appraisal tool was used to evaluate the studies while data extraction was performed using a self-designed validated tool.

Results: From the retrieved 1479 studies, 410 were found to be duplicates leaving 1069 studies for title/abstract screening. Subsequently, 130 studies were included for full text-review, with a final 84 studies included for evaluation. TF was used to optimise scanning in 14 protocols. Scan parameters used in conjunction with TF as an optimisation strategy were: iterative reconstruction (IR) level, tube voltage (kV), pitch, rotation time and reference mAs. Use of TF achieved a significant dose reduction ranging from 17-95% in all protocols.



Conclusion: TF is an efficient dose reduction technique in non-contrast CT examinations, but has limitations meriting consideration in terms of objective image quality. These limitations could potentially be solved by varying the IR level, however more studies are needed for this to be confirmed.

Limitations: Six studies could not be retrieved. A meta-analysis could not be conducted due to the heterogeneity of the studies. Paediatrics and CT protocols using IVCM were excluded.

The Development of a Digital Health Tool for Patients with Inflammatory Bowel Disease on Monoclonal Antibody Treatment

Ms Mariella Mercieca

Department of Health Systems Management and Leadership, Faculty of Health Sciences

Background: In Europe Inflammatory Bowel Disease (IBD) has a healthcare cost of around 4.6-5.6 billion euros per year. Digital health tools are effective in decreasing healthcare utilisation and costs and may offer value-based care. To date, there are no digital health tools for IBD patients on monoclonal antibody (MAB) therapy.

Aim: To develop a digital health tool for IBD patients being treated with MABs

Methodology: This study will consist of four phases. Phase 1, which is currently ongoing, is a scoping literature review using the JBI method. Phase 2 comprises a needs assessment/feasibility evaluation with 3 stages: patient recruitment, healthcare professionals' recruitment and gathering of patient information. Phase 3 consists of the development and validation of the digital tool including the design of the digital tool in conjunction with the Department of Information Technology, validation of digital data using dummy data and piloting of the digital tool. Phase 4 entails the evaluation of the digital tool by patients through a comparison of the patient's quality of life before and after using the digital tool.

Discussion: With the development of this tool, it is hoped that IBD patients on MABs will be provided with a means to be more involved in their health by monitoring their symptoms and be empowered to participate in their disease management as well as leading to better patient outcomes and more adherence to therapy.



Doctoral Stream 5.1 – 5.5

CHAIR: Prof. Melissa Marie Formosa | VENUE: Meeting Room 5



Genomics of Idiopathic Hypogonadotropic Hypogonadism in the Maltese Islands

Mr Clayton John Axiak

Department of Applied Biomedical Science, Faculty of Health Sciences

Background/Objectives: Idiopathic Hypogonadotropic Hypogonadism (IHH) is a rare and genetically heterogeneous condition defined by impaired gonadal function due to insufficient or absent pulsatile secretion of gonadotropin-releasing hormone from the hypothalamus and/or gonadotropins from the anterior pituitary, often presenting with absent or incomplete sexual development and infertility by adulthood. Our objective was to characterise a cohort of 17 probands.

Methods: Targeted gene panel and whole exome/genome sequencing data were generated using Illumina. Bioinformatic analysis and in silico predictions were implemented to shortlist variants. Calcium mobilisation and IP1 assays were used to characterise novel KISS1R and GNRHR variants.

Results: We identified causative genetic variants in eight probands and identified potential leads in four. The findings were: (i) FGFR1 p.Y132C in a man with cryptorchidism and micropenis, (ii) a woman with secondary amenorrhoea with a heterozygous GNRHR p.Q106R variant, which was also present in her (iii) hyposmic father, who had a novel CCDC141 variant, (iv) identification of a novel CHD7 stop variant in an anosmic man displaying two CHARGE features alongside cryptorchidism, (v) a woman with compound heterozygosity for GNRHR p.Q106R and a novel GNRHR frameshift, (vi) a woman with intellectual disability with a SOX2 variant, and (vii) a novel KISS1R deletion in two brothers.

Cases with potential leads included: a woman with secondary amenorrhoea with accumulated heterozygous kisspeptin variants and 3 men with autosomal dominant SOX10, SEMA3A and SPRY4 variants.

Conclusion: Findings show that novel KISS1R and GNRHR variants are non-functional and highlight the genetic complexity and heterogeneity of IHH.

Decoding D-Amino Acid Oxidase Gene Damage in Maltese ALS Patients

Ms Sylvana Tabone

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Amyotrophic lateral sclerosis (ALS), the most common form of motor neuron disease, is characterised by the progressive degeneration of upper and lower motor neurons in the brain and spinal cord. While various factors contribute to ALS onset, genetic influences play a significant role. Notably, rare deleterious variants in the D-amino acid oxidase (DAO) gene have been identified as a global but particularly frequent cause of ALS among Maltese patients. DAO is an essential enzyme involved in regulating D-serine levels in the brain, a neurotransmitter implicated in excitotoxicity. This study employs the *Drosophila* model system to investigate the mechanisms by which DAO deficiency leads to motor neuron degeneration. Our previous findings demonstrated that reduced DAO levels in flies result in ALS-like mobility impairments. To elucidate the underlying causes of this phenotype, we are examining neuromuscular junctions for potential defects associated with DAO loss. Additionally, we are analysing the brains of DAO-deficient flies for elevated D-serine levels, which are known to overstimulate N-methyl-D-aspartate (NMDA) receptors and contribute to motor dysfunction. In a pivotal ongoing study, we are exploring whether the human DAO gene can rescue ALS-like phenotypes in DAO-deficient fly models, providing insights into the functional conservation of this enzyme across species. Concurrently, we are analysing whole genome sequences from newly recruited ALS patients to identify additional DAO-positive cases among the Maltese population. This research lays the groundwork for understanding genetic variants linked to ALS and offers potential pathways toward personalised therapeutic



strategies.

A Novel Gene Therapy Combination for Non-Small Cell Lung Cancer

Mr Nathan Vella

Department of Clinical Pharmacology and Therapeutics, Faculty of Medicine and Surgery

The PI3K/Akt/mTOR pathway is highly deregulated in several cancers including lung cancer. AZD2014 (vistusertib), a dual mTOR inhibitor, targets both mTORC1 and mTORC2 complexes within this pathway. Translationally controlled tumour protein (TCTP) and heat shock protein 27 (Hsp27), commonly overexpressed in cancers, interact with the PI3K/Akt/mTOR pathway, leading to eIF4E hyperactivity, causing increased cell growth, proliferation and drug resistance. We rationalise that by targeting several proteins on a common pathway, treatment dosages can be reduced, while potentially enhancing efficacy and minimising adverse effects in prospective in vivo studies. Therefore, we aimed to study the therapeutic potential of combining the small-molecule AZD2014 with antisense oligonucleotides (ASO) designed to target TCTP and HSP27 expression. Cell viability analysis was carried out using a range of AZD2014 concentrations on A549 (adenocarcinoma), H460 (large cell carcinoma) and H520 (squamous cell carcinoma) non-small cell lung cancer (NSCLC) cell lines at 24, 48 and 72h post-treatment. Cytotoxicity of AZD2014 was studied via lactate dehydrogenase (LDH) release together with molecular and phenotypic markers of cell death mechanisms related to apoptosis and autophagy. Through magnetofection, cellular uptake of different concentrations of these ASOs into NSCLC cells was investigated at several time points. Changes in TCTP and HSP27 gene expression were investigated, while western blots confirmed protein knockdown at selected ASO concentrations. Interestingly, combination treatment resulted in synergistic effects on NSCLC cell viability. Furthermore, 3D spheroid models of each of the three NSCLC cell lines were developed and characterised to better study pharmacodynamics in vitro. These results elucidate the validity and effectiveness of this tripartite combination which is currently being further studied to effectively target NSCLC and to establish safety profiles of this novel NSCLC treatment.

Differentially Expressed Genes of Human Lens Epithelial Cells in Different Stages of Diabetic Retinopathy

Dr Muhaiyo Bartolo Khodjayeva

Department of Applied Biomedical Science, Faculty of Health Sciences

Purpose: Diabetic retinopathy (DR) and cataract are leading causes of blindness. This study aims to identify differentially expressed genes (DEGs) in human lens epithelial cells across various stages of DR to elucidate disease mechanisms, identify biomarkers, and discover potential drug targets.

Methods: A cross-sectional comparative transcriptomics study was conducted with 250 participants recruited from a cataract waiting list at a public hospital in Malta. Participants underwent physical examinations, ophthalmic assessments, and blood tests (e.g., full blood count, renal/liver function, glucose levels). Lens capsule samples were collected during cataract surgery from non-diabetic controls (G1) and patients with no DR (G2), non-proliferative DR (G3), diabetic macular oedema (G4), and proliferative DR (G5). RNA sequencing of 50 samples (10 per group) was performed using the DNBSEQ platform, and GO and KEGG pathway analyses were conducted using the Dr Tom



bioinformatics system.

Results: A total of 4,436 DEGs were identified. Significant DEGs were determined using a log₂ fold change threshold of ≥ 1.5 for upregulation and ≤ -1.5 for downregulation, with a Q-value < 0.05 . Compared with controls, 1 downregulated DEG was identified between G1 and G2, 68 DEGs (32 upregulated, 36 downregulated) between G1 and G3, 43 DEGs (29 upregulated, 14 downregulated) between G1 and G4, and 61 DEGs (35 upregulated, 26 downregulated) between G1 and G5. Bioinformatics analyses revealed key DEGs and their associated pathways.

Conclusion: This study provides insights into the molecular mechanisms underlying DR, as well as diabetic and non-diabetic cataracts, identifying potential biomarkers and therapeutic targets.

Pituitary Neuroendocrine Tumours – Insights from Single-Cell Transcriptomics and Spatial Biology

Ms Emma Jayne Spiteri

Department of Medicine, Faculty of Medicine and Surgery

Pituitary neuroendocrine tumours (PitNETs), also known as pituitary adenomas, are one of the most common types of intracranial tumours. They are broadly classified into non-functioning pituitary adenomas (NFPAs) and functioning pituitary adenomas (FPAs), including growth hormone-secreting adenomas (GHPAs). Despite their prevalence, the molecular and cellular mechanisms underlying PitNET subtypes remains poorly understood. Advances in single-cell RNA-sequencing (scRNA-seq) have provided a powerful tool for dissecting the cellular heterogeneity of complex tissues, surpassing bulk RNA-sequencing by enabling the identification of cell-type-specific gene expression and uncovering rare cell populations.

To investigate the cellular and molecular landscape of PitNETs, we conducted a systematic literature review that identified four studies, comprising FPAs (n=51), NFPAs (n=19), and normal pituitary tissue (n=5). These were processed and analysed using an scRNA-seq R pipeline. The analysis revealed several dysregulated pathways, including those related to immune system functioning, signal transduction, and extracellular matrix organisation. This was accompanied by the identification of a diverse cellular landscape including immune cells, stromal cells, and pituitary-lineage cells. Furthermore, gene expression profiling highlighted significant heterogeneity between PitNET subtypes and normal pituitary tissue, as well as within PitNET subtypes themselves, reflecting the complex characteristics of these tumours.

To refine these insights, a filtering strategy was applied to identify candidate genes for further exploration. Future work will incorporate Spatial Transcriptomics to map gene expression within the tumour microenvironment, providing spatial context to cellular interactions and complementing scRNA-seq findings. Proteomics analyses will further enhance this omics approach, offering a comprehensive understanding of PitNET biology and potential therapeutic targets.



Doctoral Stream 6.1 – 6.5

CHAIR: Prof. Jean Calleja Agius | VENUE: Meeting Room 3



A Missed Window in Early Pregnancy: What Bleeding Tells Us and What We're Not Hearing

Ms Lara Sammut

Department of Anatomy, Faculty of Medicine and Surgery

A retrospective cohort study was conducted in Malta to assess the prevalence and outcomes of threatened miscarriage, focusing on first-trimester vaginal bleeding cases managed at a local state hospital in 2019. The study addressed a gap in publicly available data on pregnancies before 22 weeks' gestation, which limits understanding of the frequency and impact of such cases. Researchers reviewed cases from the Accident and Emergency Department, excluding those with incomplete medical records, and analysed anonymised data from various hospital departments. Outcomes tracked included miscarriage, ongoing pregnancy, ectopic and molar pregnancies, as well as unknown outcomes.

Out of 711 pregnant women presenting with first-trimester bleeding, 241 had successful births beyond 22 weeks, while 412 experienced miscarriages. Other outcomes included ectopic and molar pregnancies, and 58 cases had unknown outcomes. A notable link was found between maternal age and miscarriage risk, with the highest risk observed in women aged 35-46 and under 19. Additionally, complications related to threatened miscarriage were associated with low birthweights in newborns.

The study highlights the need for a comprehensive local registry of pregnancy outcomes following first-trimester bleeding to reflect national trends. Such a resource could improve clinical decision-making, patient counselling and policy development, while also laying a foundation for future research into the epidemiology and management of threatened miscarriage. It underscores the importance of early intervention and targeted support for at-risk populations to improve pregnancy outcomes.

Genomic and Proteomic Biomarkers of Preeclampsia in the Maltese Population

Ms Celine Ann Grech

Department of Anatomy, Faculty of Medicine and Surgery

Preeclampsia (PE) is a heterogenous, multiorgan disorder of pregnancy and is a leading cause of maternal and perinatal morbidity and mortality. PE is characterised by a new-onset hypertension and accompanied by at least one other related complication such as proteinuria, maternal organ dysfunction or uteroplacental dysfunction. In Malta, the average number of PE cases per year between 2014 and 2022 was 28, underscoring its impact and the potential long-term complications for affected mothers, their newborn, and the healthcare system. The aetiology of PE is multifactorial, involving genetic, environmental, and maternal constitutional factors, with familial clustering strongly implicating genetic contributions from maternal, foetal, and paternal genome. While candidate gene studies have identified several genes associated with PE, its polygenic nature necessitates advanced approaches like High Throughput Sequencing (HTS) to uncover novel genetic variants. Proteomic studies have further revealed that proteins involved in angiogenesis, apoptosis, oxidative stress, hypoxia, and placental development are differentially expressed in PE. Despite these insights, current clinical management remains focused on symptom control, including hypertension management, seizure prevention, and prophylactic use of aspirin. Delivery remains the only definitive treatment, often necessitating preterm birth and its associated complications. To address these challenges, this study aims to investigate the role of maternal and foetal germline genomic factors in the aetiology of PE aetiology using Whole Genome Sequencing (WGS) and to explore protein biomarkers through next-generation proteomic platforms. Identifying novel biomarkers will enable earlier detection, accurate diagnosis, and more effective treatment, ultimately reducing adverse



maternal and foetal outcomes and alleviating the significant burden of this disorder.

Outsmarting Endometriosis: AI and the Future of Diagnosis

Ms Martina Haber

Department of Radiography, Faculty of Health Sciences

Endometriosis is a chronic, inflammatory, gynaecological condition that affects 10% of females worldwide, equating to approximately 190 million women. This pathology has an average delayed diagnosis of 6-12 years mostly due to non-specificity of symptoms. Local epidemiological data on endometriosis prevalence and incidence is currently not available. Literature indicates that a delayed diagnosis equates to years of debilitating pain, diminished quality of life and increased infertility risks (Sivajohan et al., 2022).

International studies using AI to diagnose endometriosis early, have shown that AI is promising in this medical field, however, there is a current research gap which lacks human comparators against the AI generated results. This first phase of the doctoral research involved a literature review in order to identify clinical pathways and imaging protocols, aiding to set the ground work for future phases.

A search strategy across four databases (Scopus, PubMed, HyDi, Google Scholar) yielded 230 articles meeting inclusion criteria for analysis. Findings revealed that no single diagnostic modality can be considered a 'gold standard', yet each modality contributes collectively to the early diagnosis of the disease. Results showed the need to prioritise comprehensive medical history-taking, with an emphasis being made on the necessity to establish AI based tools to aid in the early diagnosis of endometriosis.

The use of such tools could lead to changes in clinical practice, potentially decreasing the use of extensive medical imaging, hospitalisations, and surgical interventions. This will be explored further in the following phases of the doctoral research.

Mother-Infant Video Interaction Guidance for Women with Perinatal Mental Health Illness: A Pilot Randomised Controlled Trial

Dr Rachel Buhagiar

Department of Psychology, Faculty for Social Wellbeing

Background: Perinatal psychiatric disorders are associated with suboptimal parent-infant relationships, and increased risks for insecure attachment patterns in offsprings. Video feedback methods, such as Video Interaction Guidance (VIG) are gaining popularity as dyadic interventions, but evidence of their clinical effectiveness within the perinatal mental health field is limited.

Objectives:

- i. To assess feasibility of conducting a full scale randomised controlled trial (RCT) of VIG in mothers with perinatal psychopathology and their infants during the first postpartum year.
- i. To provide preliminary efficacy data for VIG in improving mother-infant relationships within this clinical context.

Methods: A single centre, community-based, two-armed pilot RCT compared VIG intervention to usual care. Mothers



with a diagnostic-confirmed psychiatric disorder and their infants aged ≤ 12 months were recruited, with random allocation by minimisation and blind post-intervention evaluations. Three individual VIG cycles were delivered by an accredited practitioner in-home or in-clinics over a 12-week period. Recruitment, consent, retention, and intervention acceptability were assessed as key feasibility parameters. Mother-infant dyads were evaluated for their dyadic synchrony and relational risk using a gold-standard measure.

Results: Fifty-nine mother-infant dyads were recruited; 32 were allocated to control, and 27 to intervention. Most feasibility outcomes and intervention acceptability were favourable, except for recruitment which remained challenging despite protocol revisions. Treatment estimates for VIG were promising with preliminary evidence for better relational qualities for intervention dyads.

Conclusions: The positive findings encourage the progression to a definitive RCT to subsequently inform policies and clinical guidelines. This may be feasible if sufficient resources, including funding support can be achieved to overcome barriers, particularly related to recruitment.

The Acute Stroke Pathway in Malta. A Systematic Evaluation and Recommendations on the Optimisation of the Local Acute Stroke Pathway

Ms Lara Marie Deguara

Department of Clinical Radiology and Nuclear Medicine, Faculty of Medicine and Surgery

This systematic review evaluates the stroke pathway in Malta, identifying pre-and-in-hospital delays to reduce reperfusion times and improve functional outcomes.

Methodology or Background: This study adheres to PRISMA guidelines, using a comprehensive literature search of peer reviewed articles, systematic reviews, meta-analysis, randomised controlled studies and observational studies from databases including PUBMED, Medline, Cochrane and Web of Science. Keywords identified included 'stroke', 'thrombectomy', 'stroke pathway' and 'delays' for articles published between 2010 and 2024.

Results or Findings: A total of 9,952 articles were retrieved from the initial search, 7,301 articles were identified following removal of duplicates. Thorough screening identified 222 articles used for qualitative synthesis.

The RACE prehospital stroke scale is identified as a reliable tool yielding the best sensitivity and specificity rates in detecting large vessel occlusion (LVO). The drip and ship versus mothership models for prehospital triaging was thoroughly studied in the RACECAT trial whereby the latter reduced workflow times but did not significantly improve functional outcome. The use of Mobile stroke units also shows promising treatment within the 'golden hour' and reductions in prehospital delays, however, the cost effectiveness against its benefits is still being investigated. In an in-hospital setting, artificial intelligence (AI) assisted LVO detection significantly reduces onset to groin puncture times, however, its impact on functional outcome remains under study.

Conclusion: This review sheds light on the importance of differentiating stroke patients as fast or slow progressors of stroke and the importance of the use of enhanced technologies in both pre and in-hospital settings yielding higher rates of treatment within the golden hour.



Doctoral Stream 7.1 – 7.5

CHAIR: Prof. Janet Mifsud | VENUE: Meeting Room 4



Medicines Accessibility in a National Health Service

Mr Michael Cini

Department of Pharmacy, Faculty of Medicine and Surgery

Patient accessibility to medicine is a vital factor in improving and safeguarding public health. In the 2022 European Federation of Pharmaceutical Industries and Associations Patient Waiting to Access Innovative Therapies indicator survey Malta had the longest delay (average of 1351 days) in providing access to innovative medicines. This study aims to develop a reimbursement model for Malta, which reduces this delay in accessibility while remaining sustainable. An in-depth literature review was conducted to compare medicine reimbursement policies in the international scenario and the local scenario. The compiled data was used to develop two questionnaires, each focusing on an aspect of a reimbursement system: pharmacoeconomic aspects (Focus Group A) and ethical aspects (Focus Group B). These questionnaires were applied to their respective focus group and a SWOT analysis was carried out on this data. The SWOT analysis was used to draft a reimbursement policy, which was validated through Focus Group C. The data from the focus groups indicated a desire for improved access both to innovative medicines and dosage forms. It was expressed that personalised and innovative medicine will be able to reduce healthcare expenditure despite their higher cost. Streamlining and robustness of the systems were also emphasised. The study demonstrated a need to improve access to personalised and innovative medicine. There are currently strategies in place, but further investment is needed. The strategies need to take into consideration the patient and pharmacist response for easier implementation.

Development and Validation of an HPLC-UV Method for Quantification of Cannabinoids in Commercial Oil-Based Products

Ms Karolina Szyrner

Department of Pharmacy, Faculty of Medicine and Surgery

The expanding market for commercially available cannabinoid-containing products has created an increasing demand for reliable analytical testing methods to verify product quality and label claims. This study aims to develop and validate a high-performance liquid chromatography method with ultraviolet detection (HPLC-UV) for the quantification of cannabinoids in commercial oil-based products containing hemp seed, medium chain triglycerides (MCT) and olive oil. Method development involved the comparison of different sample preparation techniques using dilution in methanol, ethanol and isopropanol, followed by sonication and filtration to achieve a high yield of cannabinoids. Chromatographic separation was carried out using an Agilent 1260 Infinity series system with a C18-AR column (250 mm × 4.6mm; 5 µm), employing isocratic elution with a mobile phase of acetonitrile and 0.5% acetic acid (66:34 v/v), at a flow rate of 2 mL/min. The column temperature was 25°C and the detection wavelength was set at 220 nm. Injection volume was 10 µL. Method was validated following the International Council for Harmonisation (ICH) for determination of cannabidiol (CBD), cannabinol (CBN) and tetrahydrocannabinol (THC) in MCT oil and acceptable results were obtained for accuracy (97%-102%) and inter- and intra-day precision (RSD <15%) and linearity over tested concentration ranges (0.5mg/ml - 0.03mg/ml) with R² of 0.99. The validated method was applied to analyse cannabinoid content in commercially oil-based products. This method has the potential to be used as an analytical tool for routine quality control of commercial cannabis products, addressing the current needs of the growing cannabis industry.



Transmission of Carbapenemase-Producing Enterobacterales in the Intensive Therapy Unit at Mater Dei Hospital

Ms Sarah Pace

Department of Pathology, Faculty of Medicine and Surgery

Objective: Carbapenemase-producing Enterobacterales (CPE) is a worldwide public health concern. These bacteria are resistant to a wide range of antibiotics, affecting the treatment of serious infections. This study aimed to investigate the transmission of CPE between patients and their surrounding environment in the intensive therapy unit of Mater Dei Hospital.

Methods: This involved 18 sample collections over one year, and environmental samples were taken around the CPE-positive and CPE-negative patients. Then, the CPE was identified using culture-based methods, and the patient's samples and CPE-positive environmental samples were sequenced.

Results: A total of 726 environmental samples were taken; 48 were found to be CPE-positive, and 678 were CPE-negative. The CPE found in the patient and their surrounding environment were genetically related. Transmission was most apparent between the patient and high-touch surfaces rather than the sink area. The last two sample collections found a link between the patients since their time in the ITU overlapped. Here, the sink between their previous beds was CPE-positive, so a transmission event occurred, but the source could not be identified.

Conclusion: The results suggest transmission between the patient and their surrounding environment. However, eight transmission events took place. Most patients (15) were already CPE-positive upon admission, suggesting that the direction of transmission was predominantly from the patient to the surrounding environment, possibly through healthcare workers. The results of this study highlight modes of CPE spread in this department and should help the infection control team implement necessary measures to help reduce the transmission of CPE.

Development of a Predictive Model of Treatment Outcomes for Patients Suffering from Lumbar-Related Leg Pain

Mr Emanuel Schembri

Department of Physiotherapy, Faculty of Health Sciences

Background: A trial-and-error approach is frequently adopted when managing patients with lumbar-related leg pain, reflecting the lack of a personalised approach within clinical practice and guidelines.

Research gap: A scoping review of systematic reviews failed to identify a predictive model explicitly developed for this patient cohort and none of the identified models exhibited good predictive abilities for pain outcomes.

Aims: To develop a predictive model of differential treatment outcomes in persons with lumbar-related leg pain, focusing on prognostic factors that may be obtained within the practical constraints of a first-contact, first-session evaluation.

Methods: Patients with lumbar-related leg pain attending the pain clinic within the Malta National Health Service shall be recruited within an inception cohort study and followed-up following 8 months. The actual primary outcomes (pain [NRS 0 to 10 scale] and disability [Roland Morris disability scale 0 to 24]) to be predicted will be verified during the qualitative phase of the research. The anticipated sample size required to develop the multiple linear regression model will be 523 participants, based on an R² value of 0.3 and 23 potential candidate predictors. The model will be evaluated



by its R2 value, calibration, discrimination and instability properties, even for predefined patient subgroups. Internal validation shall be done using the bootstrapping technique, and the model would be presented using Shiny apps. The research will abide by the PROGRESS 3 framework, and bias will be minimised by adhering to the Prediction model Risk Of Bias Assessment Tool.

Effectiveness of High-Volume Injection in Mid-Portion Achilles Tendinopathy (HighIMPACT): A Randomised Trial

Ms Tiziana Mifsud

Department of Podiatry, Faculty of Health Sciences

The primary aim of this RCT was to evaluate the effectiveness of high-volume image-guided injection (HVIGI) combined with rehabilitation exercises for mid-portion Achilles tendinopathy, assessing clinical improvement and mechanical changes over three months.

Method: This was a parallel-group randomised superiority trial at a single centre (Mater Dei Hospital) with blinding of outcome assessors. Eighteen participants with clinically diagnosed and ultrasonographically confirmed mid-portion Achilles tendinopathy were randomly allocated to either a control group doing progressive rehabilitation exercise programme (n=11, 6 males, 5 females; age: 51.2 ± 9.6 years, BMI: 31.3) or the experimental group receiving a high-volume image guided injection (n=7, 6 males, 1 female; age: 54.4 ± 12.91 years, BMI: 29.9) treatment. The primary outcome measure was the Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire and mechanical stiffness of tendon at 2 weeks and 12 weeks. Differences between groups were analysed using the independent sample t-test and its non-parametric equivalent, Mann Whitney test to compare mean scores between the two groups of patients.

Results: The mean VISA-A score improved by a maximum of 13.1(SD:12.6) for control and 23.6 (SD: 23.8) for intervention group at 12 weeks however no statistically significant difference in score changes between timepoints was observed. For the mechanical property of tendon, the control group had a mean difference of 28.5N/m (SD=117.08), while intervention group had a mean difference of -149.7N/m (SD=122.9) with a statistically significant difference between groups ($t=-3.09(16)$, $p=0.007$) in favour for the control group with a large effect size ($d=-1.49$). This difference decreased by week 12 and the performance of the groups was comparable, with no group demonstrating superior outcomes.

Conclusions: In adults with mid-portion Achilles tendinopathy, both treatments resulted in reduced pain and improved function at 12 weeks. However, based on the mechanical findings of the tendon at 2 weeks, the use of HVIGI cannot be recommended as superior due to the temporary decrease in tendon stiffness observed which needs further exploration and understanding.

Clinical trial identifier number: NCT06774066



Doctoral Stream 8.1 – 8.5

CHAIR: Prof. Sebastiano D'Amico | VENUE: Lecture Room 203



Analysing Malta's Laws That Address Marine Pollution from Land-Based Single-Use Plastics and Microplastics Sources

Ms Jyothi Thomas

Department of Environmental and Resources Law, Faculty of Laws

Since plastic is not circular, current circular economy solutions proposed by policies, including the use of bioplastics as an alternative, conversion of plastic waste to energy, and recycling that promotes the continued production of plastics, are neither circular nor sustainable. Hence, adopting other legal solutions to regulate pollution by applying various environmental law principles, including the precautionary and preventive approaches are necessary.

A qualitative case study is conducted to analyse the environmental legislation in Malta and its policies that regulate marine pollution due to SUPs and microplastics which evolve from land-based sources, identify any gaps in the regulation and make recommendations on how to fill them.

The case study finds that: 1) There has been a considerable reduction in the quantity of plastic waste littered in the Maltese Islands because of the introduction of beverage containers recycling scheme, mandatory waste separation, and the ban on certain SUPs. Most of the plastic wastes collected are exported for recycling. Since recycling is not a feasible measure considering the unsustainability of plastic material, laws and policies should be amended to extend the ban to the remaining SUPs. 2) Malta has not yet fully implemented the 2023 EU Regulation banning certain microplastics, among which certain sectors are allowed to have unreasonable and longer transition periods that prolong pollution. Hence, the authorities must ensure compliance through inspections and reporting requirements related to microplastic releases. 3) Incorporation of 'right to a clean, healthy, and sustainable environment' within the Constitution amplifies the quality of 'access to justice'.

The Impact of Changing Values on the Management of Malta's Built Heritage

Perit Charlene Jo Darmanin

Department of Construction and Property Management, Faculty for the Built Environment

Change is inevitable in an ever-evolving society, necessitating the creation and modification of the urban fabric to meet individuals' demands. The swift urban expansion within the historically rich backdrop of Malta has profoundly affected the islands'-built heritage. Heritage frequently encounters conflicts with other agendas, including social, cultural, environmental, economic, and sustainability issues. The fundamental rationale for the conservation of built heritage is primarily due to its value; no society endeavours to safeguard what it does not esteem. The transformation of heritage reflects societal change, as heritage is a societal and cultural construct. This study aims to investigate the impact of changing priorities and values in contemporary society on Malta's built and urban heritage. An integrative review of the literature was conducted to identify key pillars pertaining to cultural attitudes, fundamental social frameworks, economic requirements, environmental concerns, and sustainable management methods. This was combined with the dissemination of a survey across several demographics (age, occupation, gender, ethnicities, religious beliefs, education, geographical location) in Malta. The conclusions indicate that a study of the shifts in societal objectives and value systems over the past decade is essential to inform policies for sustainable heritage management, facilitating public engagement in national decision-making.



Advancing Microwave Ablation: Precision in Dielectric Property Measurement and Real-Time Monitoring

Ing. Federico Cilia

Department of Physics, Faculty of Science

Microwave ablation (MWA) is a minimally invasive treatment for tumours in organs like liver, kidneys, and lungs. Despite its clinical adoption, MWA faces challenges due to limited knowledge of tissue dielectric properties and their changes during ablation. These properties are critical for better treatment planning and real-time monitoring. Current methods are based on predicting ablation zone size and shape, utilising data often derived from ex-vivo tissues, failing to account for perfusion and temperature effects. This lack of accurate, dynamic data limits treatment planning and efficacy, increasing reliance on clinician judgment.

This project addresses these limitations by thoroughly characterising the tissue dielectric properties under perfused and heated conditions. This is achieved through a novel dual-mode ablation system at the ElectroMagnetic Research Group (EMRG), where real-time permittivity measurements are measured during treatment. This data will also assist the development of a thermosensitive phantom that accurately reflects the dielectric properties of tissues during ablation.

By combining dual-mode ablation dielectric measurement techniques, realistic experimental phantoms, and innovative antenna design, the project ABLAZE aims to improve the safety, precision, and effectiveness of MWA and reduce the need for on-the-fly clinical decisions.

Changing the Way We Track Eyes – Fusing the Electrooculogram and a Webcam for Robust Eye-Gaze Tracking

Ing. Matthew Mifsud

Department of Systems and Control Engineering, Faculty of Engineering

In order to access content on the web, users generally make use of control input devices such as keyboards, joysticks or touchscreen interfaces. Operating such devices is a trivial task that requires minimal effort; however, these are not a viable option for individuals suffering from mobility impairments such as stroke or Amyotrophic Lateral Sclerosis (ALS) patients, who may have limited fine control of their hands. In such situations, eye gaze tracking offers a viable alternative enabling users to select icons, execute commands and input text solely using their gaze.

One eye gaze tracking technique which can be used to operate such human-computer interface systems is electrooculography (EOG) which uses electrodes around the eyes to record electrical potentials generated during eye movements. This method is robust to ambient lighting, avoids the need for infra-red illumination like most commercial eye-gaze trackers, and enables high-rate tracking. However, one of the main challenges of EOG-based eye tracking is the drifting baseline within the recorded signals which leads to erroneous gaze angle estimates and over time, can make operating an eye tracking application practically impossible.

In this work, we propose a novel drift mitigation technique which may be used to de-drift EOG signals in real-time. The proposed approach makes use of images from a webcam to model and remove the EOG signal baseline whilst preserving the signal's original morphology. Its performance is evaluated against standard baseline estimation techniques using data recorded from ten participants, demonstrating improved performance whilst operating in a real-time fashion.



Impact of Thermal Effluent on *Posidonia Oceanica* Meadows and Associated Fish Assemblages: Insights into Biodiversity and Functional Groups

Mr Alessio Marrone

Department of Geosciences, Faculty of Science

Rising sea temperatures, driven by climate change, pose significant threats to coastal ecosystems. This study investigates the impact of thermal effluents from power plants as proxies for climate-driven temperature increases on *Posidonia oceanica* meadows and associated fish communities. Using a gradient-based approach, we analysed environmental variables, seagrass indicators, fish assemblages, and functional group (FG) dynamics across thermal gradient. Results indicate that temperature is the dominant factor influencing *P. oceanica*, with reduced leaf length, shoot density, and rhizome weight near effluents. Despite compensatory mechanisms, the overall photosynthetic biomass and resilience declined under thermal stress.

Fish assemblages exhibited reduced species richness and biodiversity close to thermal effluents, with opportunistic and thermophilic species dominating. FG analysis revealed disrupted seasonal patterns, shifts in trophic dynamics, and functional compensation among species, highlighting potential ecological imbalances. Notably, transient predators thrived near effluents, while more sedentary and temperate species were displaced.

These findings underscore the cascading effects of rising temperatures on coastal habitats such as *P. oceanica* meadows and their associated community, emphasising the urgency of conservation measures. By identifying critical thresholds and adaptive responses, this study contributes valuable insights into consequences of localised impacts of thermal stress on coastal biodiversity and ecosystem services.



Doctoral Stream 9.1 – 9.5

CHAIR: Prof. Ing. Carl James Debono | VENUE: Lecture Room 201



Bridging the Domain Gap: Leveraging Monolingual Data for Low Resource Machine Translation Systems

Mr Kurt Abela

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Machine translation (MT) for low-resource languages such as Maltese often struggles with limited parallel data, which is typically only found in specific domains such as legal texts. As a result, translations for everyday language or other domains remain inadequate. This study investigates how newly available monolingual data in Maltese, including news articles and blogs, can improve MT systems, especially on out-of-domain data (data that is generally different from the available parallel data).

We explore the optimal balance between monolingual and parallel data, testing different integration methods, such as randomly mixing backtranslated monolingual data with authentic parallel data and splitting the training phase in two by first training on the parallel data and then on the backtranslated data. Results show consistent improvements in translation quality, particularly for out-of-domain content. We also examine the use of a Maltese language model during training, and show that it further improved performance, although its impact during inference was less effective.

By using newly collected Maltese texts and these improved methods, this research addresses key challenges in low-resource MT and provides ways to expand the coverage of translation systems. These improvements not only enhance translation quality but also help include Maltese in digital tools like chatbots, educational resources, and multilingual platforms. This work emphasises the importance of supporting smaller languages to ensure they remain accessible and relevant in today's connected world.

Explainability of Graph Neural Networks for Fraud Detection

Mr Gabriel Calleja

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Graph Neural Networks (GNNs) are beginning to be applied to the detection of fraud and money laundering activities by leveraging the relational nature of financial transaction data. Traditional machine learning methods often focus on isolated instances, overlooking the interconnected structures and evolving behaviours of fraudulent actors. In contrast, GNNs capture higher-order dependencies, allowing the model to identify suspicious patterns such as layered transactions, anomalous subgraphs, and emergent rings of illicit activity. This enhanced representational power is especially beneficial in domains where adversaries continuously adapt to detection rules.

However, the complexity of GNNs necessitates robust explainable solutions. Explainers for GNNs, such as perturbation-based or subgraph-based methods, can highlight critical edges or node embeddings that contribute to a suspicious classification. Clear justifications for these decisions are vital for auditors and compliance officers who must trace the flow of funds across intricate transactional networks. Beyond regulatory demands, interpretable GNN outputs help foster trust, accelerate investigations, and lower false positives by narrowing the scope of manual follow-up tasks.

Additionally, robustness against adversaries is insufficient, as motivated fraudsters continually evolve tactics to evade detection. The aim is to develop resilient techniques that preserve interpretability even under adversarial attacks. By addressing these two gaps, future solutions can deliver reliable, explainable, and widely applicable safeguards in financial transaction networks.



Online Critic Guided Decision Transformer in Gym-MicroRTS

Mr Benjamin Bugeja

Department of Computer Science, Faculty of Information and Communication Technology

This paper presents a Reverse Conditioned Supervised Learning (RCSL) agent for Gym-MicroRTS, a real-time strategy (RTS) environment. The agent uses a Critic Guided Decision Transformer (CGDT) architecture to make up for the shortcomings of RCSL and combines it with Online Decision Transformers (ODT) to fine-tune the policy using online exploration. The critic learns to predict reward distributions conditioned on sequences of states, actions, and returns-to-go. It uses a Gaussian parameterisation with mean and standard deviation heads, penalising divergent estimates through an asymmetry coefficient. The policy network, also based on transformer blocks, predicts actions by attending to a limited history of tokens encoding states, actions, and returns-to-go. Temporal information is embedded linearly to preserve sequence order in both models.

Training proceeds in three phases: (1) offline critic training using a fixed dataset of 3000 trajectories, (2) supervised policy learning from the same dataset, and (3) online fine-tuning with a replay buffer continuously updated, replacing the oldest trajectories by trajectories collected by the online policy. Bayesian optimisation is applied to search hyper-parameters, including dropout rates, learning rates, weight decay, and expectile/asymmetry coefficients. The critic and offline policy networks are validated against 500 held-out trajectories, while the final policy's performance is measured by average returns over online rollouts. Entropy regularisation helps maintain exploration, and the expectile loss guides the policy to favour specific actions based on critic feedback. Experimental results demonstrate the potential for combining CGDT with online training to produce robust policies for real-time strategy environments.

A Comparative Study of Information Reconciliation Schemes for Continuous Variable Quantum Key Distribution

Mr Aaron Abela

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

Quantum Key Distribution (QKD) combines an authenticated classical communication channel with a quantum channel to establish information-theoretically secure keys between two parties. The security of the generated keys is guaranteed by the laws of physics to be unbreakable and aims to address one of society's most pressing concerns, namely safeguarding against future quantum computer-based attacks. A key component of any QKD system is the correction of errors introduced during the generation of the final secret keys, arising from factors such as imperfections in the quantum channel, detector limitations, environmental noise and potential eavesdropping. The process of correcting these errors is known as information reconciliation (IR), and is vital for ensuring the reliability of key exchange. To provide context, we first present a foundational overview of IR and its significance in continuous-variable QKD (CV-QKD). This background lays the groundwork for a comparative survey of existing IR schemes, where we examine and present the error correction codes employed in each approach, their respective signal-to-noise (SNR) operating points as dictated by the system in use, and their reconciliation efficiencies. Additionally, we examine the attained frame error rates (FERs), throughput (Mbps), and secret key rates (SKRs). Finally, the survey highlights the strengths and limitations of the various presented schemes, offering valuable insights into their practical applications.



Securing the Quantum Future: A Key Rate Framework for Quantum Key Distribution Protocols

Mr Ryan Debono

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

With the security of classic cryptographic protocols under threat by the quantum revolution, Quantum Key Distribution (QKD) offers a solution whereby the security of a key generated by two parties is guaranteed by the laws of physics. A QKD protocol is a formulated, stepwise procedure that determines how a key is generated and synchronised between the parties. The protocol needs to be provably secure against any eavesdropping attacks over the quantum channel by measuring the information gained by the eavesdropper, where both the information gained and its measurement depend on the type of the attack. In the most basic type, this information is bound by the Shannon mutual information between the eavesdropper's data and the data held by the party responsible for post-processing. The Csiszár-Körner theorem provides the maximum provably secure key rate, taking into account the eavesdropper's information. We argue that this key rate could be used to perform a speed comparison between protocols under the same conditions and we provide a basis for one such possible framework, in which the key rate of a protocol is measured against (1) channel parameters and (2) the proportion of attacked qubits. We perform the proposed quantitative analysis on BB84, the pioneering QKD protocol that remains prevalent in modern applications, implemented within an Additive White Gaussian Noise (AWGN) channel using Binary Phase-Shifting Keying modulation with both hard and soft decision decoding to represent a common real-world communication scenario.



Doctoral Stream 10.1 – 10.5

CHAIR: Prof. Ing. Glenn Cassar | VENUE: Meeting Room 103



Developing P Type Damage Structural Integrity Assessment Methodologies Based on RCC-MRx for the Design of Nuclear Fusion Reactor Components

Mr Kevin Degiorgio

Department of Mechanical Engineering, Faculty of Engineering

The RCC-MRx (Design and Construction Rules for mechanical components of nuclear installations: high-temperature, research and fusion reactors) code is developed by the French Association for Design, Construction and Surveillance Rules of Nuclear Power Plant Components of Nuclear Plants (AFCEN). RCC-MRx groups damages into groups. The work presented here deals with Type P damages, resulting from the application of constant or monotonic increasing loads. Two failure modes are of interest: immediate excessive deformation and immediate plastic instability. Rules are given for both the elastic and elastoplastic routes. RCC-MRx also has a section dedicated for the assessment of box type of structures which is a predominant geometry in a typical fusion reactor.

In this study, the rules for negligible creep and negligible irradiations are used. Hence, the aim of this study is to apply the code analyses rules on a simple hollow box section under the action of various loads and discuss suitable implementation methodologies particularly in the context of the elastoplastic rules. The results indicate that elastic analysis is the most conservative. Also, depending on overall deformation of the structure the results show that the plastic instability rule limits may often be reached before those of the excessive deformation rule. The excessive deformation check presents several challenges in its application and are discussed in detail.

Determining Requirements for a Design Support Framework That Balances Risk Management and Multi-User Experience Within Packaging

Ms Alessandra Bianco

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Limited resources are available to assist packaging design engineers in developing packaging products, particularly when needing to balance product risk management and multi-user experience. This study takes the pharmaceutical packaging industry as a case study to identify key requirements for an effective design support framework or tool. To do so, ten packaging designer engineers were recruited via direct email contact and professional networking platforms such as LinkedIn. Each participant took part in a virtual structured interview lasting between 30 minutes and one hour. These interviews were designed to collect both qualitative and quantitative data. Given the subjective nature of the qualitative data obtained from each participant, thematic analysis was employed to identify common themes. Following analysis, seven core requirements were identified via thematic analysis as well as additional preferences derived from the quantitative data collected. Such preferences included, for instance, how the designers would want to use the framework or tool and at which stage of the design process. These results act as a reference point for researchers wishing to develop a design support framework or tool aimed at assisting packaging design engineers in the pharmaceutical industry.



Dual Fuel Engines for Marine Application

Mr Anthony Theodore Saliba

Department of Mechanical Engineering, Faculty of Engineering

The future of large engines will face the shift towards alternative fuels in order to decrease the carbon emissions and combat environmental challenges. In particular the marine industry faces larger challenges since it has been dependent on conventional fuels such as Heavy Fuel Oil (HFO) and Marine Diesel Oil (MDO) for a significant period. Changing marine power plants to newer technology is costly and challenges the reliability gained with current MDO fuelled plants. The shift towards lower carbon fuels can be achieved with dual fuel combustion, in which a gaseous fuel such as methane (CH₄) (forming the larger part of Liquefied Natural Gas, LNG) is combusted together with a smaller amount of diesel. This technology allows existing power plants to be retrofitted to dual fuel combustion thus assisting the shift towards greener fuels.

The challenges associated with dual fuel operation using LNG and diesel is the narrow engine operating range between misfire and knock and the control during transient operation. Investigative tools such as combustion simulations and experimental testing are used in the present project at University of Malta to support the development of dual fuel technology.

The research group measured the power demand of a Gozo Channel ferry during a typical voyage. The project is making use of a dual fuel engine experimental setup in the UOM Thermodynamics Laboratory to determine performance parameters of dual fuel performance. The experimental data is extended with the use of combustion simulation work to provide insight into the combustion phase.

Development of a Force Measurement System for Cavitating Hydrofoils

Ms Mariana Zammit Munro

Department of Mechanical Engineering, Faculty of Engineering

Cavitation on lifting surfaces such as propellers and ship rudders is a highly destructive phenomenon with serious negative effects on the ship's performance. Therefore, improving the prediction of the forces developed during cavitation is crucial for the design and operation of efficient maritime vessels.

Although considerable progress has been achieved in the area of numerical simulation, independent experimental data is a pivotal element for the validation for numerical techniques (for example, Computational Fluid Dynamics). However, experimental data regarding the effect of cavitation on the hydrodynamic characteristics of hydrofoils is sparse and the data available is limited, particularly due to the challenges attributed to the design of such a measurement device.

To address this niche, an innovative force measurement device capable of determining the hydrodynamic forces on two-dimensional foils in cavitation tunnels was designed. The modular, cost-effective setup was designed to incorporate the testing of multiple hydrofoil types at any angle of attack using custom-built load cells. The development of the force measurement system required the design and testing of robust and durable load cells capable of functioning underwater and in a substantial vacuum for extended periods of time. Moreover, extensive load cell calibration under various loading conditions was carried out prior to the comprehensive testing of the force measurement system.

The experiments were conducted at the cavitation tunnel facility at University of Genoa in Italy, and the hydrodynamic



force results from the innovative device under non-cavitating conditions agreed with theoretical and numerical data. The experimental results pertaining to the developed cavitation stages shed light on the longstanding problem of scale effects in the field of cavitation.

The Potential of a Novel Switchable Glazing Assembly for Glare Control in a Mediterranean Climate

Perit Etienne Magri

Department of Environmental Design, Faculty for the Built Environment

Glare control in office environments is often retrospectively improvised using shading devices. Internal blinds block outward views and increase artificial lighting load during broad daylight. Despite having better energy-performing insulated glazing units (IGUs), visual comfort is perhaps still not being given its due importance particularly in climates with high solar insolation. This presentation discusses a preliminary assessment of the visual performance of a novel glazing assembly comprising of two, independently switchable solar-PDLC (Polymer Dispersed Liquid Crystal) and SPD (Suspended Particle Device) interlayers. Using a scale model representative of a typical indoor space and a luminance photometer, the Daylight Glare Probability (DGP) provided by the different states and positioning of the switchable interlayers are compared to that provided by conventional static glass under identical field test conditions. Comparisons of the visual appearance of the potential combinations of these technologies were investigated to assess the ability of switchable films to instantly convert transparent openings into opaque, wall-like elements. Results indicate that the novel combined switchable glazing assembly not only provides a potential for reducing glare but identifies an additional innovative retrofit application for buildings. The deployment of switchable glazing into an external shading device such as that of an overhang would allow any façade to incorporate a glazed, dynamic device capable of casting a shadow on demand. Besides the potential of retrofitting on existing facades, this concept would encourage the use of less raw material in achieving a controllable level of improved visual environment within an indoor space.



Doctoral Stream 11.1 – 11.5

CHAIR: Prof. Godfrey Baldacchino | VENUE: Lecture Room 202



Leadership and School Self-Evaluation: Building the Relationship Towards School Improvement

Ms Denise Gatt

Department of Leadership and Innovation, Faculty of Education

The propensity to be reflective and strategic in today's educational environment is essential especially in relation to educational leadership. School self-evaluation leading towards development planning is a process which aims at supporting educational leaders in reflecting on their vision for improvement through a consistent exercise of analysis and evaluation. However, is there a clear understanding of how school self-evaluation and development planning processes can be used effectively towards improvement? To what extent do leaders understand the importance of consistency and evaluation in carrying out the process especially considering different contexts and realities? The study discussed in this paper aims at addressing these questions. It discusses findings emanating from an in-depth two-year case study on the role of school self-evaluation and development planning within two primary schools in Malta with special interest in evaluation and how leaders view this aspect of the process. The study aims at looking at possible pitfalls which might be faced by leaders while focusing and reflecting upon ways of how the interaction and synergy between leadership and school development processes might be enhanced towards effective school improvement.

Maltese First Language Acquisition: The Noun Phrase & Elements of Morphosyntax

Ms Michela Vella

Institute of Linguistics and Language Technology

First language acquisition has been studied extensively both in individual languages and cross-linguistically through diverse theoretical frameworks. Yet, research on Maltese First Language Acquisition (MFLA) is lacking. This study seeks to address this gap by investigating the developmental trajectory that characterises MFLA from a morphosyntactic perspective, focusing on nominal inflection and agreement, whilst also considering other morphosyntactic features that develop concurrently.

The research project employs a combined longitudinal and cross-sectional design to capture the language development of Maltese-dominant children aged 18-60 months. Eight children, aged 18-36 months at the study's onset, were recruited and visited 5 times over a period spanning 20-25 months. Both naturalistic data (through free-play) and controlled data (through comprehension and production tasks) were collected during 45-minute video-recorded sessions. The resulting dataset comprises over 30 hours of Maltese child language data, transcribed orthographically and annotated according to established conventions.

Through morphosyntactic analysis, a number of stages in the typical emergence and development of noun phrase morphology are identified from the data alongside other features. Findings are compared to: a) child language acquisition studies of Arabic varieties, which like Maltese are characterised by a hybrid morphology (e.g., Saiegh-Haddad et al., 2012), b) morphosyntactic studies conducted with Maltese-speaking adults (e.g., Nieder et al., 2021), c) bilingual FLA research, in consideration of the bilingual background of the children in this study (e.g., Nicoladis & Marchak, 2011), and d) developmental stages describing FLA of well-studied Indo-European languages, such as English and German (e.g., Brown, 1973).



Redefining Liturgical Ritual Music Beyond Sacred Space

Maestro Christopher Muscat

School of Performing Arts

My DMus project, entitled *Redefining Liturgical Ritual Music Beyond Sacred Space*, consists of a portfolio of three large-scale compositions and a detailed written commentary. The main aim is the creation of stylistically and idiomatically distinct sacred compositions that are deeply embedded in, and influenced by, Catholic tradition (particularly through the use of liturgical texts and chant) combined with extra-liturgical elements (such as the inclusion of humanist, non-sacred, texts or musical styles and instruments that go 'beyond' the Roman liturgy). The commentary attempts to answer important questions about the 'need' to write such works for non-liturgical use or the possible use of a non-sacred spaces (such as the concert hall) for the performance of such works. This project also bridges my two main fields of professional practice: as a composer and as Director of Music of the Metropolitan Cathedral. The use of a traditional musical language of the Roman Catholic Church, which is still very much valid and attractive, as a springboard for the creation of new compositions has led me to employ a chant-inspired compositional language that reaches out to audiences that might not otherwise experience the intensity of the Catholic liturgy, and in performing spaces that are not necessarily associated with divine worship. In so doing, I developed a new notational method that draws freely from past and current practices but depicts more accurately my aesthetic tastes for this work, both on paper and in performance.

Health Data Sharing for Scientific Research Purposes in the Digital Age: Legal, Ethical and Practical Challenges in the European Research Area and Beyond

Dr Roxanne Meilak Borg

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My doctoral research addresses data protection-related challenges in sharing health data for scientific research purposes.

Research on health data has limitless potential and can lead to improved medical treatment, care and healthcare services, thus benefiting both individuals and society as a whole. However, social, technological and legal barriers hinder the use of such data for research. Legally, the EU General Data Protection Regulation (GDPR) and other stringent data protection laws can restrict the free flow of data. Although the GDPR permits certain derogations for research, its implementation is inconsistent across EU Member States, leading to a fragmented legal landscape that impedes data sharing and accessibility. The GDPR additionally renders the sharing of research data with third countries challenging.

The upcoming European Health Data Space (EHDS) Regulation aims to streamline the re-use of health data across the EU, and includes provisions relating to the secondary use of health data for research. However, this law raises many questions, including whether the procedure it sets out for researchers to access data is itself too burdensome and bureaucratic.

This research thus seeks to explore whether the EU's current legal framework adequately balances the public interest in scientific advancement with the protection of individual privacy and data protection rights. The study will explore the notion of public interest, and critically analyse the EHDS, national systems and the GDPR's application, with a view to contributing to a more harmonised approach to the sharing of health data for research that fosters scientific progress



while safeguarding individual rights.

Labour Relations and Democratisation in Transitional Tunisia

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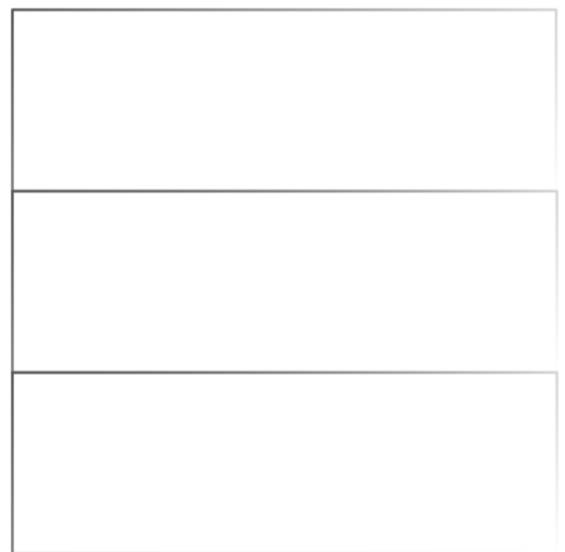
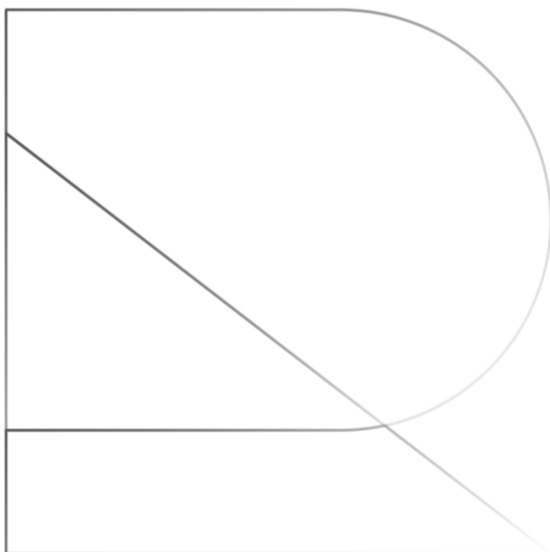
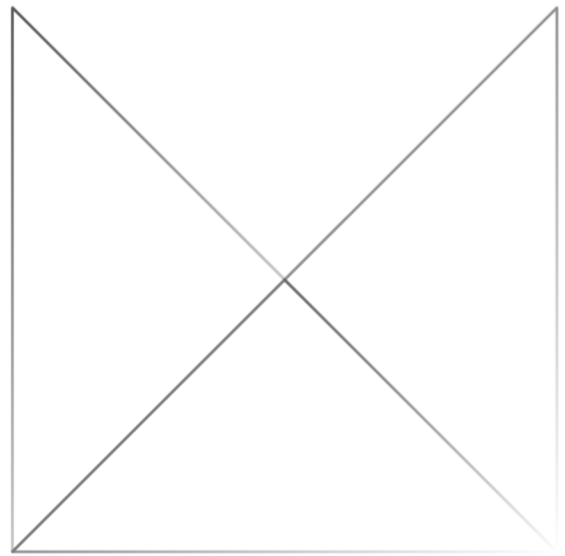
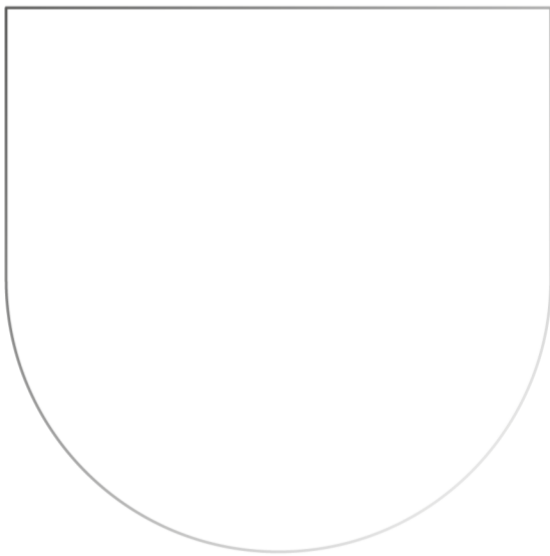
The 2010-2011 Tunisian Uprisings were driven by widespread socioeconomic grievances, concerning – inter alia – unemployment, economic inequality and inadequate labour protections. The Union Générale Tunisienne du Travail (UGTT) played a pivotal role in the revolution and subsequently advocated for comprehensive labour reforms. Despite initial optimism however, Tunisia largely failed to implement substantive labour reforms in the post-revolutionary period. This not only led to several instances of social unrest throughout the transition era, but has also had broader implications for Tunisia's democratic consolidation. Weak democratic responsiveness to labour demands contributed to public disillusionment, progressively eroding trust in the institutional setup of democracy post-2011.

This chapter provides a historical and empirical analysis of Tunisia's failure to improve labour relations in the post-Ben Ali era. It explores the factors that hindered progress, including opposition from business interests, political instability, and the conditions imposed by international financial institutions. The objective is to ascertain to what extent the reluctance of Tunisia's political class to implement labour reforms was driven by external constraints imposed by international economic structures, including international creditors and International Financial Institutions. The overarching aim is to assess how international economic structures affect democratisation and democratic consolidation in Low and Middle-Income Countries (LMICs), using Tunisia as a case study.



Poster Stream

VENUE: VC Theatre



1. Investigating the Effects of Pesticides on the Molecular Biology of the Colon and Colorectal Cancer

Ms Kimberly Fenech

Centre for Molecular Medicine and Biobanking

Pesticides are used in agriculture to enhance crop yield and quality. In 2020, Malta recorded the highest average pesticide residues per sample among EU countries, raising public health concerns. Locally, chlorpyrifos, glyphosate, and deltamethrin are among the most used pesticides, with potential long-term health effects, including cancer. This study investigates whether chronic, low-dose pesticide exposure—reflective of real-world exposure through food and water—alters the biochemistry of the colon and contributes to colorectal cancer (CRC) progression. In vitro models comprising normal colon cells (CCD841) and CRC cell lines (HCT-116, DLD-1, LoVo) were used. Ecologically relevant concentrations (0.1 μ M chlorpyrifos, 5 μ M glyphosate, and 1 μ M deltamethrin) were determined based on residue levels in local produce, acceptable daily intake, and 72-hour cell viability assays. Cells were exposed to these concentrations for two weeks, followed by assessments of cell morphology through microscopy, cell cycle analysis through flow cytometry, and proteomic changes via ELISA, Western blotting, and liquid chromatography-mass spectrometry (LC-MS). To evaluate the effect of pesticide exposure on chemoresistance, cells pre-treated with pesticides were exposed to 5-fluorouracil (5-FU) and the response was compared to untreated cells. Findings indicate no morphological alterations in the treated cell lines. Glyphosate reduced cell division, while chlorpyrifos and deltamethrin promoted cell cycle progression. Chlorpyrifos increased EGFR levels in CCD841 cells but reduced them in CRC cells. 5-FU treatment revealed no differential response in glyphosate-exposed cells. This study contributes to research on cancer prevention, and emphasises the need for comprehensive environmental monitoring to mitigate potential health risks.

2. Lychee Fruit Polyphenols: A Unique Combination Affecting Epithelial-to-Mesenchymal Transition in Colorectal Cancer

Prof. Byron Baron

Centre for Molecular Medicine and Biobanking

Litchi chinensis Sonnerat, commonly known as lychee, is a fruit tree belonging to Sapindaceae family, that grows mainly in China. The lychee fruit contain a blend of components including polyphenols with interesting nutraceutical properties. The most interesting of these are the catechins, which have been shown to have a variety of anti-tumoural properties on a variety of cancers including colorectal cancer (CRC), the most intriguing of which is reduced epithelial-to-mesenchymal transition (EMT). This is of particular interest because the polyphenolic mix found in other plant species such as Perilla (mint) family does not produce such anti-tumoural effects.

The aim of this study was to validate the ability of a specific formulation of lychee low molecular weight polyphenols called Oligonol to decrease CRC cell proliferation and viability, reduce migration potential and alter the expression of markers involved in EMT. Three CRC cell lines (HCT116, DLD1 and Lovo) were cultured and treated with 50 μ g/mL Oligonol for 72 hours, after which viability assays, migration assays and Western blotting for β -catenin, phospho-AKT, and phospho-ERK1/2 were performed.

The data generated will be a useful guide for future explorative HPLC isolations of different polyphenolic components from lychee fruit extracts, in order to identify these anti-cancer compound classes. This would be particularly useful prior to chemotherapy administration or to limit the metastatic potential of tumours. The interaction between such



compounds and signalling molecules within the body opens up novel avenues for creating potent small molecule inhibitors.

3. Functional and Structural Characterisation of Two Novel Protein Phosphatase 2A Isoforms

Ms Abigail Anne Dalli

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

One of the most important post-translational modifications in protein regulatory mechanisms is protein dephosphorylation. Protein phosphatase 2A (PP2A) is an important phosphatase found ubiquitously in cells. It dephosphorylates proteins at serine/threonine residues. These proteins play a major part in signalling and physiological pathways. Medically, PP2A has been implicated in neoplasms where canonically it functions as a tumour suppressor.

Each PP2A subunit consists of diverse members where combinations of the A, B and C isoforms can form various holoenzyme assemblies, providing diverse cellular functions. Abnormal mutations in these subunits or changes in isoform assembly may have detrimental effects on cells. The unexplained deregulation of PP2A in cancer and unknown function of certain emerging isoforms of PP2A subunits, especially the C subunit, highlight the importance of this research. Two novel isoforms of the PP2A catalytic subunit were identified in chronic myeloid leukaemia by Prof. Godfrey Grech's research team (Department of Pathology). These two isoforms have a characteristic exon deletion resulting from a loss in exon 2 forming PP2AC δ 2 and a loss in exon 5 forming PP2AC δ 5. In this PhD thesis, the main objective is to validate the reliability of these isoforms for use as diagnostic/prognostic biomarkers in breast cancer and other cancer types.

4. Radiomics and Radiogenomics in Healthcare as an Aid for Precision Medicine

Dr Elaine Borg

Department of Surgery, Faculty of Medicine and Surgery

Radiomics is an emerging field that leverages advanced imaging analysis and artificial intelligence (AI) to extract quantitative data from breast cancer medical images like ultrasound, mammogram, contrast-enhanced mammography, MRI, CT and PET scans to provide insights into diagnosis, prognosis and potential treatment planning. The integration of radiomics with genomics, known as radiogenomics, links imaging features with molecular characteristics enabling a more comprehensive understanding of tumour biology. Radiomics and radiogenomics show promise in tumour profiling by predicting tumour aggressiveness, treatment response and patient outcomes. We will be looking at key cancer pathways such as the PI3K/Akt/mTOR, MAPK and p53 pathways which regulate tumour growth, resistance mechanisms and metastasis. By analysing these patterns this may allow personalised surgical and oncological treatment. Despite this, there are challenges in standardisation, data integration of multi-modal datasets and clinical validation. Reproducibility needs to be ensured followed by eventual regulatory acceptance for routine clinical use of this data-driven decision making which has the potential to revolutionise medical imaging by enhancing diagnostic accuracy and optimise patient care.



5. Review of Diagnostic Reference Levels in Interventional Neuroradiology

Mr Marvin Grech

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Aim: This study assesses the radiation dose metrics and the methods used to derive them for the purpose of establishing Diagnostic Reference Levels (DRLs – 3rd quartile) in Interventional Neuroradiology (INR).

Materials and Methods: An exhaustive literature search was carried out in four databases – Scopus, Web of Science, PubMed, and Pro Quest—using four principal terms: Air Kerma-Area Product (PKA), Fluoroscopy Time (FT), Reference Air Kerma (RAK), DRLs, INR, and optimisation. Their synonyms were also employed in the searches.

Results: DRLs established in 38 studies for Air Kerma Area Product (PKA), Fluoroscopy Time (FT) and Reference Air Kerma (RAK) were compared. In Cerebral Angiography, the reported PKA ranged between 41Gycm² to 256.65Gycm², FT varied from 6 minutes to 20 minutes, and RAK from 289 mGy to 921 mGy. In Stroke Thrombectomy, the PKA ranged from 110Gycm² to 225.1Gycm², FT ranged between 30 and 45 minutes, whereas the RAK ranged from 730 mGy to 1590mGy. In Aneurysm Coiling, the lowest PKA was 52.1 Gycm² up to 487.4 Gycm², lowest FT 16 minutes and highest 90 minutes, whilst the RAK ranged between 505mGy and 4750mGy. In AVM/AVF embolisation, the lowest PKA was 206.4 Gycm², and highest 550 Gycm², FT between 59 minutes and 135 minutes, and RAK ranged between 2350 mGy and 6000 mGy. Variability among the PKA, FT, and RAK doses that were attributed to differing procedures and types of equipment used, operator experience, and data collection methods were noted. The level of detail and amount of transparency given in radiation dose reporting in the literature referenced were questioned.

Conclusion: Only a few studies have reported the amount of radiation that patients receive during INR procedures, and these studies have not always provided a complete picture. For many procedures, it is vital to know how much radiation exposure is being administered to patients so that quality control can be enacted and so that the "As Low As Reasonably Achievable (ALARA)" principle can be followed. This principle states that the necessary radiation that must be used for a medical diagnosis or treatment should not expose the patient to any more radiation than is absolutely required.

Limitations: This study is a literature review that depends entirely on the data found in the reviewed papers.

6. Sara: Synthetic Anatomy for Radiological Applications – Generating a Functional MRI Phantom

Dr Brandon Seychell | *Co-researchers: Prof. Therese Hunter, Dr Claude J. Bajada*

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Functional magnetic resonance imaging (fMRI) is a crucial tool for understanding human brain function, offering non-invasive insights into cognition and clinical neurological disorders like schizophrenia, Alzheimer's, and epilepsy. fMRI uses fast imaging sequences like echo-planar imaging which are sensitive to the blood oxygenation level-dependent effect associated with neural activity. Applications in fMRI span from diverse aspects of cognition to clinical. However, technical challenges have impeded its clinical utility, particularly in data processing and quality assurance (QA). The reliability and validity of fMRI studies depend on QA protocols' availability. QA protocols typically use physical phantoms for assessing and optimising MRI scanner performance. Physical phantoms are particularly useful for calibrating scanners and designing pulse sequences for fMRI validation.



To address these technical challenges, we proposed the development of brain-mimicking phantoms capable of generating and modifying T2*-based signals, enhancing fMRI reliability. Our approach involves incorporating signal-producing biomolecules into anthropomorphic brain phantoms, a concept absent in current research. We aim to improve signal-to-noise and contrast-to-noise ratios and facilitate early and reliable diagnoses. Through these efforts, we aspire to provide future researchers and medical professionals with a valuable tool while deepening our understanding of fMRI effects. Ultimately, we aim to design more robust tools for future research endeavours, thereby contributing to the advancement of the field.

7. Development of a Clinical Pharmaceutical Service in Long-Term Care

Ms Tresha Formosa

Department of Pharmacy, Faculty of Medicine and Surgery

Background: Older adults often experience drug-related problems (DRPs) due to multiple chronic conditions. Clinical pharmacists play a vital role in optimising medication use and deprescribing in geriatric care, reducing risks and enhancing outcomes.

Purpose: To develop and implement a clinical pharmaceutical service in a residential aged care facility, focusing on better medication management.

Method: The study was divided into five phases. Phase I sees the development of a gap-finding tool to identify areas for improvement in clinical geriatric guidelines. Phase II involved the development of two tools: the 'Pharmacist Patient Profile' for comprehensive reviews and the 'Patient Medication History on Admission' for accurate history-taking. Phase III included clinical pharmacy implementation, such as medication reconciliation and drug advice. DRPs were classified using PCNE Classification V9.1. Phase IV includes the evaluation of the service through the other healthcare professionals via a satisfaction survey. Phase V contains proposals to promote active ageing through better medication practices.

Results: Of the 81 duties listed in the gap-tool, 21 of the duties of a ward-based geriatric clinical pharmacist were not performed at the long-term care facility. Twenty-five patients, with a mean age of 84 years, were recruited in the study, having 89 DRPs and 166 interventions identified by the clinical pharmacist. The most common DRPs were inadequate monitoring (n=18) and dose too high (n=16). Interventions were largely accepted and full implemented (n=128).

Discussion: Integrating clinical pharmacists into elderly care settings enhances deprescribing, minimises polypharmacy, and reduces DRPs. This structured service supports active ageing by improving medication safety and effectiveness.

8. Periodontal Status in Long-Term Care: A Comparative Study in Older Adults With and Without Dementia at St Vincent De Paul Residence

Dr Carmen Caruana

Department of Oral Rehabilitation and Community Care, Faculty of Dental Surgery

Aim: The study compared the periodontal status of older adults with dementia to those without dementia, using oral clinical parameters as key performance indicators, at St Vincent de Paul, a long-term care facility.

Methodology: A three-year clinical longitudinal study was conducted at St Vincent de Paul Long Term Care Facility for



older adults. The study utilised scientifically validated oral health indices to compare the periodontal status of older adults with dementia to those without dementia at the ward level. The sample consisted of 164 older adults during the first visit, 145 during the second visit, and 127 during the third visit.

Results: The study, conducted at the ward level (dementia vs. non-dementia wards), revealed significant differences in clinical parameters. Dementia wards showed greater increases in recession and clinical attachment loss, along with higher bleeding scores ($p < 0.005$), indicating cognitive health's impact on periodontal outcomes.

In non-dementia wards, the mean and median recession in the lower right sextant increased by 0.27mm and 0.87mm, respectively. In dementia wards, these values rose by 1.5mm and 1.46mm ($z = 1.98$; $p = 0.047$), indicating more significant recession in dementia wards over time.

Clinical attachment loss also differed significantly, with a median increase of +0.75 in non-dementia wards and +2.25 in dementia wards. The average clinical assessment loss continued to rise, being highest at the third assessment in dementia wards ($z = 1.98$; $p = 0.034$).

Bleeding scores increased more in dementia wards from visit 1 to visit 3, with changes from 1.23 in dementia wards compared to 0.14 in non-dementia wards ($z = 2.38$; $p = 0.017$). The median total bleeding score was higher by the third assessment in dementia wards. Semi-alert patients exhibited the highest periodontal pocket depths.

Conclusion: These findings highlight the complex factors affecting periodontal health in older adults based on cognitive health status. Understanding these factors is essential for creating targeted interventions to improve periodontal health in older adults with dementia. The study demonstrates the effectiveness of using periodontal indices as performance metrics, revealing a trend of worsening periodontal health among dementia patients.

The research underscores the need to identify service delivery gaps and assess performance in long-term care facilities for older adults. Implementing key performance indicators (KPIs) is crucial for monitoring healthcare environments and promoting regular oral care. This study supports the use of Periodontal Indices as KPIs to track progress toward oral health goals, essential for evaluating and improving the quality of care for dementia patients in long-term care settings.

9. Ethical Issues Associated with Assistive Technologies for Persons Living with Dementia and Their Caregivers – A Systematic Review of Reviews

Dr Anthony Scerri

Department of Nursing, Faculty of Health Sciences

Assistive technologies (AT) hold significant potential to enhance the quality of life for persons with dementia and their caregivers by addressing key concerns related to safety, independence, and social inclusion. Although ethical issues surrounding the design and use of AT have been explored in various studies, no comprehensive systematic review of reviews has been conducted to synthesise the existing evidence on these issues. This review aims to categorise the ethical issues associated with AT for persons with dementia and their caregivers using established ethical principles, while also examining factors shaping the ethical debate on their design and implementation. The study was conducted across nine databases and included reviews published in the past 20 years that substantially addressed ethical considerations. Data synthesis followed the framework synthesis approach developed by Carroll et al. (2011). Out of 509 identified records, 15 reviews focusing significantly on ethical issues were included in the analysis. Findings revealed key ethical issues, including maintaining autonomy, respecting privacy, and addressing equity and accessibility. While AT demonstrate potential in enhancing safety and independence, concerns about surveillance, depersonalisation, and stigmatisation persist. The ethical debate is shaped by contextual, philosophical, temporal, and geographical factors,



including varying stakeholder priorities, the fluctuating nature of dementia symptoms, diverse approaches to dementia care and ethics, cultural differences, and the implications of future technological advancements. This review underscores the complexity of ethical issues related to AT for dementia care and how these identified factors inform the ethical design and their use for persons with dementia and their caregivers.

10. Pharmacist-Led Thyroid Point-of-Care Testing

Ms Mariah Vella

Department of Pharmacy, Faculty of Medicine and Surgery

Pharmacist-led point-of-care testing (POCT) supports evolution of the provision of clinical pharmacy services in primary care settings and can contribute to timely patient management including referral for further investigations. The aim was to establish a framework for pharmacist-led thyroid POCT.

The method consisted of: i) Validating a thyroid POCT kit by comparing it to a laboratory-based method (20 participants), ii) Developing a framework for pharmacist-led thyroid POCT, and iii) Feasibility testing of the developed framework in a community pharmacy (50 participants). Inclusion criteria were participants taking levothyroxine or medications which may alter Thyroid-Stimulating Hormone (TSH) levels.

The qualitative TSH Rapid Test Cassette (AcroBiotech), with a sensitivity of 5µU/ml and providing results in 10 minutes was selected following appraisal of kits available. Concordance between the POCT kit and laboratory-based method was 95% ($\kappa=0.773$). The developed framework consists of a data collection tool which examines risk factors associated with hypothyroidism and medication management, an action plan intended to standardise patient advice according to test results, and a leaflet providing information related to hypothyroidism. From the 50 participants assessed (40 female, mode age 45-54 years $n=18$), 15 participants were identified to have hypothyroidism; 10 were already being treated for hypothyroidism, indicating nonadherence or dosage insufficiency, while 5 were taking medication which may alter TSH levels.

Through this study, a POCT kit that is suitable for use within a framework for community pharmacist-led assessment of hypothyroidism in a collaborative care context was identified. The framework can support pharmaceutical service development in the primary care setting.

11. Surface HLA-DR Dynamics and Functionality of Monocytes in Pneumonia-Induced Sepsis

Ms Emma Hunter

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Sepsis-induced immunosuppression is a major concern in critically ill patients, and one of the hallmarks of this phenomenon is the decreased expression of the human leukocyte antigen (HLA)-DR on antigen-presenting cells, such as monocytes.

This study aimed to investigate the relationship between HLA-DR expression on monocytes and their cytokine production abilities in patients with sepsis.

Conducted as part of the MENDSEP project at Mater Dei Hospital, the research involved 14 sepsis patients and 16



age- and sex-matched controls. The sepsis patients were over 18 years old, suffering from either hospital or community acquired pneumonia. Monocytes were isolated from blood samples and analysed using flow cytometry for CD14 and HLA-DR expression. After exposure to *E. coli* lipopolysaccharide (LPS), the levels of IL-1 β were measured.

The results demonstrated that monocytes from septic patients exhibited significantly reduced levels of CD14+ HLA-DR+ expression and produced less IL-1 β compared to the control group. A direct correlation was established between HLA-DR expression and IL-1 β production in both sepsis patients and controls. These findings highlight the potential of HLA-DR as a biomarker for detecting immunosuppression in sepsis and suggest that monitoring HLA-DR levels could inform therapeutic strategies.

12. Whole Genome Sequencing Reveals the Involvement of Novel Genes and Variants in Familial Osteoporosis

Ms Chanelle Cilia

Department of Applied Biomedical Science, Faculty of Health Sciences

Osteoporosis is a silent skeletal disease with a strong genetic background. The study aimed to identify causal gene variants in a family with osteoporosis and fragility fractures. A three-generation pedigree of seven relatives (aged 27 to 87) was recruited of whom five had osteoporosis or low bone mass, including three with a fragility fracture history. The proband had a femoral neck T-score of -2.6. Whole genome sequencing was performed on five individuals using the Illumina NovaSeq6000 platform. Data was analysed by comprehensive stepwise filtering strategies and multiple in silico tools to evaluate the potential causality of the shortlisted variants which were subsequently validated by Sanger sequencing. Gene variant filtering following a dominant inheritance pattern shortlisted three missense variants having an alternative allele frequency of $\leq 1\%$ in Non-Finnish Europeans from gnomAD, classified as 'variant of uncertain significance' by the ACMG/AMP guidelines, and predicted to be deleterious by multiple in silico software. PDK4 c.878A>T (p.Asp293Val; rs913394387) is located in the histidine kinase domain that is involved in ATP binding and protein phosphorylation, playing an important role in downregulation of sclerostin. In silico protein modelling predicted the amino acid change to be structurally damaging. TNFRSF10B c.4486C>T (p.Pro173Arg; rs778130882) is found in between two domains; the coiled coil structure and EGF-like 1 domain and causes protein structural damage due to expansion of surface cavity. FN1 c.518C>G (p.Arg1496Trp; rs139078629) is present in fibronectin type III domain which is critical for cell migration and adhesion via integrin binding and necessary to support the assembly and organisation of the extracellular matrix. Findings suggest that the shortlisted variants, alone or in combination, may contribute to osteoporosis and fragility fractures, which nonetheless require further functional validation. The coding proteins interact through TNF- α signalling which promotes bone resorption and mediates inflammatory responses underlying bone disease.



13. Mapping Next Generation Sequencing Reads to Genes with Highly Homologous Regions

Mr Dimosthenis Tzimotoudis

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Next generation sequencing (NGS) has revolutionised genetic diagnostics thanks to the possibility of rapid, low-cost sequencing of whole genomes or selected parts. The technique generates millions of short reads, typically around 150 nucleotides in length. Then, for each read, its gene of origin is found by comparing the read's sequence to the genome of an average healthy human. Differences between the sequence of the read and the reference genome indicate genetic mutations.

While this technique can be used to analyse the majority of the human genome, many medically important mutations remain difficult to reliably detect. One of the reasons is that the sequences of some genes are highly similar to other parts of the genome, a phenomenon referred to as sequence homology. A notable example is pseudogenes, non-functional copies of the gene of interest. When a gene has highly similar pseudogenes, the exact placement of the reads is ambiguous – the reads match both the gene and the pseudogenes equally well.

Our group is working on improving the precision of mapping short reads to genes which have highly similar pseudogenes. Our aim is to identify the reads which can be mapped with a high confidence and separate them from reads with ambiguous placement. This way, we can have a high degree of certainty that the reads that indicate a genetic mutation really come from the gene of interest rather than from the highly similar pseudogenes. This can potentially improve the accuracy of diagnostics of multiple important genetic diseases.

14. The Contribution of Signal Detection in Promoting Safety, Quality and Efficacy of Medical Devices

Mr Luca Galea

Department of Pharmacy, Faculty of Medicine and Surgery

The safety, quality, and efficacy of medical devices are crucial to advancing patient care and public health. Existing methods for signal detection and management, vital for identifying potential safety concerns, encounter challenges such as variability in data collection, a lack of standardisation, and biases in reporting practices. This research aims to explore the role of signal detection in medical device vigilance, with a focus on its contribution to promoting safety, quality and efficacy, and optimising the benefit-risk profile of these devices. The research adopts a multi-phase methodology encompassing scenario analysis of signal detection and management practices, establishment of standardised definitions of signal detection, and the development of a structured framework for signal management. The research addresses critical knowledge gaps, including the underreporting of incidents and the lack of harmonisation across regulatory authorities. The research will strengthen regulatory policies and guide industry stakeholders in adopting best practices for addressing safety concerns. Expected outcomes include strengthening signal detection and management practices through evidence-based approaches, improved medical device regulations, and innovative courses on signal detection and management will be presented. By establishing a robust, scientifically validated framework for signal detection, this research seeks to mitigate risks associated with medical devices, ensuring their safe and effective use while enhancing patient outcomes. This research contributes to the field of regulatory sciences by addressing the challenges of medical device surveillance, offering innovative solutions to foster a safer and more effective healthcare system.



15. Clinical Investigations for Medical Devices in Small Member States

Ms Shirley Tanti

Department of Pharmacy, Faculty of Medicine and Surgery

The ever-growing medical devices market size and the need for harmonisation of the clinical investigation processes across member states, form the basis of the research. This research aims to establish a state of the art of a clinical investigation hub in a small member state enabling the development of medical devices on the market. The research will follow a mixed method study; phase one determines differences in the assessment of medicines clinical trials and medical devices clinical investigations through literature review; phase two analyses the challenges observed to conduct clinical investigations through focus group discussions; phase three identifies the competences and responsibilities involved in performing clinical investigations; phase four determines the lacunae in the design of the clinical investigation by investigating a sample of thirty incident reports of medical devices received by the Authority through focus group discussions; phase five evaluates literature review to optimise guidelines in relation to clinical investigations to stakeholders; and phase six analyses the feasibility of setting up a clinical investigation's hub for the purpose of training, education, research, and intelligence. The deliverables of the research are to improve the timely efficiency and reduce challenges related to clinical investigations; strengthen the regulatory portfolio of the competent authorities; encourage collaboration and sharing of expertise; decrease the amount of incident reports; and promote harmonisation in the interpretation of the regulations. The hub will adopt an innovative ecosystem which ensures accessibility and availability of safe, effective and quality medical devices as per 'intended-use' for patients and healthcare professionals.

16. Regulatory Oversight of Patient Safety in Medical Devices

Ms Audrey Cachia

Department of Pharmacy, Faculty of Medicine and Surgery

Background: The growing dependency on medical devices and in vitro diagnostic technologies is providing significant benefits in healthcare, but also necessitating market regulation to safeguard patient safety.

Purpose: The aims were to identify gaps in medical device patient-centred regulatory sciences, and to develop a post-market surveillance framework to ensure patient safety.

Method: The methodology design consisted of three phases. Phase I focused on identifying global procedures for the oversight of post-market surveillance and vigilance. A data collection tool was validated and disseminated to European regulatory experts. Evaluated observations from Phase I guided development of a regulatory framework in Phase II. Phase III consists of pilot testing the framework on a sample of incident reports from the Malta Medicines Authority database. Insights into opportunities, weaknesses, and risks will guide further framework refinement.

Results: Phase I identified 5 key areas where patient-centric regulatory gaps exist, forming the 5 domains of the data collection tool: (a) regulatory resources, (b) incident reporting, (c) legal requirements on legacy and custom-made devices, (d) recall process, and (e) artificial intelligence integration in surveillance and vigilance regulation.

The framework developed in Phase II maps the processes that ensure safety and performance of devices across risk classes, and outlines responsibilities of stakeholders involved in post-market surveillance and vigilance. Risk mitigation measures, including field safety corrective actions and recalls, are defined.



Discussion: The developed framework is intended to serve as a resource for regulatory authorities to overcome challenges encountered in the oversight of patient safety in medical device regulatory sciences.

17. Capacity Building in Medical Device Regulatory Inspectorate

Ms Julia Catania

Department of Pharmacy, Faculty of Medicine and Surgery

Harmonised inspection strategies of medical device economic operators are considered as one of the arms of market surveillance activities within the 2017 medical device regulations, which came into effect in 2022.

The aim was to establish a capacity-building framework for medical device regulatory sciences within European National Competent Authorities (EU NCAs), presented as a structured guidance document.

A literature analysis to determine the regulatory challenges encountered by economic operators in the current medical device scenario was completed. A validated questionnaire was disseminated to medical device regulatory inspectors. Observation sessions of joint inspections of EU-based manufacturers (JIMs), as part of Work Package 6 of the Joint Action Market Surveillance (JAMS) Programme, were conducted. Inspections of local distributors and importers were also performed. A capacity-building framework was developed and validated.

Regulation changes and the application of transition periods were the main challenges identified in the literature. Twelve EU NCAs answered the questionnaire. Human resources (n=7) and established training programs for inspectors (n=5) were the key gaps identified. During the JIMs (N=2) and local inspections (N=3), 'major' non-compliances were identified within the quality management system, such as insufficient documentation control (n=4). The framework developed includes the sections: (i) outline of core competencies, (ii) role specific activities, (iii) technical expertise and (iv) training objectives.

The developed and validated capacity-building framework serves as a template for regulatory bodies state of the art inspections. The expertise and core competencies required for inspectors' skills were identified in this study, which shows excellence beyond previously published literature.

18. Crisis Preparedness and Management in Pharmaceutical Scenarios

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Crisis management and preparedness strategies are critical in pharmaceutical scenarios, ensuring reliable delivery of essential medicines to patients while maintaining adherence to regulatory standards. The complexity of the pharmaceutical supply chain with its numerous stakeholders increases the likelihood of emergencies disrupting the flow of product through the supply chain. The aim is to investigate crises scenarios in pharmaceutical processes, specifically distribution, regulatory science, and community pharmacy. Two focus groups are conducted to evaluate i) crisis scenarios in pharmaceutical distribution and community pharmacy, ii) the role of National Competent Authorities, iii) lessons learnt from past crises. Two questionnaires were developed, validated and disseminated to pharmacists working in community pharmacy and pharmaceutical distribution. Crisis preparedness and management strategies are designed and validated. A risk management plan based on analysis of findings from the focus groups and questionnaires



is developed. Crises in pharmaceutical scenarios include unforeseen and severe adverse drug reactions, medicine shortages, medical product or device failure, product falsification, new information negatively impacting a product's safety profile, medication errors, and sudden regulatory changes. Pharmaceutical scenarios and supply chains may also be vulnerable to externally occurring crises such as pandemics, natural disasters, and geopolitical instability. Regulators have an important role in consequence mitigation of crises. Effective crisis preparedness and management in pharmaceutical scenarios require a proactive approach, continuous improvement, and collaboration across the industry. By prioritising these elements, pharmaceutical stakeholders can better navigate crises and ensure the safety and wellbeing of patients.

19. Digital Health Competences for the Health Workforce

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Background: Digital health technologies have the potential to transform healthcare by improving efficiency and patient outcomes. However, successful implementation depends on healthcare professionals possessing the necessary competences. This systematic review aims to consolidate evidence on digital health competence requirements across different healthcare fields.

Method: Databases, including MEDLINE, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, Cochrane Library, Scopus and ProQuest were searched. There were no limitations on study design. To ensure specificity and manage the research scope, the literature search focused on English-language publications and those conducted before January 2014, considering the rapid advancements in digital health.

Results: A total of 4,417 titles have been identified through database searches. After the initial title and abstract screening, 404 articles met the inclusion criteria for full-text review. The inclusion studies primarily focus on frameworks, models, or standards related to digital competences in healthcare. Screening is ongoing, with further analysis planned to identify key themes and competency domains.

Discussion: The initial screening process highlighted the importance of selecting appropriate keywords, as variations in terminology affected the retrieval of relevant studies. Most articles identified present lists of competences rather than structured frameworks, suggesting a potential gap in the literature. Including grey literature in the next phase may help uncover additional frameworks that are not well represented in peer-reviewed research.

Conclusion: The findings from this review can serve as a first step in guiding digital health training initiatives by identifying key competences in healthcare from existing literature.

20. The Development of a Quality Assurance Signal Analytics Framework

Ms Valentina Sammut

Department of Pharmacy, Faculty of Medicine and Surgery

Background: The concept of regulatory science has been coined to provide scientific knowledge and intelligence for informed decision-making by regulatory, statutory and jurisdictional bodies. The contemporary upsurge of regulatory sciences, transnational pharmaceutical markets, advanced healthcare technologies and the cumulative intricacy of



supply chain networks has emphasised the need for collaborative interfaces amongst regulatory agencies, systems and infrastructure.

Objective: Development of a Quality Assurance Signal Analytics Framework (QASAF).

Methodology: Quality improvement forms (QIFs) were systematically analysed, and data was consolidated in a tabulated format, featuring four criterion-based rows: QIF reference number, root cause identification, listing of positive and negative signals along corresponding principles, and assignment of Likert scale values. Signals were aligned with principles inspired from established frameworks, such as ISO9001. A four-column criterion framework guided the selection of relevant principles, encompassing the organisational quality assurance ethos, thematic principles, characteristics, and Likert scale integration.

Results: The QASAF is constituted of two components: the Systematic Quality Signal Extraction Framework (SQSEF) for data analysis and the Principle-Based Signal Alignment Framework (PBSAF) for thematic analysis and integration of the Likert psychometric scale. This dual-structured tool facilitates the systematic extraction and alignment of quality signals within regulatory contexts.

Conclusion: The QASAF utilises the element of the signal as a mechanism to direct conscious effort throughout the evaluation process, thereby ensuring an evidenced-based approach. The QASAF serves as a visual and analytical tool for researchers and regulatory professionals in navigating pharmaceutical regulatory signals. This framework supports the identification of organisational opportunities and risks, ultimately contributing to informed decision-making and enhanced regulatory practice.

21. Taming Wicked Problems with Artificial Societies

Mr Gian Paul Gauci

Department of Policy, Politics and Governance, Faculty of Economics, Management and Accountancy

Wicked Problems represent extremely complex social and policy challenges characterised by their resistance to conventional solutions. Researchers have identified issues such as climate change, poverty, criminality, and land appropriation as wicked problems, noting their intractability due to both inherent complexity and conflicting stakeholder perspectives. These challenges are further complicated by political incentives that favour short-term victories over comprehensive, multi-tiered solutions. Key characteristics of Wicked Problems include the impossibility of trial-and-error approaches and the absence of immediate remedies.

However, recent advances in agentic AI and Large Language Models (LLMs) have enabled the development of sophisticated artificial societies. These virtual environments, populated by autonomous AI agents capable of independent reasoning and decision-making, offer promising new approaches for analysing complex social dynamics. This project presents a framework for addressing Wicked Problems through artificial societies, detailing the required inputs (agents, rules, and environmental parameters), processing mechanisms, and anticipated outputs. The methodology involves systematic policy testing within these virtual environments, leveraging agentic AI's capacity for emergent behaviour and strategic interaction. This novel approach promises to revolutionise policy design by facilitating the development of robust, adaptive strategies that can address the complexities of our most challenging societal problems.



22. The Impact of Large Language Models on Adaptive Educational Frameworks

Mr Andrew Emanuel Attard

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The integration of Artificial Intelligence (AI) into education is redefining how instructional content is developed and personalised. This study investigates the transformative role of Large Language Models (LLMs), such as GPT-4, and Intelligent Tutoring Systems (ITS) in automating the generation of adaptive, high-quality educational materials. Traditionally, content creation imposes significant time and effort constraints on educators, diverting focus from individualised student interactions. By leveraging state-of-the-art transformer architectures, LLMs streamline content generation, creating diverse resources—such as quizzes, study guides, and interactive exercises—and demonstrating a 96% accuracy rate, effectively addressing common challenges such as hallucination.

The practical significance of integrating LLMs lies in their ability to reduce the workload of educators while enhancing instructional quality. For example, educators can rapidly generate tailored lesson plans aligned with individual student needs, facilitating differentiated instruction. Theoretical contributions include demonstrating the effectiveness of deep learning-based LLMs in improving scalability and inclusivity in educational frameworks. Surveys conducted during this study reveal an 85% likelihood of adoption among educators, underscoring strong interest in AI-driven tools to optimise teaching workflows.

However, ethical considerations are critical. The risk of bias in AI-generated content could perpetuate inequalities, while concerns about data integrity necessitate robust mitigation strategies, such as diverse training datasets and transparent auditing mechanisms.

This research positions LLMs and ITS as tools that complement rather than replace educators, allowing them to prioritise critical tasks such as fostering meaningful student engagement. Ultimately, AI's integration into education offers scalable, dynamic, and inclusive solutions to address the evolving demands of 21st-century learning environments.

23. The Impact of a Growth Mindset Intervention on Chemistry Students' Educational Trajectories

Ms Louise Gafa'

Department of Mathematics and Science Education, Faculty of Education

This qualitative longitudinal study examines the transformative potential of a growth mindset intervention in enhancing the motivation, confidence, and resilience of chemistry students navigating critical educational transitions after the end of secondary school. Rooted in my extensive teaching experience, the research seeks to address the challenges that often lead to disengagement from chemistry education by fostering a mindset shift among students.

Targeted at Year 11 students, the intervention challenges fixed mindset beliefs—such as equating low performance with a lack of innate ability—by encouraging students to reflect on their learning journeys, redefine obstacles as opportunities for growth, and express these insights through guided writing activities. The study tracks 20 participants over four years, spanning their transition from secondary school to post-secondary and tertiary education. Data is collected through pre- and post-intervention questionnaires, four annual semi-structured interviews, and reflective journal entries.

Using thematic analysis and a reflexive narrative approach, preliminary findings reveal a notable shift in students' self-



perceptions, with increased self-efficacy and a more optimistic outlook on their ability to succeed in chemistry. Emerging themes suggest that adopting a growth mindset can play a pivotal role in students' persistence with the subject, even when faced with challenges.

This research fills a gap in qualitative literature on chemistry education transitions and underscores the value of psycho-social interventions in supporting STEM retention.

24. Addressing Linguistic Diversity in Malta: Teacher Education and Classroom Pedagogy in Early and Primary Education

Dr Rosienne Camilleri | *Co-researchers: Dr Charmaine Bonello, Dr Josephine Deguara, Prof. Josephine Milton, Dr Tania Muscat*

Department of Early Childhood and Primary Education, Faculty of Education

The Early Childhood and Primary Education Research Group (ECPE Research Group), of the Department of Early Childhood and Primary Education, was awarded University of Malta Excellence Research Funds (2024-2026) in the research category of Social Sciences and Education to support this research project.

This project seeks to create understanding and awareness, as well as generate new knowledge, about the linguistic scenario in local Maltese schools, at early and primary education levels. The concept idea of this study stems from global mobility trends which brought about increased linguistic diversity. In State schools 21% of students are non-Maltese (NSO, 2024) and 28.1% of the population in Malta being non-Maltese (NSO, 2024), the need to bring to light the current language and literacy diversities in local schools is pressing.

Through triangulation of the data collected (research in progress) the study aims to answer the following research question:

Where does Malta stand at the intersection between teacher education, classroom pedagogy and linguistic diversity in early and primary education?

To work towards the aims of this project data is in the process of being collected through a mixed methods investigation as follows:

- i) a systematic literature review;
- ii) a comparative analysis of policy documents and teacher training;
- iii) a pre-service and in-service teacher survey; and
- iv) qualitative teacher narratives.

Thus, the project aims to provide stakeholders with a snapshot of the local situation and explore how in-service and pre-service educators are navigating linguistic diversity in their everyday practice with learners in early and primary education.



25. The Effectiveness of Podcasts in Enhancing Students' Foundational Knowledge Compared to Traditional Reading Materials

Dr Justin Lee Mifsud

Department of Nursing, Faculty of Health Sciences and Faculty of Dental Surgery

Introduction: Although students are given reading materials to prepare for classes, many do not engage with them. This lack of preparation limits their understanding and readiness for class discussions and activities. A podcast format might be more engaging and accessible, possibly leading to better retention of foundational knowledge (Back et al., 2017).

Aim: The study evaluates whether a podcast can more effectively improve students' foundational knowledge on a topic than traditional reading materials.

Method: Students from different departments, including Nursing, Dentistry, Podiatry, and Midwifery, will be randomly assigned to the intervention or control group. Those randomly assigned to the intervention group will receive a podcast, while those in the control group will only have access to a reading source. A pre-test and a post-test will be conducted in both groups to assess knowledge acquisition.

Discussion: The expected outcomes and interpretation could include podcasts being more effective for foundational learning. Also, there could be no difference between groups, which indicates that content format (audio vs. reading) may not impact knowledge acquisition. Another possibility would be higher scores in the Reading Group, which suggests that traditional reading could provide more profound engagement with foundational material.

26. The Economic Implications of the EU Labour Migration Framework for Low and Medium-Skilled Migrants in the Central Mediterranean Region

Ms Kailyze Attard

Institute of European Studies

The Central-Mediterranean region is a pivotal nexus for both regular and irregular economic migration. Existing research on labour migration reflects narrow economic perspective rooted in neoclassical frameworks, neglecting the complex interplay of sociological, demographic, and political factors that shape international migration. Furthermore, most empirical datasets disproportionately focus on legal migration inflows to OECD countries, excluding the critical role of unauthorised labour migration and limit research to countries which are members of the organisation.

This research seeks to investigate the economic implications of low- and medium-skilled migration in the Central-Mediterranean region through the lens of the European Union's labour migration framework. The research explores three interconnected questions: (1) How does the EU labour migration framework affect the entry and employment prospects of low- and medium-skilled economic migrants? (2) Is there a link between legal avenues between the legal avenues for low and medium skilled migrants and irregular migration in the Central-Mediterranean region? (3) What are the labour market implications of low and medium-skilled economic migration on receiving states?

Using a mixed-methodology approach that integrates economic analysis with sociopolitical and demographic perspectives, this research seeks to examine the effectiveness of existing EU migration policies in fostering inclusive and sustainable labour markets for low and medium-skilled migrant workers. It also evaluates how legal and irregular migration channels interact, shaping regional migration dynamics. This research aspires to contribute to a more nuanced understanding of the economic and policy implications of migration, informing future labour migration frameworks that balance economic efficiency with human dignity.



27. Exploring Institutional Design: Intersections of Institutional Theories

Dr Myrna Azzopardi

Department of Policy, Politics and Governance, Faculty of Economics, Management and Accountancy

Institutional theory provides a powerful lens to examine the importance of public institutions and their effect on society. Institutions, understood as both formal structures and informal norms, operate within interconnected frameworks often marked by conflict and transformation.

The presentation will delve into the development of new institutionalist theory which emerged in the 1970s and explored how institutions interact with and shape individual and collective preferences. Three key branches emerged: historical institutionalism, sociological institutionalism, and the rational choice model. Over time, further specialisations like constructivist and discursive institutionalism developed, focusing on ideas and discourse as drivers of institutional change.

This evolution in institutional theory highlights the shift from static, structure-driven perspectives to dynamic, idea-centred and actor-influenced approaches, providing a richer understanding of how institutions are formed, maintained, and transformed over time.

Finally, the presentation will look at issues of institutional design and change. Through an actor-centred approach, the theory of institutional work examines the deliberate efforts individuals undertake to shape institutions, shedding light on micro-level practices and their broader societal impact. Complementing this perspective, the theory of institutional logics considers the broader cultural, material, and symbolic foundations of institutions, identifying patterns of behaviour and belief that govern societal orders such as markets, professions, and states.

This presentation synthesises insights from both approaches, examining their theoretical convergence and divergence. Building on debates by scholars such as Zilber and Hampel, it highlights how institutional logics can frame the strategies actors use in institutional design.

28. The Relationship Between Leadership Skills and Human Resource Management Practices: A Systematic Review

Ms Elaine Vella

Department of Business and Enterprise Management, Faculty of Economics, Management and Accountancy

The theoretical frameworks based on the 'Upper Echelons Theory' and the 'Attention Based View' indicate that there is a link between leader cognitions and the adoption of management practices. However, the mechanism of the relationship remains unclear. Addressing such gap in literature to uncover the drive towards the choice of management practices is critical for businesses to thrive in the dynamic and unstable environments they subsist. Thus, the aim of this study is to shed light on the relationship between the two variables. More specifically between leadership skills, the knowledge structures leaders acquire through experience and education, and human resource management (HRM) practices; the cornerstone of any organisation since they enhance employees' performance, connects them with the firm's strategic direction and towards the achievement of the company goals.

The dynamics between the variables will be determined through a Systematic Review (SR) by conducting searches in databases such as ProQuest, ScienceDirect, and Scopus. Search terms will include Leadership Skills, and HRM Practices and studies will only be included if they refer to both variables.

This research will provide insights on the mechanisms linking skills to HRM practices contributing to theoretical



discussions about the influence of leadership skills on the choice of management practices and providing future direction to advance this subject further. It will also have significant practical implications for organisations providing awareness on best practices, recommending and guiding improvements on decision making and directing business policies.

29. An Instrumentation System for the Characterisation of Borehole Discontinuities

Mr Brian Azzopardi

Department of Electronic Systems Engineering, Faculty of Engineering

3D-scanning technology is commonly applied to the field of geotechnical engineering, where rock outcrops are scanned, often remotely using aerial vehicles, with the aim of detecting and assessing rock mass discontinuities. Capturing 3D point clouds from pre-drilled small-diameter boreholes to investigate rock mass discontinuities, still presents a research gap. A prototype instrumentation system capable of recording internal borehole geometry in the form of 3D point clouds was developed and deployed. This yielded datasets that needed to be analysed to detect rock mass discontinuities, and subsequently characterise them by primarily estimating discontinuity metrics including the location of each discontinuity along the borehole axis, their orientation and their aperture.

A process to estimate these discontinuity metrics from point cloud data acquired by the downhole electronic instrument is presented. Acquired data undergoes pre-processing, that includes the organisation of points in a 3D space and denoising. Pre-processing is succeeded by post-processing steps that include segmentation to divide a point cloud into distinct clusters potentially representing a rock mass discontinuity, and feature extraction to estimate discontinuity metrics, primarily through discontinuity plane fitting. Various established segmentation techniques were considered to reliably select points for discontinuity metric estimation.

The presented process, in conjunction with the developed downhole instrument, successfully led to borehole-derived estimations of rock mass discontinuity metrics that may be used to represent discontinuity planes on stereonets. Preliminary trials suggested that user intervention, particularly in segmenting and merging clouds, may be inevitable given the inherent heterogeneity of point clouds obtained from boreholes. Methods of visualising and validating results are still in progress.

30. Detecting Areas of Geological Interest in Boreholes

Ing. Gabriella Muscat

Department of Electronic Systems Engineering, Faculty of Engineering

Excavation projects often face instability due to unpredictable rock mass discontinuities. Understanding these geological features is crucial for ensuring structural safety and optimising excavation strategies. Traditional borehole investigations are highly time-consuming and often lack sufficient information for detailed geological assessment.

The presented research forms part of a multi-disciplinary project that introduces an innovative approach to characterising rock mass discontinuities. A deployment system was developed for an electronic 3D high-resolution scanning instrument to analyse borehole walls. However, the probe and deployment system testing revealed that the 3D scanning process is excessively time-consuming. This inefficiency highlights the need for a more targeted approach to improve data collection and reduce scanning time. A pre-scan algorithm utilising the instrument's integrated normal



vision camera and computer vision techniques was developed to detect areas of geological interest in borehole walls. Additionally, the algorithm generates a detailed borehole depth map that pinpoints the location of these identified regions of interest. Expert validation is being conducted to confirm the algorithm's reliability and accuracy in identifying key geological features in different geological conditions.

The next phase focuses on transforming borehole imagery into a flattened 2D representation of the borehole wall, aiding in identifying and characterising rock mass discontinuities. Using image unwrapping techniques, raw borehole images captured by the normal vision camera will be converted into 2D visualisations. These images will complement the 3D point cloud, allowing for a more comprehensive geological interpretation. Integrating these approaches will achieve more accurate characterisations of discontinuities, leading to improved and faster geotechnical assessments.

31. Second Life of Electric Vehicle Batteries for Sustainable Energy Solutions

Mr Antonis Theofanous

Department of Electrical Engineering, Faculty of Engineering

The widespread adoption of electric vehicles (EVs) has intensified concerns regarding the management of end-of-life battery packs (BPs). Without a structured disposal, recycling or reuse framework, decommissioned EV BPs present both environmental risks and economic challenges. In Malta, where no formal strategy exists for sustainable battery waste management and regulatory oversight, the issue is becoming increasingly urgent. The ReUse project aims to bridge this gap by developing an innovative methodology to extend the operational life of decommissioned EV BPs through repurposing, thereby converting the growing environmental burden of electronic waste into a valuable energy storage asset. Research indicates that more than 80% of the individual cells within retired EV BPs retain at least 70% of their original capacity, making them well-suited for secondary applications in energy storage.

Objectives of the ReUse Project:

- Developing standardised assessment protocols to evaluate the state of health (SoH) of discarded EV BPs and establish a reliable system for collecting, analysing, and organising data
- Designing a modular and adaptable Battery Management System (BMS) to facilitate the seamless integration of repurposed BPs into non-automotive applications
- Demonstrating feasibility through pilot studies in photovoltaic (PV) energy storage and portable power solutions

By leveraging the remaining capacity of battery cells, the ReUse project seeks to enhance environmental sustainability, promote resource efficiency, align with Malta's goal for a circular energy economy, and reinforce the shift toward a low-carbon and greener future.

32. Enhancing the Contribution of Residential Battery Storage Systems

Prof. Cedric Caruana

Department of Electrical Engineering, Faculty of Engineering

Aggressive targets for decarbonisation have been set by numerous nations in the combined effort to combat climate change. One of the primary action strategies is increased uptake of renewable energy, where various grants and feed-in tariffs for rooftop photovoltaic systems are offered across the world. As the photovoltaic system prices fell and the



tariffs dropped, self-consumption of the generated energy gained popularity. The installed capacity of residential battery systems consequently grew, with Europe expected to lead in distributed system capacity. Recently, increased energy security became another important feature of the residential battery systems. The operation of the battery inverter is directed by a control strategy which faces considerable uncertainty in operating conditions. Inverter manufacturers revert to simple control strategies to maintain high versatility of their products. The ACTUATE project seeks to understand the performance of current systems and proposes a tiered approach for boosting the operating strategy in order to enhance the contribution of residential battery systems. The project also examines the operation of the emergency power supply feature. The project upkeeps the current technology.

33. Active Support of Decarbonised Weak Power Distribution Networks (ASPIRE)

Dr Gowthamraj Rajendran

Department of Electrical Engineering, Faculty of Engineering

As renewable energy sources, particularly small- and medium-scale systems, continue to proliferate, the traditional centralised model of electrical power delivery is transitioning toward a more distributed approach. This shift has brought significant challenges, especially given the intermittent nature of renewable energy generation. Energy storage systems (ESS) offer a promising solution by mitigating this intermittency and providing consumers with the flexibility to increase self-consumption of generated energy. However, aging and overstressed distribution networks often operate under weak power conditions, characterised by pronounced voltage and frequency distortions. These non-ideal conditions not only degrade the performance of interface converters but can also lead to system instability. Additionally, conventional interface converters may exacerbate power quality issues by feeding unbalanced and distorted power back into the grid. While the use of active power filters and advanced renewable energy interface converters has been explored in literature as potential solutions, these approaches typically require significant investment in new hardware. This project aims to address these challenges by embedding imbalance and harmonic compensation capabilities directly into battery energy storage platforms. By enhancing the functionality of these systems, they can actively support weak grids without necessitating substantial changes to the existing network infrastructure. This innovative approach retains the original network hardware while providing improved grid stability and power quality. Furthermore, enhancing the power quality in weak networks can improve the overall efficiency of distribution feeders, offering a cost-effective and scalable solution to the challenges posed by the integration of renewable energy sources.

34. Nuclear Fusion Technology – Stress Analysis of the Volumetric Neutron Source Vacuum Vessel

Prof. Ing. Pierluigi Mollicone

Department of Mechanical Engineering, Faculty of Engineering

UM is part of EUROfusion, the consortium of national nuclear fusion research, through the national Xjenza programme 'Research and Development towards a European Fusion Reactor' (ENDURE). The research group at the Department of Mechanical Engineering contributes to the field of stress analysis and structural integrity as part of DEMO, the DEMOnstration power plant, successor of ITER (an experimental power plant currently being constructed). DEMO is a



technology-driven programme where the key criterion is the production of electricity, to lay the foundation for the environmentally sustainable power plants of the future.

The work presented here deals with a preliminary stress analysis of a plant called the Volumetric Neutron Source (VNS). The VNS is being considered as a new plant for testing full size components to be qualified for DEMO. VNS will be a small-scale tokamak with innovative features. The work carried out at UM dealt with preliminary analyses of the Vacuum Vessel (VV) structure. Sequentially coupled thermal to structural numerical Finite Element Analysis (FEA) models of the proposed design were used for load cases representing various critical scenarios such as normal operation, magnetic fast discharge, vertical displacement events, baking etc. The work provides a preliminary assessment of the structural response of the vessel. Results show that stress values exceed typical limit criteria in certain regions, and that the design must hence be improved before proceeding to a full structural integrity assessment.

35. A Multi-User Experience Data-Driven Design Support Framework: A Sustainable Smart Take-Away Food Packaging Case Study

Ms Tamasine Camilleri

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

In early design, designers must make important but uninformed decisions based on limited knowledge, due to large amounts of unstructured data. As a result, they risk developing products which are rejected by life cycle stakeholders. To increase the product's impact, designers must understand the needs of potential users, but with the added endeavour of balancing functional, sustainability, and market requirements, this poses challenges to designers. By adopting smart sustainable food packaging as a case study, this research extends on previous work to identify strategies employed in designers' practices. Smart packaging enhances traditional packaging's basic functions by meeting emerging consumer expectations for quality and sustainability through novel technologies. Smart packaging acceptance relies on user values, and given the multi-stakeholders involved, their consideration in design allows for food packaging to evolve towards new advancements that are more mindful of their requirements. Studies with the multi-users of food packaging revealed their needs, and established framework requirements that seeks to support the development of innovative products which enhance multi-user experiences. Hence, the overall research goal is to address the gap in design support systems, which inspired the generation of the SUSTAIN-MULTI-UCD framework. The contribution lies in employment of data-driven approaches to gather diverse user data to help enhance multi-stakeholder experience, such as the application of topic modelling and text classification. This research focuses on providing a knowledge-based framework applied in the early design stages to capture multi-user requirements, and lay the foundation for concept generation.

36. Innovative Strategies Through Nature-Based Solutions for Sustainable Infrastructure

Dr Himanshu Sharma | Co-researchers: Dr Deepankar Kumar Ashish, Prof. Ruben Paul Borg

Department of Construction and Property Management, Faculty for the Built Environment

Nature-based solutions are considered solutions that are inspired and supported by nature, provide environmental, social, and economic benefits, and support resilience. They lead to locally adapted, resource-efficient, and systemic



interventions. The NBSINFRA Horizon Europe Project supports enhancing the local urban critical infrastructures protection against natural and manmade hazards through the Nature-based solutions (NBS) co-design and co-creation for a climate change resilient society.

Self-healing concrete presents opportunities for civil engineering infrastructure including in coastal areas, exposed to aggressive environment. Self-healing concrete can support durable structures through autogenous or autonomous crack healing. Self-healing can be achieved through bacterial-induced calcite precipitation in concrete mixtures. It is exploited for the consolidation of waste limestone and a sustainable alternative to cement which harms the environment.

Coastal protection relies on civil engineering infrastructure exposed to aggressive environments and the impacts of climate change. Such engineering infrastructure, relying on concrete, can also be integrated through hybrid solutions with reef regeneration as living breakwaters therefore enabling ecosystem regeneration. The research activity explores the potential of concrete types and different environmental conditions, in relation to ecosystem regeneration, as nature-based hybrid solutions in coastal infrastructure.

The Nature-Based Solutions described support engineering solutions, complement existing infrastructure, and mitigate climate change impacts.

The Faculty of the Built Environment, University of Malta is a partner in the HORIZON EUROPE Project NBSINFRA: City Nature-Based Solutions Integration to Local Urban Infrastructure Protection for A Climate Resilient Society.

37. Innovative Alkali Activated Material Based on Waste Materials

Dr Deepankar Kumar Ashish | *Co-researchers: Dr Himanshu Sharma, Prof. Ruben Paul Borg*

Department of Construction and Property Management, Faculty for the Built Environment

Alkali-Activated Materials (AAMs) offer a sustainable alternative to traditional cementitious materials. This study investigates the development of AAMs using construction and demolition waste, excavated limestone, and quarry waste, aiming to enhance reactivity and mechanical performance. The construction industry generates vast amounts of inert waste, which poses significant disposal challenges and environmental impacts. Recycling such waste reduces landfill dependency and lowers the demand for virgin resources, yet low-quality inert waste remains difficult to repurpose.

The ReCON Project – Large Volume Waste Recycling for Low-Impact High-Performance Concrete – introduces an innovative approach to utilising excavation waste, particularly lower-quality Globigerina limestone, in alkali-activated concrete production. This process minimises environmental impact while yielding high-performance construction materials. The optimised mix design enhances mechanical properties, enabling the production of durable building blocks, cladding panels, and other structural elements.

This study establishes a strong correlation between precursor treatment and material performance, identifying optimal mix ratios that maximise strength and durability. By utilising locally sourced raw materials, the research advances sustainable construction practices and significantly reduces carbon emissions. The findings contribute to the transition toward eco-friendly, low-carbon building solutions, reinforcing the role of AAMs in the future of sustainable construction.

The ReCON Project at the Faculty for the Built Environment, is financed through XJENZA Malta, FUSION Research and Innovation TDP Technology Development Programme.



38. SWIM-360: Multimodal Explainable AI for Holistic Swim Optimisation

Mr Reno Yuri Camilleri

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The SWIM-360 project presents a novel approach to competitive swimming performance analysis through the integration of multimodal AI and sports science. Funded through Xjenza Malta's Thematic Programmes and the Malta Digital Innovation Authority (2024-2026), this research builds upon established swimming analysis foundations to address critical limitations in current training methodologies.

The project's primary innovation lies in developing a comprehensive AI system that synchronously processes real-time sensor data with video analysis, enabling sophisticated biomechanical tracking and performance optimisation. Central to the system's architecture is an explainable AI framework that ensures transparency in performance feedback, facilitating improved coach-athlete communication and training adaptation.

Key technical objectives include: (1) development of a multimodal dataset integrating synchronised video and sensor data; (2) implementation of real-time performance monitoring through wearable sensor integration; and (3) application of advanced machine learning algorithms for stroke optimisation and injury risk prevention. The research methodology incorporates practical validation through collaboration with the Aquatic Sports Association of Malta, targeting Technology Readiness Level 6.

The project aligns with Malta's AI strategy while contributing to international digital technologies research. Expected outcomes include advancement of academic knowledge in AI applications for sports science, development of novel training methodologies for competitive swimming, and creation of scalable frameworks for performance analysis. This research has significant implications for both theoretical understanding of AI in sports and practical applications in athletic training and injury prevention.

39. Towards a Prompt Engineering Framework for Generative AI in Assistive Device Design

Mr Adrian Mercieca

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

The use of artificial intelligence (AI) into assistive device design represents a paradigm shift in engineering, enabling more efficient, user-centred solutions. This study investigates the use of prompt engineering to optimise generative AI-driven workflows for assistive devices, with an emphasis on the creation of a systematic framework that bridges big language models, such as ChatGPT, to CAD platforms like Fusion 360. This study aims to improve the translation of user-centric requirements into CAD-ready generative models in order to build an iterative process that increases assistive technology usability, manufacturability, and accessibility.

As a case study, the PREMIERTOGO project serves as a practical implementation of Generative Design (GD) within the field of prosthetics. This initiative employs AI-enhanced methodologies, including generative design and 3D printing, to develop an above-knee modular prosthesis that balances functionality, aesthetics, and adaptability. Furthermore, PREMIERTOGO integrates an AI-based Human-Machine Interface (HMI) and sensor technologies to optimise real-time control, health monitoring, and personalised adjustments for amputees.



By looking at PREMIERTOGO through the lens of prompt engineering for GD, this study will highlight important problems and potential for expediting AI-assisted workflows for assistive devices. The proposed approach aims to improve the efficiency of generative design in CAD systems while simultaneously laying the groundwork for future advances in adaptive, user-centred assistive technology. This method emphasises AI's revolutionary significance in the development of next-generation assistive technologies.

40. Microwave Phased Array System for Hyperthermia Treatment of Breast Cancer **Ms Therese Quattromani**

Department of Electrical Engineering, Faculty of Engineering and Department of Physics, Faculty of Science

Microwave hyperthermia is the *in vivo* heating of tumour cells using electromagnetic radiation from a phased array system. It increases the sensitivity of cancerous cells to other therapies such as radiation therapy and chemotherapy, aiding in cancer treatment. It functions best when not obstructed by bones, in cases such as breast, prostate, cervical, and head and neck cancers.

This project focuses on treating breast cancer, one of the most common cancers nowadays. It involves the development of a system that takes a microwave signal at 2.4 GHz from a signal generator, and divides and manipulates it to allow for easy beam steering from a 3D phased array with eight antennas. The induced total electromagnetic field is constructively added at the target location and destructively combined elsewhere. A feedback loop is integrated into the system to minimise the risk of overheating of healthy tissue.

Recent studies support this treatment method's efficacy, and have reported only mild side effects such as skin irritation or discomfort. Serious complications have not been recorded in studies with well-designed systems.

In keeping the tumour temperature at therapeutic levels – typically between 40°C to 45°C – for a length of time, the treatment takes place. The system aims to be accurate, efficient and reliable. Thus, it can contribute to advancements in cancer treatment protocols.

41. Investigating the Effect of Light on Electrooculography Data

Mr Jeremy James Cachia

Centre for Biomedical Cybernetics

Technological advancements have provided human beings numerous modalities to interact with modern devices, from touchscreens to voice commands or hand gestures. While seeming mundane, these methods can still be challenging for individuals with impaired fine motor skills, such as stroke or Amyotrophic Lateral Sclerosis (ALS) patients. Since the oculomotor system of such individuals is generally intact, a more suitable alternative modality would be an eye movement-based human-computer interface (HCI).

The EyeTrack project focuses on electrooculography (EOG), a technique that measures eye movements by recording the electrical potential generated by the eye non-invasively using electrodes attached around the eyes. Assuming a stable potential, the magnitude of the EOG signal varies with the displacement of the eyeball from its resting position, allowing for effective tracking of eye movements. In the literature on EOG-based HCI development, EOG is generally claimed to be insensitive to variations in ambient illumination. On the other hand, there is clinical research on the use of



EOG for the diagnosis of certain ocular diseases that shows that the EOG signal amplitude for a given ocular displacement varies substantially when transitioning between dark and bright conditions. Consequently, any variation in the EOG signal due to illumination causes the need for frequent recalibration during the long-term use of EOG-based HCI systems, limiting its use in real-world environments.

In view of this contrasting literature, one of the aims of the EyeTrack project is to investigate this phenomenon systematically and propose methods to compensate for these effects, ultimately improving the robustness of EOG-based HCI systems.

42. Partial Object Doubling Induced by Negative Afterimages in the Periphery

Ms Anna Riga

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

Visual illusions are both aesthetically pleasing and puzzling effects. But they can also provide substantial information about how our brains process information from the physical world. Recently, we reported a new phenomenon in which the shape of a peripherally viewed object that moves against an oriented grid background appears distorted and doubled. We call this phenomenon “partial object doubling” (Thornton & Riga, 2024). We argue that this illusory doubling occurs due to the release of negative afterimages, which create a dynamic texture within the object. These afterimages interact with the object's physical contours, causing it to “split.” Through a series of interactive demos, we show that the luminance contrast between the target and the background is one of the most critical factors for the illusion to occur. Although we utilise a well-known motion illusion—the Furrow illusion (Anstis, 2012; Cormack et al., 1992)—to demonstrate this new effect, we show that the two phenomena are in fact independent.

43. The Influence of Identity on Facial Expression Recognition: A Foraging Study

Ms Nina Attard Montalto | Co-researcher: Prof. Ian Thornton

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

Facial expressions play a crucial role in communication, but how we recognise them can be influenced by other factors, such as a person's identity. This study explored how the presence of multiple identities affects the way we process facial expressions. We used a type of visual task known as foraging, a process similar to how animals search for food—except here, participants searched for specific facial expressions in a display of multiple faces.

Twelve participants were shown screens with 40 faces and asked to find all the faces with either positive or negative expressions as quickly as possible. The faces belonged to six different celebrities, each displaying a range of emotional expressions. In half of the trials, faces of all six identities were mixed together, while in the other half, all the faces belonged to the same person.

Our results showed that participants took significantly longer to find the target expressions when multiple identities were present compared to when all faces were of the same person. This suggests that variations in identity make it harder to recognise emotions efficiently. We also found that people were slower at finding negative expressions compared to positive ones.

These findings highlight how identity influences emotion recognition and demonstrate that visual foraging tasks can be



a useful tool for studying complex visual perception. Understanding these processes can provide insight into everyday social interactions and how we quickly interpret emotions in the real world.

44. Silhouette Distance Loss for Learning Few-Shot Contrastive Representations

Mr Nemanja Rasajski

Institute of Digital Games

Conventional supervised contrastive learning methods excel in optimising encoders for discriminative tasks. In scenarios where only a few labelled samples are available, however, they struggle in eliminating the inductive bias when transferring from source to target classes. This is a byproduct (and inherent limitation) of their underlying optimisation process that involves training a representation to maximise class separation, without directly optimising for within-class cohesion. As a response to this limitation this paper introduces the Silhouette Distance (SD) loss, a new optimisation objective for supervised contrastive representation learning. SD aims to enhance the quality of learned embeddings by emphasising both the cohesion and separation of representation clusters for each class. We test SD extensively across several few-shot learning scenarios where labelled data is limited and we compare its performance against supervised contrastive loss and prototypical network loss for various text and image classification tasks. We also test SD in a cross-domain manner, by training a model on one dataset and testing it on another, within the same modality. Our results demonstrate the superior, at worst competitive, performance of the SD loss compared to its baselines. By leveraging pre-trained models and fine-tuning techniques, our study highlights how the SD loss can effectively improve representation learning across different modalities and domains. This initial study showcases the potential of the SD loss as a robust alternative within the few-shot learning setting.

45. Distinct Site Labels in Complex Computer Networks Based on Spectra

Prof. Irene Sciriha Aquilina | Co-researchers: Dr James Borg, Dr Zoia Sherman

Department of Mathematics, Faculty of Science

The flurry of publications on Distinct Vertex Labelling (DVL) justifies the annual review conducted by J. Galliano in the electronic journal *A Dynamic Survey of Graph Labeling*. Vertex labelling is the assignment of integers to vertices under prescribed rules. We envisage applications for optimisation in algorithmic theory in which a specific vertex needs to be called for processing, in optical networks, data security, coding theory and in signal transmission among autonomous drones assigned distinct frequencies. Not all graphs lend themselves to a good labelling. So far number theoretical methods have been used for symmetrical rooted trees. Our novel methods use spectral graph theory on the class of threshold graphs that model complex networks. Threshold graphs are nested split graphs (NSGs), that is, the vertex set is partitioned into a clique (with every pair of vertices adjacent) and a coclique (with no edges) such that the coclique consists of subsets with nested neighbours within the clique. A graph is called threshold if it admits real vertex weights such that the sum of two weights is less than some threshold whenever the associated vertices are not connected by an edge. NSGs are extremal with regards to their degree sequence and their spectral radius. We create the DVL(Eig) which is the spectrum of the Laplacian and identify the subclass of NSGs for which it is valid. The eigenvectors of the Laplacian are the same for all NSGs of the same order. Using this surprising property, we devise the new DVL(Vec) and develop it to DVL(SD) derived from the eigenvectors of the Laplacian such that the edges of the NSG also have distinct



labels (DEL). For NSGs when this is false, we set up an algorithm (AlgoSD) that reduces an offending NSG to a more compact NSG that admits both a DVL and a DEL. Diagnosis of an offending NSG is worked out by decorating an encoding of a NSG via a picture of its cotree and then extracting the eigenvalue and eigenvector corresponding to each vertex. In this way we create subclasses of NSGs with an SD labelling.

46. Advanced Li-Fi System with Green Wavelength Directly Modulated Laser for High-Speed, Scalable and Resilient Communication in 6G Hospitals

Dr Ajay Sharma

Department of Computer Information Systems, Faculty of Information and Communication Technology

In this research, an innovative Li-Fi system is developed for high-speed communication in hospital environments that operates at a green wavelength of 500 nm with Directly Modulated Laser (DML). The proposed system shows excellent performance and achieves a Q factor of 18.84, a bit error rate (BER) of $1.6e-79$, and a signal-to noise ratio (SNR) of 74.94 dB, which is significantly better than the previous research. It also has a range of up to 25 meters line-of-sight (LOS) and can transfer data at speeds in excess of 1 Gbps, making it significantly faster than previous work conducted with much lower LOS ranges while being robust against interference. New applications of DML combined with optical splitters contribute to providing signal stability and system scalability, overcoming problems such as low range. This design ensures safe, reliable, and non-intrusive communication, ideal for applications that require high data reliability, such as real-time imaging and telemedicine in hospitals. This new Li-Fi system is found to be compatible with modern hospital power requirements, and it also provides a solid foundation for future 6G communication networks.

47. Variational Gibbs State Preparation on Noisy Intermediate-Scale Quantum Devices

Dr Mirko Consiglio

Department of Physics, Faculty of Science

The preparation of an equilibrium thermal state of a quantum many-body system on noisy intermediate scale quantum (NISQ) devices is an important task in order to extend the range of applications of quantum computation. Faithful Gibbs state preparation would pave the way to investigate protocols such as thermalisation and out-of-equilibrium thermodynamics and provide useful resources for quantum algorithms, where sampling from Gibbs states constitutes a key subroutine. We propose a variational quantum algorithm (VQA) to prepare Gibbs states of a quantum many-body system. The novelty of our VQA consists of implementing a parameterised quantum circuit acting on two distinct, yet connected (via CNOT gates), quantum registers. The VQA evaluates the Helmholtz free energy, where the von Neumann entropy is obtained via postprocessing of computational-basis measurements on one register, while the Gibbs state is prepared on the other register via a unitary rotation in the energy basis. Finally, we benchmark our VQA by preparing Gibbs states of the transverse-field Ising and Heisenberg XXZ models and achieve remarkably high fidelities across a broad range of temperatures in state-vector simulations. We also assess the performance of the VQA on IBM quantum computers, showcasing its feasibility on current NISQ devices.



48. Tracing the Origins of the Cavalry Armour Collection Exhibited at the Palace Armoury in Valletta, Malta: A Materiological Examination

Dr Daniel A. Vella

Department of Metallurgy and Materials Engineering, Faculty of Engineering

This study examines cavalry armour suits from the Palace Armoury in Valletta, aiming to determine their provenance. Stylistically, these suits align with early 1600s Italian designs, yet their presence in Malta is puzzling given the island's unsuitability for cavalry warfare. Curatorial consensus suggests they were acquired for offshore campaigns.

Three cavalry armour suits (24 pieces) were physically examined for attributes such as plate thickness and hardness. Six pieces underwent invasive sampling, with small metal fragments extracted from breastplates and tassets.

Metallographic analysis revealed the armour was primarily hot-worked from wrought iron or low-carbon steel, exhibiting ferritic, ferrite-pearlite, or predominantly pearlitic microstructures. Notably, two tasset pieces displayed similar metallurgical characteristics, suggesting perhaps a common manufacturer.

Elemental analysis of the slag inclusions via scanning electron microscopy with energy-dispersive spectroscopy identified minor element concentrations. Findings distinguished metal extraction processes, indicating both Bloomery and indirect blast furnace methods for the extraction of the steel. Statistical analysis of the minor elements present in the slag inclusions through Principal Component Analysis suggests an Italian origin, aligning with known European armour datasets. Further confirmation requires trace element comparison via Laser Ablation-Inductive Coupled Plasma-Mass Spectrometry.

49. Shaping Minds and Souls: Jesuit Missions and the Mediterranean World

Rev. Dr Nicholas Joseph Doublet

Department of Church History, Faculty of Theology

Shaping Minds and Souls: Jesuit Missions and the Mediterranean World is a pioneering research initiative exploring the Jesuit Order's profound influence on Mediterranean society during the early modern period. This endeavour is being sustained through a collaborative framework between the University of Malta and the Università degli Studi di Palermo. The project examines the interplay between religious formation, art, and architecture, highlighting the Jesuits' integration into Malta's cultural landscape and their broader impact across the Mediterranean.

Designed to support the ongoing conservation of the Jesuits' Church Complex in Valletta, the project links historical research with heritage preservation. It emphasises the Jesuit mission in Malta, particularly the foundation of the Collegium Melitense, and situates it within the broader context of the Jesuit mission in the Mediterranean. By aligning academic inquiry with conservation efforts, the initiative seeks to underline the cultural and spiritual significance of the complex, including its rich artistic heritage.

Central to the project is an international symposium scheduled for May 2025, which will bring together scholars to explore themes such as Jesuit missionary strategies, educational foundations, and artistic contributions. Archival research across Malta and Rome will illuminate the Jesuits' role in shaping local and regional religious and cultural dynamics.

Outcomes include a peer-reviewed volume and digital proceedings, ensuring broad dissemination of findings. By fostering interdisciplinary scholarship and supporting heritage conservation, this initiative highlights the Jesuits' lasting legacy in shaping Mediterranean society and contributes to global Jesuit studies.



50. Musings of Recovery: The Microhistorical Journey of a Jesuit Convalescent (1898-1911)

Rev. Prof. Charló Camilleri

Department of Moral Theology, Faculty of Theology

Research in the Archivum Conventus Carmelitarum Notabilis (ACCN), brought to light a diary spanning from January 1, 1898 to April 9, 1911, and a sole entry in 1916 complemented by a short entry on 1916-1918. Found in a very good condition, the diary is written in English – with the exception of some entries in Italian – and presents detailed accounts of the life and encounters of an anonymous Jesuit, who seems to have been in Malta in convalescence from ill health. Mention of Casa Leone XIII and The College, situate the diary in the context of the Jesuit College founded in 1877 in Bel-Vedere, St Julian's, and the establishment of a home for the sick in 1894. Entries to visits in Gozo with fellow Jesuits, situate the diary in the context of Jesuits assuming leadership (1865-1909) of the Seminary and the school erected by the Bishop of Gozo. Unfolding in 498 pages, the diary is embellished with colourful pencil drawings of religious motifs and architectural designs. The microhistorical method will be applied for textual analysis, starting from transcription and preservation of the volume, passing on to annotate themes and cross-referencing to historical details and contexts emerging from other sources connecting microhistory of the individual to the socio-religious macro-history of the island. The interdisciplinary approach will be used. A compilation the names of specific individuals, events, and localities will be made, aiming at uncovering the author's life experiences, throwing light on ecclesial microhistory for a more nuanced understanding of the past. A unique feature of this diary: a number of intriguing codes inserted in the main entries, awaiting to be deciphered, will be highlighted.

51. Filming, Ethnography, and Research in Maltese Funeral Marches

Mr Simon Farrugia

School of Performing Arts

This poster highlights the use of audio-visual ethnography in the author's doctoral research which explores the cultural and social significance of funeral marches in Malta. As a significant aspect of Maltese cultural life, funeral marches extend beyond their formal settings such as Good Friday processions. In Malta, funeral marches have the potential to foster personal and communal spaces in which individual grief and collective emotional expressions merge. This poster explains how filming can serve as a strong method to analyse ethnography and facilitate both the collection and sharing of data for research purposes.

Accompanying this poster is an ethnographic documentary titled *Sounds of Weeping: Funeral Marches in Maltese Society and Culture* which delves into the role of funeral marches in Maltese life. This documentary was screened for the first time in January 2025 during the 48th ICTMD (International Council for Traditions of Music and Dance) World Conference held in Wellington, New Zealand. Drawing on the methodologies of ethnomusicology and visual anthropology, this poster highlights Catherine Russell's (1999, 14) view of ethnography as an 'experimental practice' that combines aesthetics and cultural theory for new insights into the emotional resonance of, in this case, funeral marches. Although a video camera cannot capture touch, taste, or smell, it nevertheless has the 'potential to represent the multisensoriality of the research encounter' (Pink, 2011, 608). This enables viewers to engage with the emotions of participants. In this way, 'observational filmmaking' serves as a form of anthropological exploration where the filmmaker's expertise and sensitivity foster the development of new ways of generating knowledge (Grimshaw & Ravetz, 2009, 130–36).



52. Geophysics: A Tool to Reveal Our Buried Past

Prof. Sebastiano D'Amico

Department of Geosciences, Faculty of Science

Geophysics, the study of Earth's physical properties and processes, has revolutionised the way we uncover the past hidden beneath our feet. This scientific discipline employs non-invasive techniques to explore subsurface features, making it a powerful tool for archaeologists, historians, geologists, conservators etc. By analysing variations in soil, rock, and sediment properties, geophysics helps detect and map buried structures, ancient artefacts, and even paleontological remains. Key methods include ground-penetrating radar (GPR), magnetic surveys, and electrical resistivity tomography (ERT). GPR uses electromagnetic waves to create detailed images of subsurface layers, ideal for detecting foundations, graves, and tunnels. Magnetic surveys identify anomalies caused by human activities, such as hearths or iron tools, while ERT reveals buried structures by measuring how electricity flows through the ground. Geophysics minimises destructive excavation, preserving archaeological sites and enabling broader exploration of landscapes. It has uncovered ancient cities, Roman roads, Viking settlements, and prehistoric burial mounds, shedding light on civilisations long forgotten. Beyond archaeology, it aids in understanding geological hazards and the Earth's history. As technology advances, geophysics continues to bridge the gap between science and history, revealing the stories buried beneath us and connecting us to the past with precision and respect. This work presents main results from a number of case study within the Maltese islands.

53. BeeSustain: Integrative Modelling for Enhanced Beekeeping Carrying Capacity

Dr James Ciarlo`

Institute of Earth Systems

Beekeeping is increasingly threatened by climate change, habitat degradation, and environmental stressors, necessitating innovative solutions to ensure colony health and productivity. The BeeSustain project, developed at the University of Malta, integrates advanced climate and environmental modelling, microbiome analysis, and multispectral drone imagery to optimise honey bee colony placement and enhance beekeeping carrying capacity.

This interdisciplinary approach aims to develop a predictive model capable of assessing carrying capacity with greater accuracy and reliability. By progressing to Technology Readiness Level 4, BeeSustain focuses on model development and lab validation, setting the foundation for real-world applications. The ultimate goal is to provide beekeepers with real-time, data-driven tools to support colony management, fostering healthier bee populations and improving honey production efficiency.

Positioned at the nexus of environmental science, apiculture, and technology, BeeSustain offers a transformative approach to sustainable beekeeping. By integrating scientific advancements with practical applications, the project contributes to resilient pollination services and broader ecosystem sustainability.



54. Halophytes and Xerophytes: 'Adaptations' or 'Responses' to Proximal Stress?

Prof. Sandro Lanfranco

Department of Biology, Faculty of Science

'Halophytes' and 'xerophytes' may represent a continuum of morphological, anatomical, and physiological variability, where certain traits are the outcome of long-term evolutionary processes, while others are context-dependent responses expressed under conditions of abiotic stress. This study tests that hypothesis by examining morphological and anatomical traits of 12 species, equally distributed as halophytes, xerophytes, or 'generalists' acting as controls. Plants of the same species were compared across 10 sites in Malta. Adaptive traits should exhibit less variability across habitats, whereas site-specific responses to environmental stress may show broad adaptations.

Traits considered adaptive for halophytes and xerophytes were identified from literature, including stomatal dimensions and density, trichome length, and the presence or absence of salt glands. Control traits included leaf chlorophyll content, epidermal thickness, and leaf area index.

Ten individuals per species were sampled from coastal and inland sites. Variability in adaptive and control traits was evaluated using multivariate statistics.

Preliminary results indicate higher intraspecific variability in stomatal size for 'xerophytes' and 'halophytes' compared to 'generalists', suggesting environmental influence on this trait in specialised plants. Ongoing work on other traits supports the notion that morphological variation, combined with vegetation composition data, reflects environmental stress experienced by individual plants.

55. Conservation Status of *Crepis pusilla* (Sommier) Merxmüller (Asteraceae: Cichorieae, Crepidinae) in Malta

Ms Reeya Ghose Roy

Department of Biology, Faculty of Science

The Maltese Dwarf Hawksbeard (*Crepis pusilla*) is an annual plant native to the Maltese Islands, initially described as *Melitella pusilla* and later reclassified into *Crepis* by Merxmüller. It was first discovered in 1906 and, until 1967, was thought to exist only in Malta. Since then, it has been found in other Mediterranean locations, though it has been confined to a single site in Dingli, SW Malta, for the past 50 years. The species is currently listed as "Critically Endangered" by the IUCN.

In 2023, a detailed survey of the remaining population was conducted between March and May. The study found 27 plants over a 60m stretch of country path, with flowering occurring between April 4 and April 17. By early May, most of the plants had withered. Achenes production was estimated at 150 per plant, and preliminary germination trials showed a rate of 80-100%. Further trials are planned to investigate the species' rarity and develop a conservation plan.

The study recorded environmental data, including temperature (ranging from 14.1°C to 26.7°C) and rainfall (54.3mm in seven events). The ongoing surveys aim to monitor the species' status and inform future conservation efforts, ensuring that a data-driven action plan is in place to protect this critically endangered plant.



56. Marine and Terrestrial Protected Areas to Foster Climate Change Adaptation in Islands: A Sustainable Livelihoods Approach

Mr Vincenzo de Cancellis

Islands and Small States Institute

This PhD project is part of the MEDiverSEAty European Doctoral Network, funded under the Marie Skłodowska-Curie grant, exploring the human dimensions of Mediterranean marine biodiversity.

In particular, this research intends to investigate the role of marine and terrestrial protected areas in supporting climate change adaptation (CCA) and wellbeing in Malta, focusing on 'Il-Majjistral' National Park. This research aims to identify key climate change hazards and examine how protected areas contribute to Malta's and the EU's CCA commitments. Using a sustainable livelihoods approach, the study will assess how protected areas in Malta can enhance livelihood resources and wellbeing among stakeholders and the wider population, including challenges and obstacles.

The project will employ a mixed-methods approach, combining qualitative participatory focus groups, quantitative surveys, and spatial analysis. This methodology will geo-locate hazards, identify livelihood resources, and evaluate measures promoting CCA through ecosystem restoration.

Outcomes are expected to contribute to climate change and development theories, particularly regarding livelihoods, wellbeing, and the planning and management of protected areas in small island states. Findings aim to inform policy on climate change adaptation, environmental management, and communication strategies.

By May 28th, the research will have completed a systematic literature review on CCA in small islands, discussing research gaps on the potential of protected areas to foster adaptation and wellbeing, and Malta's current adaptation strategies.

57. Barriers and Motives to Citizen Science Participation in Coastal Island Environments: A Systematic Literature Review

Mr Justin Whittle

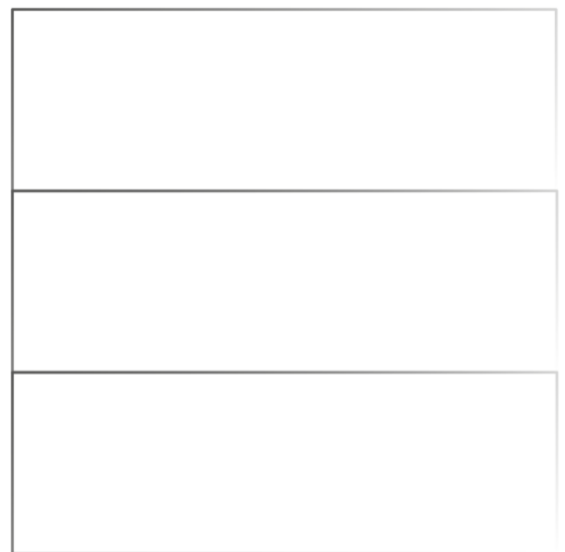
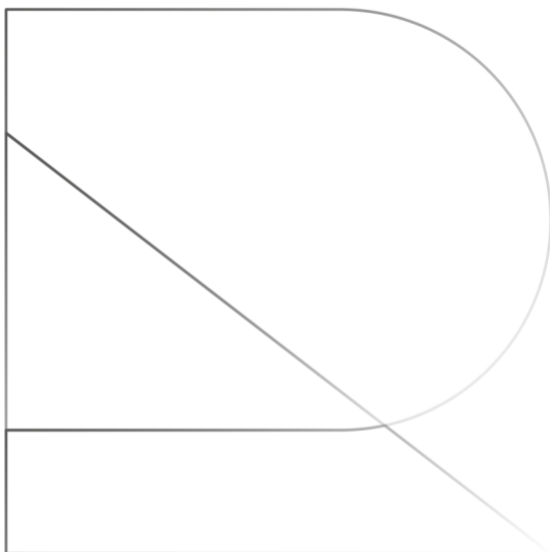
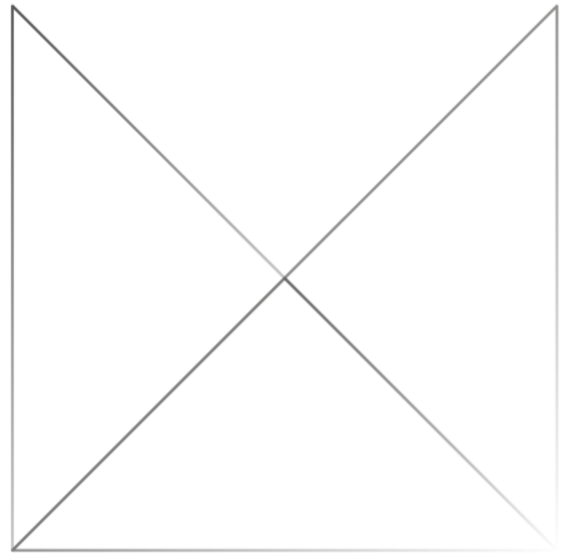
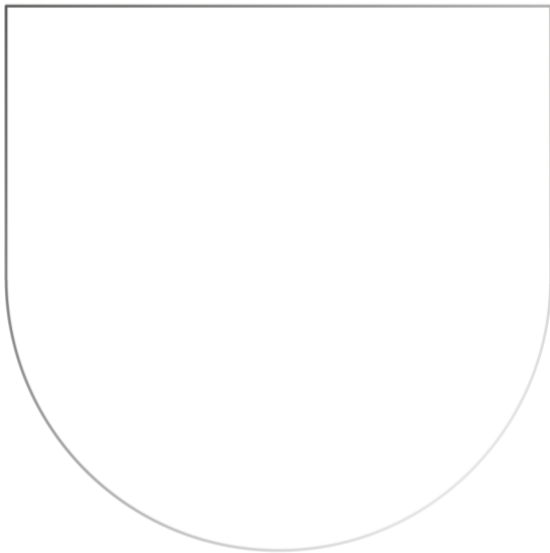
Islands and Small States Institute

Citizen Science (CS) is a tool widely being adopted around the world for its participatory and community-based approach in expanding scientific knowledge. The United Nations (UN) have encouraged the role of CS and its importance in addressing global data deficiencies, monitoring projects, facilitating knowledge sharing and enhancing active participation in nature restoration, with a particular focus on island contexts. For island states the collection of reliable and validated data remains limited, coupled with weak governance structures of coastal protected areas. Hence, the scope of the study will focus on coastal island environments as they face significant challenges due to climate change, limited resources and geographical isolation. Therefore, this research will aim to understand the potential barriers and motivations to participation in CS initiatives in coastal island environments. Through this research we aim to address the gaps in literature and build research on existing theories of CS. This study will use the PRISMA 2020 method to conduct a systematic literature review. Using SCOPUS, Web of Science and SpringerLink databases we will conduct a thematic review of the literature. The following results will be conducted in the first quarter of 2025 for analysis. The findings and key gaps will inform further studies and questionnaires for future research. The following research forms part of the European Doctoral Training Programme 'MEDiverSEAty' funded by the European Union's Horizon Europe programme under the Marie Skłodowska-Curie Doctoral Network.



Parallel Sessions 2

Presentations – Academics/Researchers



Expo Stream 1.1 – 1.8

CHAIR: Prof. Josanne Vassallo | VENUE: Lecture Room 201



Caught in a Cluster: The Impact of Protein Aggregation in ALS

Dr Rebecca Cacciottolo

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Amyotrophic lateral sclerosis (ALS) is a devastating neurodegenerative disease characterised by progressive degeneration of motor neurons. A key pathological hallmark of ALS is the misfolding and accumulation of protein aggregates in neurons. However, the mechanisms underlying their formation and their role in disease progression remain poorly understood. Elucidating the causes of ALS and their connection to protein aggregation is crucial for identifying potential therapeutic targets. Recent findings from the largest genome-wide association study (GWAS) to date have identified the SCFD1 gene as a significant contributor to ALS risk. Using a *Drosophila* (fruit fly) model, we have recently demonstrated that SCFD1 disruption plays a meaningful role in ALS pathogenesis, likely by impairing cellular defence mechanisms that prevent protein misfolding and aggregation. To further explore this hypothesis, we are currently investigating protein aggregation dynamics and their underlying cellular mechanisms within motor neurons of fly brains. Our work also examines how aging influences these processes. Of particular interest is understanding how SCFD1, a protein involved in intracellular trafficking, contributes to protein aggregation and, ultimately, neurodegeneration. By uncovering the cellular pathways through which a major ALS risk factor promotes protein aggregation, this research aims to provide novel insights into the molecular hallmarks of ALS. These findings will lay the groundwork for future studies focused on restoring cellular homeostasis and mitigating the toxic effects of protein aggregates, ultimately advancing therapeutic strategies to slow or halt disease progression and improve outcomes for individuals with ALS.

Exploring the Requirements and Challenges for Implementing Supplementary Breast Cancer Screening in Women with Dense Breasts Across Europe: A Quantitative Cross-Sectional Survey

Ms Deborah Mizzi

Department of Radiography, Faculty of Health Sciences

Purpose: This study aims to explore the requirements for implementing supplementary breast cancer screening across Europe by surveying current guidance and practices, assessing staff awareness of protocols for supplementary screening, identifying barriers to practice change, and exploring staff willingness to implement these screenings.

Method: This research was conducted as part of a PhD study at Salford University, with the principal investigator (PI) being the author of this study. It was not part of an international consortium or a multicentre survey. A non-experimental, descriptive, cross-sectional online survey targeted radiographers and radiologists working in European breast cancer screening units. A total of 83 participants from across Europe—including Austria, Belgium, Ireland, Latvia, Malta, Norway, Portugal, Spain, and the United Kingdom—completed the survey over a six-month period. The majority of participants had more than five years of experience, and most were actively working within breast cancer screening at the time of the survey. Descriptive and inferential statistics, including the Friedman test, were used to assess differences between groups regarding awareness, barriers, and willingness to implement supplementary screening.

Results: Among the 83 respondents, 95.2% were actively involved in a breast cancer screening programme at the time of the survey, while 4.8% were not. The most commonly used supplementary screening methods were hand-held ultrasound (45.8%), magnetic resonance imaging (MRI) (22.9%), and digital breast tomosynthesis (32.5%). The main barriers identified were increased waiting lists (mean rating score (\bar{x}) = 3.99), cost (\bar{x} = 3.98), and increased workload (\bar{x} = 3.95). Key factors influencing the implementation of supplementary screening included breast cancer risk (\bar{x} = 3.70)



and equipment availability ($\bar{x} = 3.40$), while patient preferences ($\bar{x} = 2.16$) and cost-effectiveness ($\bar{x} = 2.77$) were rated lower. A significant variation in responses ($p < 0.001$) highlighted differing priorities among participants, particularly regarding the availability of trained personnel and resources.

Conclusion: While there is strong awareness of the need for supplementary screening, implementation is hindered by resource constraints and organisational barriers. Additional training and clearer guidelines are required to facilitate practice changes across Europe.

Limitations: The study had a low response rate, which limits the generalisability of the findings.

Molecular Exploration of the p53 Landscape in Different Colorectal Cancer Cell Types

Prof. Therese Hunter

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

The p53 tumour suppressor protein is a DNA-binding transcription factor that regulates apoptosis, DNA repair and senescence and forms complexes with other proteins. Missense mutations, particularly in the DNA-binding domain, have been associated with over 50% of solid tumours, including colorectal cancer, which is the third most common cancer worldwide. The TP53 gene expresses 13 different mRNA variants, whose profile of expression differs in different tumours. Their exact mode of action in cancer formation and/or progression remains elusive, partly due to limited insights into their structural and functional characterisation. As part of an ongoing project aimed towards identifying a molecular signature of colorectal cancer cells (CRC), that can assist tumour classification and identify novel biomarkers, we have employed qRT-PCR and RNA sequencing on eight different CRC cell lines to analyse the p53 transcriptome landscape. Our results demonstrate an upregulation of the p53 Δ 133 and p53 Δ 160 isoforms in CRCs. The identification of the p53 isoforms at a protein level was investigated through western blot analysis and further verified through mass-spectrometry, which also revealed the occurrence of the p53 Δ 40 protein isoform in certain CRCs. We have also successfully produced and purified recombinant human p53 α and four of its protein isoforms, p53 Δ 40, p53 Δ 133, p53 Δ 160 and p53 Ψ , from an E-coli host expression system. These isoforms have been characterised for protein stability, aggregation tendency and differential protein-protein interactions, identified through proteomics mass-spectrometry. The integration of protein data with RNA sequencing provides a comprehensive, multidisciplinary approach to further elucidate the p53 interactome and its regulatory network.

Changing Cell Fate

Dr Analisse Cassar

Department of Anatomy, Faculty of Medicine and Surgery

Regenerative medicine, often considered the "holy grail" of biomedical science, offers unprecedented opportunities for healing and restoration of function. The ethical challenges associated with embryonic stem cells have propelled the use of alternative sources like umbilical cord blood. Moreover, the promising yet challenging landscape of induced pluripotent stem cells (iPSCs) pioneered by Shinya Yamanaka offer a beacon of hope for generating patient-specific cells, however, they also present substantial hurdles in therapeutic contexts, including issues of safety and efficiency.



Our approach aims to enhance the safety and applicability of cell-based therapies by integrating epigenetic agents and looking to nature, where several organisms have found ways to repair themselves, using better systems than humans have ever managed.

Our team therefore uses products derived from nature, with the interplay of epigenetic modulation to alter the lineage programming of the cell and change its fate. Umbilical cord blood is treated with a combination of chromatin-modifying agents and natural products followed by differentiating inducers aimed at promoting neuronal development.

Various sources of perinatal derivatives have been used to investigate the best possible source of stem cells, but the team is now focusing on creating neurons from the most available human source, that is peripheral blood.

The integration of natural products with epigenetic tools can open new avenues for enhancing stem cell plasticity and ultimately achieving the regenerative outcomes that have long been envisioned in medical science.

There's Something Fishy – Using Zebrafish to Understand Muscle, Bone and Wound Healing (Project STRONG)

Ms Margherita Muscat

Department of Applied Biomedical Science, Faculty of Health Sciences

Osteosarcopenia, the concurrent presence of low bone mass (osteoporosis) and loss of muscle mass (sarcopenia), is an emerging musculoskeletal disorder that primarily affects the elderly population and can lead to increased risk of falls, fractures and mortality while posing a great socioeconomic burden. There are currently no FDA-approved drugs to target sarcopenia, never mind osteosarcopenia, with nutritional approaches being used for patient management.

Project STRONG aims to screen a library of natural products to identify potential drug targets and health supplements that can concurrently improve bone and muscle function, targeting the existing treatment gap. With project ZeEBRA, where a WNT library of drugs was tested in zebrafish to identify novel drug targets to treat bone disease, concluding, project STRONG aims to use techniques and methodologies developed during project ZeEBRA and expand them to cover musculoskeletal disorders. The zebrafish model for osteosarcopenia can allow for the development of treatments that promote an active aging population and ease socioeconomic burden. The knowledge achieved and methodologies developed in project STRONG will also allow for further studies in the area, such as also exploring drug targets for osteosarcopenia and wound healing as a comorbidity of Type 2 Diabetes.

Project STRONG (R&I-2024-007L) has received financial support through the FUSION R&I Technology Development Programme LITE 2024 awarded by Xjenza Malta.

Beyond the Boundaries of the Brain

Dr Claude J. Bajada

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Accurate delineation of functional brain regions is crucial for understanding brain function and developing biomarkers for neurological disorders. This abstract, presented at the University of Malta 2025 Research Expo, summarises the key findings of the BEyond BOundaries on the Brain (BE-BOB) project, funded by the University of Malta's Research



Excellence Fund (202201). Building upon the MCST-funded Boundaries of the Brain (BOB) project, BE-BOB aimed to develop and refine the Vogt Bailey Index (VBI), a tool for delineating functional brain regions. A preliminary analysis within BE-BOB using VBI on data from participants with autism spectrum disorder highlighted the need for improved methods, particularly in pre-processing, motivating further refinement of the tool. BE-BOB leveraged spectral graph theory to analyse local functional homogeneity in the human cortex. Traditional fMRI pre-processing techniques often introduce biases in the boundaries of functional brain regions. To address this, BE-BOB developed a novel "hybrid searchlight" algorithm that estimates algebraic connectivity in volumetric MRI space and projects these connectivity values back to the cortical surface, preserving spatial accuracy. Furthermore, the project conducted a rigorous comparison of the refined VBI against the widely used Regional Homogeneity (ReHo) approach. Tests on both synthetic and real fMRI data demonstrated that VBI exhibits significantly higher sensitivity and delineates significantly sharper boundaries around activated brain regions compared to ReHo. These findings, published in *Brain Structure & Function* and presented at the Organisation for Human Brain Mapping Annual Meeting, underscore the potential of VBI as a powerful tool for precise functional brain mapping. The BE-BOB project's success has also led to further funding by Xjenza Malta in the Operation TOM Project, where VBI will be applied to analyse the effects of spaceflight on brain structure and function using MRI data.

Conversations with the Human Brain: Closed-Loop Sensory Stimulation

Dr Nowell Zammit

Centre for Molecular Medicine and Biobanking

The brain is often likened to an orchestra, where various instruments harmonise to transform simple dissociable vibrations into elaborate symphonic compositions. Although each neuron in the brain is tuned to evoke its own selective responses, much of the overall impact is shaped by the way it resonates with the tens of billion neurons populating the brain. While the latter is often addressed as a complication, recent advances in neuroscience, including our own findings, demonstrate that our brain exploits such complexity to control which specific neurons 'direct the melody'. Such control or as better known, selective routing, is in part orchestrated by entraining frequency-specific oscillatory profiles, defining discrete temporal windows that 'couple' or in turn 'decouple' specific neural responses. Our recent findings have substantiated the latter by revealing significant decoupling between inhibitory beta oscillations and working memory (WM)-related activations, its dysregulation in patients with ADHD and corresponding neuromodulation following psychostimulant medication. In this new study, we take the latter one step further by employing a closed-loop EEG approach in psychostimulant medicated ADHD patients. Herein, we record human EEG beta activity to detect both 'facilitative' and 'suppressive' temporal windows in real-time while concurrently delivering sensory stimuli within these restricted instances. While this design is intended to provide the first causal evidence in favour or against 'beta windows' of WM neural transmission, it reframes the relationship between WM anomalies and ADHD as well as its corresponding sensitivity to catecholaminergic neuromodulation.



Searching for Biological Motion

Prof. Ian Thornton

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

As a social species, the rapid and accurate understanding of human action plays an important role in our daily lives. Within the field of Cognitive Science, many studies have made use of a very compelling method of depicting biological motion – point-light figures – a technique first popularised by Gunnar Johansson (1973). With this technique, the details of the human form are reduced to a small set of dots representing the major joints of the body. As soon as the dots are set in motion, observers are able to quickly and accurately describe the underlying action, even though they have very limited visual information about the body itself. In this presentation, I will begin by showing some examples of biological motion using a web-based animation system developed in our lab, then discuss some classic findings from the literature, before presenting recent work from our group exploring the impact of cross-modal cues (e.g., footstep sounds) on the speed and accuracy of locating biological targets within the context of a multi-item foraging task.



Expo Stream 2.1 – 2.8

CHAIR: Prof. Ruben J. Cauchi | VENUE: Meeting Room 3



Genomics of Rare Diseases: Identifying Local Disease-Causing Variants Using High Throughput Sequencing

Prof. Rosienne Farrugia

Department of Applied Biomedical Science, Faculty of Health Sciences

High throughput sequencing (HTS) has revolutionised genetics research and is finding widespread application in clinical diagnostics of Mendelian disorders greatly improving on the diagnostic sensitivity of traditional approaches. The Malta NGS project and the Genomics of Rare Diseases project were designed to take advantage of the genetic history and composition of the Maltese population to identify novel disease-causing genes and mutations in a variety of conditions and diseases present in the Maltese Population.

Affected singletons, trios and families were recruited following approved ethical procedures in collaboration with clinicians from Mater Dei Hospital. Blood or saliva were collected and interviewer led questionnaires were carried out. Selected gene panels, whole exome and whole genome sequencing were used to generate HTS data from patients with a number of different conditions. Raw data was mapped to GrCh37 as paired-end libraries. An in-house data analysis pipeline was set-up to shortlist potentially causative variants which were filtered against an in-house database of more than 1000 HTS datasets.

A number of variants which can be classified as pathogenic, likely pathogenic or which influence the risk for the development of disease have been identified. Some of these variants are novel, possibly unique to the Maltese population. A number of founder effects have also been identified, highlighting conditions which are much more common locally than elsewhere. This highlights the importance of studying the local population as many of our causative variants differ from the more commonly published northern European variants. These findings enable the design of cheap, targeted diagnostic tests enabling the timely diagnosis and treatment of rare diseases.

Improving Genomic Variant Data via a Relational Database Approach

Mr Andrea Gariboldi

Department of Applied Biomedical Science, Faculty of Health Sciences

In genomic research, to record, share, and analyse genetic variations across different populations and studies is fundamental to numerous applications such as: personalised medicine, understanding and investigation of disease mechanisms (general and hereditary), genetic diversity and so on. These variations mainly refer to single nucleotide polymorphisms (SNPs), insertions, deletions, and structural variants. The standard format currently used to store information related to gene sequence variations is called, Variant Call Format (VCF). Although VCF files are widely recognised as a standard for storing genomic data, their use for data retrieval tasks is not particularly convenient and certainly not the most efficient. This often forces domain experts to use tools or write ad-hoc code to retrieve the data of interest, depending on the target of their analyses.

In this project, we aim to investigate whether transferring data from VCF files into a relational database can enhance the efficiency of data retrieval processes.

We found that, by using a relational database, the data retrieval of requested target data achieved a significant improvement in terms of both speed and efficiency. By designing SQL queries based on the most common data retrieval needs of bioinformaticians, we found that the time to obtain target data is significantly reduced compared to performing the same tasks with traditional VCF file searches. This transition aims to significantly improve query



performance and streamline research workflows.

miRBench: Novel Benchmark Datasets for microRNA Binding Site Prediction That Mitigate Against Prevalent microRNA Frequency Class Bias

Dr Panagiotis Alexiou

Department of Applied Biomedical Science, Faculty of Health Sciences

Motivation: MicroRNAs (miRNAs) are crucial regulators of gene expression, but the precise mechanisms governing their binding to target sites remain unclear. A major contributing factor to this is the lack of unbiased experimental datasets for training accurate target site prediction models. While recent experimental advances have provided numerous miRNA-target interactions, these are solely positive interactions. Generating negative examples in silico is challenging and prone to introducing biases, such as the miRNA frequency class bias identified in this work. Biases within datasets can compromise model generalisation, leading models to learn dataset-specific artefacts rather than true biological patterns.

Results: We introduce a novel methodology for negative sample generation that effectively mitigates the miRNA frequency class bias. Using this methodology, we curate several new, extensive datasets and benchmark several state-of-the-art methods on them. We find that a simple convolutional neural network model, retrained on some of these datasets, is able to outperform state-of-the-art methods. This highlights the potential for leveraging unbiased datasets to achieve improved performance in miRNA binding site prediction. To facilitate further research and lower the barrier to entry for machine learning researchers, we provide an easily accessible Python package, miRBench, for dataset retrieval, sequence encoding, and the execution of state-of-the-art models.

Availability: The miRBench Python Package is accessible at <https://github.com/katarinagresova/miRBench/releases/tag/v1.0.0>

TargetMI: A Multi-Omics Approach for Novel Drug Targets, Biomarkers and Risk Algorithms for Myocardial Infarction

Prof. Stephanie Bezzina Wettinger

Department of Applied Biomedical Science, Faculty of Health Sciences and Centre for Molecular Medicine and Biobanking

We are introducing TargetMI, an EIC Pathfinder Cardiogenomics project, where we are developing a high throughput multiomic approach for rapid discovery of novel drug targets, biomarkers and risk algorithms, applied to atherosclerosis, myocardial infarction (MI) and their risk factors. Cardiovascular disease is a major cause of death and morbidity worldwide. Despite much effort the high complexity of MI has resulted in few clinical applications of research findings. In TargetMI, we harness extensive data on 1000 highly phenotyped samples (cases, controls and relatives) of the Maltese Acute Myocardial Infarction (MAMI) Study including clinical and epidemiological data, besides four -omic datasets (whole genome, transcriptomic, metabolomic and proteomic data). Meticulous attention was paid to preanalytical variables. Using a combination of approaches, we have developed a high throughput strategy to analyse the extensive data to identify relevant intermediate phenotypes and potential drug targets for them. These will be



validated through computational analysis, (using Mendelian randomisation and 10-year follow-up data) and functional work. Novel biomarkers and risk algorithms, including polygenic risk scores, for early risk prediction in the clinic are being identified. Quantitative targeted proteomic assays will be developed for further validation in other cohorts facilitating clinical use. Besides the increase in knowledge on the molecular aetiology of MI, this powerful integrated strategy will bring rapid clinical translation of unprecedented multiomic data, and not just for MI.

Uncovering Novel ALS Genetic Drivers in the Unique Maltese Population: From Gene Discovery to Therapeutic Insights

Dr Paul Herrera

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Amyotrophic Lateral Sclerosis (ALS) is a devastating neurodegenerative disease characterised by motor neuron loss, leading to muscle weakness, paralysis, and eventual respiratory failure. While the cause remains unknown in most cases, genetics plays a pivotal role, with isolated populations like Malta exhibiting significantly elevated genetic risk. Leveraging the unique genome of the Maltese population, we aim to uncover novel ALS genetic contributors that could inform global populations. Using whole-genome sequences from ALS patients and matched elderly controls stored in Malta's National ALS Registry and Biobank, we developed a robust gene discovery pipeline. This approach has identified rare (<1.5% frequency in European populations) and potentially deleterious gene variants unique to patients and surprisingly shared by genetically unrelated cases. Some implicated variants are predicted to disrupt genes involved in pathways relevant to ALS, such as vesicular transport. Key candidate genes identified are accessible via a newly developed web-based platform, enabling open access to this unique dataset and its interrogation whilst fostering collaboration with international researchers and clinicians. Validation efforts focus on prioritising a top candidate gene, which will be tested in an animal model (*Drosophila*) to confirm its contribution to ALS pathogenesis. This study not only underscores the value of isolated populations in genetic research but also paves the way for early diagnosis and gene-targeting therapies. Identifying novel genetic drivers of ALS will enhance our understanding of the disease and contribute to the development of interventions that slow or prevent its progression.

Spatiotemporal Expression and Control of Haemoglobin in Space

Prof. Joseph Borg

Department of Applied Biomedical Science, Faculty of Health Sciences

It is now widely recognised that the environment in space activates a diverse set of genes involved in regulating fundamental cellular pathways. This includes the activation of genes associated with blood homeostasis and erythropoiesis, with a particular emphasis on those involved in globin chain production. Haemoglobin biology provides an intriguing model for studying space omics, as it has been extensively explored at multiple-omic levels, spanning DNA, RNA, and protein analyses, in both experimental and clinical contexts. In this study, we examined the developmental expression of haemoglobin over time and space using a unique suite of multi-omic datasets available on NASA GeneLab, from the NASA Twins Study, the JAXA CFE study, and the Inspiration4 mission. Our findings reveal significant variations in globin gene expression corresponding to the distinct spatiotemporal characteristics of the collected samples. This study sheds light on the dynamic nature of globin gene regulation in response to the space



environment and provides valuable insights into the broader implications of space omics research.

An in Vitro Study on Prophylactic Doses of Anticoagulants in Coagulation Factors Deficiencies

Dr Nicoletta Riva

Department of Pathology, Faculty of Medicine and Surgery

Background: Patients with haemophilia A (HA) and haemophilia B (HB) are at increased risk of bleeding. A recent guidance document suggests to consider pharmacological thromboprophylaxis on a case-by-case basis in these patients undergoing surgery at high risk of venous thromboembolism.

Aim: To assess the effect of prophylactic doses of 3 anticoagulants (enoxaparin, rivaroxaban, and unfractionated heparin [UFH]) on in vitro models of HA and HB.

Methods: FVIII and FIX deficient plasma were spiked with FVIII and FIX concentrates to mimic severe, moderate, and mild HA (FVIII concentrations <1%, 1.2%, and 17.0%, respectively) and HB (FIX concentrations <1%, 3.9%, and 22.9%, respectively). Each pool was subsequently spiked with enoxaparin (concentration range 0.3-0.4 IU/mL), rivaroxaban (50-100 ng/mL), UFH (0.2-0.3 IU/mL). The following assays were performed: prothrombin time (PT), activated partial thromboplastin time (APTT), thrombin generation (using the Fluorogenic Calibrated Automated Thrombin Generation Assay [CAT]).

Results: The PT was only slightly prolonged by the 3 anticoagulants. A significant increase of the APTT was observed with all 3 prophylactic anticoagulants, compared to unspiked plasma, in both HA and HB models ($p < 0.001$ for all). UFH showed the highest prolongation of APTT (ratio range 1.34-1.77 times compared to unspiked plasma), followed by rivaroxaban (1.23-1.68), and enoxaparin (1.19-1.38).

On the CAT, there was a significant reduction of the peak and a significant increase of the time to peak with all 3 prophylactic anticoagulants, compared to unspiked plasma, in both HA and HB models ($p < 0.001$ for all). Rivaroxaban showed the longest prolongation of the lag time (ratio 1.58-3.00) and the time to peak (3.06-4.13), while UFH showed the highest reduction of the endogenous thrombin potential (0.40-0.64).

Conclusion: These results showed a significant effect of most prophylactic anticoagulants in factor deficient plasma, supporting the concept on an individualised approach to haemophilia patients.

Acknowledgments: This study was funded by MCST and MOST (Sino-Malta Fund 2021).

Decoding the Risk Elements of Diabetes and Osteoporosis: The DETERMINE Project

Ms Marichela Schembri

Department of Applied Biomedical Science, Faculty of Health Sciences

Osteoporosis is a common progressive skeletal disorder characterised by low bone mass and bone strength, resulting in increased bone fragility and a higher risk of fractures. Individuals with type 2 diabetes (T2D) are more prone to sustain an osteoporotic fracture, highlighting the presence of pleiotropic genes and variants that contribute to the onset and



progression of both conditions. The DETERMINE (DEcoding The gEnetic Risk eleMents of osteoporosis aNd diabEtes) project will be using high throughput sequencing technology with the aim of identifying the genetic determinants contributing to bone and glucose pathophysiology, possibly uncovering pleiotropy. DNA from unrelated women from the Malta Osteoporotic Fracture Study (MOFS) with diabetes and different bone phenotypes will be used in this project. The resulting genetic findings will be tested in national and international case-control studies to determine whether the variants contribute to one or both diseases at the population level. This will provide valuable insights into the shared underlying mechanisms involved in the development and progression of both diseases, that can potentially lead to new prediction biomarkers and enhanced treatment options. This project received financial support through the Research Excellence Programme (REP-2024-027) awarded by Xjenza Malta.



Expo Stream 3.1 – 3.8

CHAIR: Dr Stephen Lungaro Mifsud | VENUE: Aula Prima



Enhancing Connections in Healthcare Education: The ECHOES Project

Dr Jose Guilherme Couto

Department of Radiography, Faculty of Health Sciences

Introduction: The ECHOES project aims to bridge competence gaps in healthcare education across Europe by fostering connections among healthcare professionals and educators. A key output is the ECHOES networking e-platform, designed to facilitate expert mobility, promote collaborations, and address disparities in skills and knowledge exchange.

Methods: The project follows a structured approach, beginning with research (WP2) to identify competence gaps through surveys and qualitative focus groups. Insights from this phase inform the platform's design and functionalities. The platform's development, undertaken by an experienced IT company, integrates features such as searchable expert profiles, AI-driven matchmaking, and video-conferencing capabilities. Dissemination efforts include social media campaigns, associate partner collaborations, and public events to ensure broad stakeholder engagement.

Results: The research phase identified critical gaps in digital, green, and transversal skills among healthcare educators. Notably, Central and Eastern Europe showed a larger gap in expertise in the education of hard skills, emphasising regional disparities. These findings guided the platform's development to address user needs effectively. Dissemination efforts have already surpassed targets, with 741 social media followers (148% of the goal) and 12 associate partners (120% of the goal). The ECHOES website (www.echoesplatform.eu) is live, providing updates and ensuring accessibility to stakeholders.

Conclusions: The ECHOES project demonstrates significant progress in fostering collaboration in healthcare education. The platform, coupled with robust dissemination strategies and partner engagement, is poised to achieve a lasting impact at local, regional, and international levels, ensuring a sustainable exchange of expertise and skills among healthcare educators.

Should Research Start from an Undergraduate Level? A Case Study Among University of Malta Medical Students

Dr Sarah Cuschieri

Department of Anatomy, Faculty of Medicine and Surgery

Introduction: Physicians play a crucial role in translating research into clinical practice, yet few are engaging in research. Early exposure during medical training may help address this decline.

Methods: Over four years, we investigated whether research should begin at the undergraduate level by assessing medical students' attitudes, engaging them in hands-on research, and implementing structured training.

Results: First, a mixed-methods questionnaire explored attitudes to research participation, revealing that while 86.43% of students were interested in research, only 22.86% had pursued it, with the main obstacle being a perceived lack of opportunities. Next, a hands-on research project on COVID-19 epidemiology was provided to assess the impact of direct research involvement. This experience significantly improved students' perceptions towards research, reduced barriers ($p < 0.01$), and highlighted mentorship as a key factor, with 95.24% of students expressing a desire for faculty-led opportunities. Building on these findings, a structured research course provided through the degree plus programme (DPG0118) was developed to systematically address identified barriers. Post-course analysis showed significant improvements in research knowledge and confidence ($p < 0.05$). Qualitative feedback indicated that students felt "empowered through education" and valued the course's "effective design and delivery," reinforcing the



importance of structured research training in undergraduate medical education.

Discussion and Conclusion: These findings demonstrate that structured research exposure improves students' perceptions, reduces barriers, and fosters engagement. Mentorship and formal training play key roles in sustaining interest. Integrating research opportunities into the medical curriculum could cultivate future physician-researchers, ensuring continued advancements in healthcare through evidence-based practice.

The Data Integrity and Stewardship Research Cluster (DISC)

Dr Mireille M. Sant

Department of Media, Communications and Technology Law, Faculty of Laws

The Data Integrity and Stewardship Cluster (DISC) is a multidisciplinary research initiative that aims to overcome legal and technical barriers to data processing for the purposes of scientific research carried out in the public interest while upholding participant fundamental rights and interests, and enhancing public/patient engagement. The DISC Research Cluster is currently addressing critical challenges in data governance and data stewardship for health and biomedical research. Focusing on data protection, data stewardship, and open science, DISC aims to contribute to the development of legal, technical, and ethical frameworks to enable compliant, efficient, and innovative data-driven research.

The Cluster comprises two foundational pillars – Biomedical Imaging, and Genetics and Genomics – and brings together experts from the fields of law, science, technology and sociology. It aims to align Malta's strategies with EU policies and stakeholders' interests by proposing legislation and, or codes of conduct as necessary, clarifying data protection rules for health research, and leveraging UM facilities like the University MRI Research Platform (UMRI) and DwarnaBio Biobank through interdisciplinary collaboration for practical, solution-focused outcomes.

As such, in its first five years, DISC plans to promote interdisciplinary dialogue, publish impactful research and secure additional significant funding, while working to enhance public trust and understanding of data-driven science. Its ultimate vision is to position Malta as a leader in biomedical research, balancing open science principles with the protection of individual rights to advance health outcomes and societal wellbeing globally.

The Bio-Psycho-Social Needs of the Aging Population Using Heroin

Dr Anna Grech

Department of Psychology, Faculty for Social Wellbeing

The National Report on the Drug Situation and Responses in Malta (2021) highlights an aging population of heroin users, posing unique challenges for treatment services. This research investigates the biopsychosocial needs of individuals with lived and living experience of heroin use aged 40 and above in treatment in Malta and evaluates their implications for service provision. Substance abuse among older individuals is rising, with some persisting into advanced age, often experiencing comorbid disorders, social isolation, and stigmatisation. Chronic drug use accelerates aging, compounding physical, psychological, and social difficulties, which strains services primarily designed for younger clients. Despite limited data on older individuals with lived and living experience of heroin use in Europe, this study aims to address critical gaps by identifying specific needs, service provision challenges, and areas for development to



improve the health and wellbeing of this population. Using a biopsychosocial framework, the study employs a mixed-methods approach. A questionnaire was distributed among individuals with lived and living experience of heroin use over 40 in treatment to assess their needs, followed by in-depth interviews to explore lived experiences. Data from these participants informed subsequent interviews with service providers, capturing their perspectives on challenges and potential service improvements. Findings are expected to reveal ways to combat issues like social isolation, stigmatisation, unemployment, homelessness, and poor health among aging heroin users, ultimately enhancing their quality of life. This research contributes to the European evidence base, aligns with the United Nations Sustainable Development Goals 1, 3, and 10, and provides actionable recommendations for policymakers to address the pressing issue of aging drug users in treatment.

Stakeholder Perspectives on a Hybrid Care Model for Chronic Non-Communicable Diseases: A Qualitative Study Out of the RAPIDE Project

Mr Andrea Cuschieri

Department of Anatomy, Faculty of Medicine and Surgery

Introduction: RAPIDE, a horizon Europe-funded multi-national project, is aiming to develop tools to enhance healthcare resilience during cross-border emergencies. One of the aims is to identifying key components in normal care pathways for chronic diseases, exemplified through type 2 diabetes and chronic heart failure, assessing patient experiences, and evaluating hybrid care potential.

Methods: Six focus groups with patients and their informal caregivers, along and 2 interviews with healthcare specialised professionals were conducted. Audio-recordings were manually transcribed. The resultant data was analysed through open and axial coding following grounded theory using NVIVO15. Ethical approval: MED-2024-00219.

Results: Patients and caregivers highlighted key challenges in chronic disease management, including limited access to consistent healthcare providers, logistical difficulties, and financial constraints. While in-person consultations were preferred for physical examinations and continuity of care, hybrid care was seen as beneficial for routine follow-ups, reducing travel burdens, and preventing hospital-acquired infections. Digital literacy, access to technology, and privacy concerns emerged as potential barriers. Healthcare professionals emphasised the importance of structured implementation and training for hybrid care adoption. The research suggests that a balanced integration of hybrid care could enhance patient experiences while maintaining the quality of chronic disease management.

Discussion and Conclusion: Hybrid care presents significant benefits but requires careful implementation. Addressing technological barriers, digital literacy, and communication gaps is crucial. Insights from this research will inform the development and testing of a hybrid care model within RAPIDE's validation study, aiming to shift hospital care into primary, community, and home settings without compromising quality.



Using Microalgae to Support Agriculture: Findings from the Literature and Farm Trials in Malta

Dr Jules Siedenburg

Institute of Earth Systems

Agriculture is a critical sector, providing jobs and boosting food security in an uncertain world. It is also central to cultural heritage. Yet farmers in Malta and beyond face growing threats to agricultural production, including rising input costs, land degradation and climate change. Agricultural innovations are urgently needed to help farms remain viable despite such threats. Nature-based solutions (NbSs) – i.e., innovative natural resource uses – are attracting interest across sectors as possible ways to address escalating sustainability concerns, including risks of current systems to jobs, health and the environment. NbSs based on microalgae are attracting particular attention due to the favourable characteristics of these organisms. Ongoing research at UM is exploring the scope for microalgae to boost both crop and livestock production, including the pertinence of these inputs to various threats facing farmers. This includes reviewing the academic literature, examining these technologies in partnership with Maltese farmers, and developing fresh conceptual framings. This presentation will frame the challenge facing farmers then share the findings of this research to date. This includes key findings from its farm trials and its literature reviews on the efficacy of microalgae to both field crops and livestock. The findings suggest that microalgae hold promise for helping Malta realise its Strategy for Resilient Food Systems, with its vision of forging more viable, resilient and healthy food systems on the islands.

Monitoring of Imposex and Antifouling Organotins: A Review

Prof. Victor Axiak | *Co-researcher: Prof. Alfred J. Vella*

Department of Biology, Department of Chemistry, Faculty of Science

Tributyltin (TBT) has been used worldwide as a powerful biocide in antifouling marine paints, for over 40 years. However, its toxic effects on non-target marine species led to its ban, first on small boats and then in all ships by 2008. Imposex (or imposed male sex characteristics on certain female neogastropods) has been considered as a powerful biomonitoring tool for TBT at extremely low concentrations. Researchers at the University of Malta have been amongst the first to utilise such biomonitoring tool in the Mediterranean using *Hexaplex trunculus* (the banded dye-murex), over the period 1992-2010. This review will report on imposex monitoring from Malta over this period, as well as from Lampedusa and Linosa (both sites considered as relatively free from marine pollution). Such biomonitoring was supported throughout by chemical monitoring for organotins. Imposex and organotins had been reported at high levels of occurrence in areas associated with maritime traffic such as harbours and marinas. At the peak of the use of TBT, no coastal location in Malta or Gozo was found to be completely free from imposex. We also discovered novel organotin compounds that were not deliberately added to the marine environment as biocides but originated from TBT by biochemical transformation processes. After the total ban of the use of TBT, further biomonitoring enabled us to assess the success or otherwise of such ban. Throughout, these years the notion that only TBT leads to imposex has been repeatedly challenged, with triphenyltin often cited as another imposex inducer. Chemical monitoring of various environmental marine compartments in Malta, including the water column, bottom sediments and the surface microlayer has also discovered triphenyltin at varying environmental levels.



A Predictive Occupancy Model for Vascular Plants in Temporary Freshwater Rockpools

Ms Leanne Camilleri

Department of Biology, Faculty of Science

Temporary freshwater rockpools (TFRs) in the Mediterranean are dynamic habitats with seasonal drying and inundation, hosting species adapted to these conditions. Effective conservation is sometimes hindered by their transient nature. This study aimed to develop a predictive tool for estimating TFR phytocoenosis composition based on physical characteristics, focusing on seven target species: *Damasonium bourgaei*, *Elatine gussonei*, *Callitriche truncata*, *Crassula vaillantii*, *Ranunculus saniculifolius*, *Zannichellia melitensis*, and *Lythrum* spp. We surveyed 170 TFRs across the Maltese Islands, recording water depths, pool dimensions, and sediment depth. Using Orange Data Mining software, we constructed binary occupancy models for each species-parameter combination with logistic regression classifiers. Models were trained on 80% of the data and tested on 20%, utilising nomograms to indicate parameter importance. Results showed that water depth contributed more to classification decisions than sediment depth for all species. Occupancy models for *Elatine gussonei* and *Zannichellia melitensis* achieved high Classification Accuracy (CA) of 89% and 77%, respectively. These models could effectively predict species colonisation in TFRs based on water and sediment depth, serving as valuable tools for conservation and restoration efforts. This study demonstrates the potential of using physical characteristics to predict plant species occurrence in TFRs, offering insights for more targeted and efficient management of these unique Mediterranean habitats.



Expo Stream 4.1 – 4.8

CHAIR: Dr Patrick Camilleri | VENUE: Meeting Room 2



Designing Professional Development for Teaching Mathematics Through Problem-Solving

Dr James Calleja

Department of Leadership for Learning and Innovation, Faculty of Education

The INSOLVU project, funded by UNESCO and Huawei Technologies and led by the Ministry for Education in Malta and the Collaborative Lesson Study Malta (www.clestum.eu) programme at the Faculty of Education (UM), involved the design and implementation of a professional development (PD) programme to support teaching mathematics through problem-solving in primary schools using lesson study.

Prior to the PD design, qualitative data was collected from primary school teachers (PSTs) and mathematics specialist teachers (MSTs). With PSTs, an online questionnaire was used to collect data about their mathematics teaching practices, their beliefs about effective mathematics teaching, issues and challenges in teaching mathematics, and their understanding and use of teaching through problem-solving. With MSTs, a focus group discussion generated data about their role in supporting PSTs, their perceptions of mathematics lessons, their understanding of problem-solving, their views about different approaches to PD, and their perception of teachers' disposition to PD.

Data analysis, of these two research activities, informed the design a two-phase PD programme, that included:

1. A 30-hour programme for MSTs so that they become knowledgeable in facilitating lesson study with PSTs.
2. A 15-hour lesson study programme that MSTs facilitated with PSTs in schools over a period of 6 to 8 weeks.

Throughout this PD, MSTs were mentored by an experienced lesson study facilitator.

We present the results of two research activities and then discuss how the findings informed the design and implementation of a lesson study based professional development (PD) programme.

An Investigation into Literacy Practices for Students with Intellectual Disabilities

Dr Loredana Muscat

Department of Human Communication Sciences and Disorders, Faculty of Health Sciences

This postdoctoral research examines literacy educational practices designed for students with intellectual disabilities. . This research aims to bridge the gap between theory and practice, encouraging an inclusive approach to literacy education that empowers all learners, regardless of their abilities. The presentation focuses on two complementary studies, both aimed at improving literacy practices for this population.

The first study provides insight from a scoping review of the literature to identify evidence-based practices that support literacy development in inclusive bilingual settings. Preliminary findings highlight effective strategies, including multisensory instruction, scaffolded phonics, and the cultivation of a supportive language environment. Additionally, the review offers insight into how language choice, within bilingual communities influences literacy outcomes and student engagement in reading activities.

The second study investigates how students with intellectual disabilities are taught to read in Maltese schools. Early findings reveal both challenges and successful practices. Inclusion coordinators from various school contexts provided reports on current literacy practices, highlighting issues related to the selection of appropriate teaching strategies, the difficulties encountered during planning and implementation, and the need for specialised training and targeted resources to address these gaps effectively.

Together, these studies emphasise the need to equip educators with the knowledge, skills, and resources necessary for



inclusive literacy instruction. Future studies will focus on refining teacher training programmes and developing resources aligned with evidence-based strategies identified through this research.

Experimentation, Exploration and Boundary Testing in the Narratives of Primary-School Children

Mr Julian Galea

Department of Early Childhood and Primary Education, Faculty of Education

This paper explores the role of experimentation, exploration and boundary testing in the free-writing of primary-school (Year 5 and 6) children. The paper investigates 800 written narratives prompted through the use of an image employing a collage of stereotypical images from fairy-tales and mythology (Gellel and Morales, forthcoming). A number of these narratives contained themes of violence, death, power struggles, conspiracy, and subversion. In a cultural landscape dominated by Disneyfication, where children's media is often sanitised, morally simplistic and neatly resolved, this study examines how children may navigate, resist, test, or internalise these cultural constraints in their storytelling. We posit that shadow themes in children's writing are not simply expressions of fear or rebellion but rather critical sites of meaning-making, where children negotiate personal and collective anxieties within a structured but flexible narrative space, drawing on and exercising a personal repertoire of symbols to navigate uncertainty.

Drawing on Bruner's (1986, 1996, 2006) concept of narrative thought and Vico's (1746) concepts of narrative and imagination, we examine children's engagement in imaginative boundary-testing and use of agency in weaving the cultural tools at their disposal to re-develop meaning.

These findings have significant implications for educational practices, encouraging a re-evaluation of pedagogical approaches that either suppress or underestimate the complexity of children's self-driven storytelling. The study also raises questions about the cultural shaping of childhood narratives, particularly in an era where dominant media influences increasingly dictate the boundaries of "appropriate" storytelling.

Bridging Language Gaps in Early and Primary Education: A Pre-Service and In-Service Teacher Survey of Linguistically Diverse Practices in Malta

Prof. Josephine Milton | Co-researcher: Dr Josephine Deguara

Department Early Childhood and Primary Education, Faculty of Education

The growing phenomenon of global mobility has heightened linguistic diversity in schools, posing both challenges and opportunities for teachers and students. Migration has introduced complex dynamics in language and literacy acquisition across bilingual, multilingual, and plurilingual contexts in Europe and beyond. Maltese classrooms exemplify this trend hosting Maltese and non-Maltese children, who may have varying proficiency levels in Maltese and English, with non-Maltese children possibly also having a foreign language or two as their first and second languages of communication. This linguistic diversity often leads to difficulties in teaching, learning and communication for teachers and students alike.

Grounded in affordance theory (Gibson, 1977), this study investigates how schools in Malta create social language affordances that enhance acquisition of languages. As part of a larger project, this study employs a questionnaire,



targeting pre-service and in-service educators teaching children aged 3 to 11 in Malta and Gozo. The questionnaire, designed with both closed- and open-ended questions, examines how pre-service and in-service educators perceive and implement strategies to support linguistically diverse classrooms.

Indicative findings may highlight current linguistic pedagogical and communicative practices, ongoing challenges and innovative strategies being used in Maltese classrooms. These insights inform teacher training, promote inclusive classroom practices, and the development of effective responses to linguistic diversity.

It also emphasises the importance of teacher education and mentoring programmes for newly qualified teachers (NQT) in developing awareness and agency for implementing effective pedagogical strategies for linguistic diversity.

Access Denied: Third-Country Nationals Parents' and Children's Narratives of State-Sanctioned Exclusion from Schooling

Dr Louise Chircop | *Co-researcher: Dr Jonathan Borg*

Department of Education Studies, Faculty of Education

The right of children and young people to education is internationally recognised in Article 28 of the United Nations Convention of the Rights of the Child (UNCRC), which guarantees access to education for all children. Malta's Education Act (1988) reaffirms this right. However, bureaucratic processes continue to deny a number of children, who are Third-Country Nationals (TCNs), access to state education, violating both the local Education Act and the UNCRC of which Malta is a signatory. This exclusion contradicts the principles of Entitlement and Diversity of the National Curriculum Framework (MEDE, 2012) and questions the democratic credentials of the education system. This qualitative study serves as a means to unearth the lived experiences of five children, aged between eight and fifteen years, who are TCNs and who currently reside in Malta but are denied access to state education. Additionally, semi-structured interviews with seven TCN parents provide insights into their experiences, highlighting the broader impact of exclusion on families. Through a thematic analysis of semi-structured interviews, the study explores how systemic barriers infringe on children's right to schooling. The children's voice focuses on their experiences of exclusion while parents' perspectives shed light on the challenges they face in advocating for their children's right to education. The findings emanating from this study contribute to a broader understanding of the structural injustices within Malta's education system and call for urgent measures to safeguard the right to education for all.

The Heart of Education: Understanding and Prioritising Educator Wellbeing

Dr Amanda Bezzina

Centre for Resilience and Socio-Emotional Health

Educator wellbeing is increasingly recognised as a critical component of a thriving education system. However, occupational stress continues to undermine the physical and mental health of educators, disrupt work-life balance, lower job satisfaction, and contribute to high attrition rates. This study focuses on educator wellbeing in Malta, gathering perspectives from a wide range of stakeholders, including Heads of Schools, Deputy Heads, Teachers, Learning Support Educators (LSEs), Policy Makers, Education Managers, and Administrators, and School-based Youth workers. Framed within the principles of Positive Psychology, which emphasises resilience, optimism, and happiness,



the research identifies key challenges impacting educators and explores strategies to support their professional and personal development. Using a qualitative methodology, data was collected through four focus groups, each comprising a distinct group of stakeholders: Heads of Schools and Deputy Heads; teachers and LSEs; school-based youth workers, and policymakers, education managers, and administrators. Participants were purposively sampled to ensure representation from the various staff categories. Thematic analysis of the discussions will reveal important reflections on educator wellbeing and will present suggestions for implementation. Ethical guidelines were strictly followed, ensuring informed consent, participant confidentiality, and the right to withdraw from the study at any stage. The study is an eye-opener to key stakeholders in education because results indicate the views and the feelings of the professionals who need to preserve their own wellbeing for their life and their effective functioning at work.

Exploring Teachers' Perceptions of MOOCs Through the Lens of the Technology Acceptance Model

Dr Michelle Attard Tonna | Co-researchers: **Dr Patrick Camilleri, Dr Abeer Watted**

Department of Leadership for Learning and Innovation, Faculty of Education

While Massive Open Online Courses (MOOCs) have gained prominence in higher education, their role in fostering pedagogical and technological readiness among teachers remains underexplored. This study addresses this gap by leveraging the Technology Acceptance Model to investigate how MOOCs influence teachers' perceived usefulness, perceived ease of use, and professional growth. By employing a mixed-methods approach, the research explores how perceived usefulness and perceived ease of use influence participants' attitudes, behavioural intentions, and learning practices via MOOCs. A total of (N=144) participants, primarily Israeli and Maltese teachers in their pre-service and in-service stage completed the "Teaching Thinking" MOOC. Data collection involved pre- and post-course surveys, as well as open-ended questionnaires for a subset of participants. Quantitative findings reveal initial ambivalence toward MOOCs, with moderate Perceived Usefulness and Perceived Ease of scores, tempered by concerns over time management and platform usability. Post-course analysis showed significant improvements in participants' perceptions, highlighting increased acceptance and acknowledgment of MOOCs' flexibility and access to diverse resources. Qualitative insights underscored key factors driving these shifts, including instructor support, peer interactions, and the self-directed learning environment. Results suggest that MOOCs foster critical skills such as time management, problem-solving, and professional engagement while contributing to participants' self-efficacy and readiness to integrate technology into teaching practices. Challenges identified include technical barriers, lack of personalised feedback, and initial reluctance to adopt online learning. This study underscores MOOCs' transformative potential in teacher education, emphasising the importance of tailored course design, supportive learning environments, and strategic policy initiatives to enhance engagement and outcomes. Future research should further explore long-term impact on teaching efficacy and the integration of MOOCs into teacher training curricula.



Classics Through Digital Leisure-Learning

Dr Carmel Serracino

Department of Classics and Archaeology, Faculty of Arts

A young student is whisked away by the gods to replace Helen and influence the outcome of the siege of mythic Troy. Will she be able to avert the city's destruction? Can she perhaps help concluding a peace treaty between the ancient foes? The University of Malta has been awarded a Creative Europe Programme Grant to lead a project 'CITADEL - Classics Through Digital Leisure-Learning' which aims to revive the interest of young people in classical literature by the creation and distribution of a digitised game downloadable through a mobile app. A teaching campaign is the core part of the project where secondary school students from three EU member states will not only learn about ancient mythology but will also have the possibility of modifying the game by exploring ways how to integrate modern-day social and environmental issues into its storyline and end result.



Expo Stream 5.1 – 5.8

CHAIR: Prof. Conrad Thake | VENUE: Lecture Room 203



From Copy to Original: Unveiling the Medieval Origins of a Byzantine Icon

Prof. Charlene Vella

Department of Art and Art History, Faculty of Arts

This research examines a recently restored Byzantine icon of the Madonna and Child housed in the Birgu Church of Santa Maria Damascena. Originally believed to be a 17th-century Maltese copy of the Damascus Madonna, transferred to Valletta's Greek Catholic Church, restoration and scientific analysis, including carbon dating, revealed its 13th-century origins. This significant discovery sheds light on medieval Mediterranean artistic and devotional practices.

The study explores the icon's context within the Knights of the Order of St. John, highlighting the influence of Byzantine art brought to Malta by the Knights and the Rhodiots who followed them to Malta. It analyses the icon's stylistic and iconographic features, emphasising themes of replication in sacred art. A detailed investigation of its material composition and painting techniques provides insights into its production methods and Byzantine artistic milieu.

This research positions the icon as one of the oldest securely dated images of the Madonna and Child in Malta, enriching the understanding of the Maltese islands' artistic legacy. It also examines the implications of its re-dating for Maltese art history and the broader role of icons as objects of veneration and cultural exchange in the medieval Mediterranean.

The project underscores the value of interdisciplinary approaches, combining art history, scientific analysis, and restoration studies. Conservation and restoration were conducted by Preverti Ltd under the guidance of Prof. Charlene Vella, contributing to the growing field of technical art history and revealing new dimensions of historical artefacts.

An Exciting Discovery: Scenery at the Royal Opera House

Prof. Vicki Ann Cremona

School of Performing Arts

Imagine the sheer thrill of finding scenery that has been forgotten for over eighty years and realising that this belonged to the Royal Opera House. This theatre, situated at the entrance to Valletta, marked both colonial power and Maltese pride. It lives on in Maltese collective memory, tinged with a sense of nostalgia, even though the generations who frequented it are no more. The paper will discuss the concepts and ambitions behind the building of the opera house, taking as a starting point its plans and scenery. It will discuss findings about the opera house, its scenographers and scenography, the machinery used, and the introduction of new devices. It will focus on the methodology and processes used to gather information with a view to creating a documentary with the aim of diffusing knowledge about the opera house beyond academic circles. It will discuss the criteria used to develop an outreach approach, one that would fascinate viewers, while at the same time showing the level of excellence targeting by the performing arts section of the University of Malta. It will also highlight collaboration with the Manoel theatre, and with researchers abroad working on historical theatres and their administration.



Notes from Underground: The Project UndergroundMed

Dr Chiara Cecalupo

Department of Classics and Archaeology, Faculty of Arts

The MSCA project UndergroundMed traces the history of the rediscovery of ancient catacombs between the 16th and 20th centuries across the Mediterranean, in particular Italy, Malta, and Tunisia. It analyses the topic from a broad European perspective, through studies conducted on travel routes, explorations, archive and museum collections, and it enhances the role of European scholars in creating an international and multicultural research-network while travelling across the shores of the Mediterranean in search for catacombs. I will share some preliminary results of this systematic analysis on catacombs rediscovery, to illustrate how UndergroundMed defines the role played by catacomb archaeology in building a European common culture.

Uncovering the Medieval Church of St Anne in Fort St Angelo: Using Ground-Penetrating Radar to Explore its Architectural Evolution

Dr Emanuele Colica | Co-researcher: Prof. Charlene Vella

Department of Geosciences, Faculty of Science

This interdisciplinary research project – conducted in collaboration between Prof Charlene Vella from the Department of History of Art in the Faculty of Arts and Dr Emanuele Colica and Prof Sebastiano D'Amico from the Department of Geosciences in the Faculty of Science – investigates the original size and layout of the medieval Church of St. Anne within Fort St. Angelo, Malta. The church underwent significant alterations after 1530 with the arrival of the Knights of the Order of St. John. Ground-Penetrating Radar (GPR) technology was employed to survey the subsurface features of the site, aiming to reconstruct the church's early architectural footprint and spatial configuration. The Church of St. Anne holds a pivotal position in Malta's medieval and early modern history, as the site of the fort, originally known as Castro Maris, was the most important fort or castle on the Maltese Islands. It also served as the headquarters of the Order of St. John after their arrival in 1530. Archival research alone has proven insufficient for discerning the church's pre-1530 form.

The GPR survey revealed a series of anomalies beneath the existing structure, suggesting the presence of previously undocumented architectural elements such as foundations and walls. By integrating geophysical data with historical and architectural analyses, this study contributes to a deeper understanding of Malta's ecclesiastical heritage and the transformation of sacred spaces during periods of political and religious change. This project underscores the importance of interdisciplinary approaches in uncovering hidden narratives within Malta's historic built environment.



The Divergent Fates of Wartime Israeli and Gazan (Palestinian) Cultural Heritage: An Analysis of Heritagisation Processes Affecting GLAMs on Separate Sides of the Israel-Hamas War

Prof. Marc Kosciejew

Department of Library, Information and Archive Sciences, Faculty of Media and Knowledge Sciences

Divergent fates have befallen Israeli and Gazan (Palestinian) cultural heritage during the Israel-Hamas war. This presentation provides a case study of the war's implications for both Israeli and Gazan cultural heritage sectors, represented by galleries, libraries, archives, and museums (GLAMs), to overview the state of cultural heritage over the course of the war. A tripartite typology of heritagisation processes – namely heritagisation, re-heritagisation, and de-heritagisation – is furnished in which to situate, examine, and contrast the case study. Foregrounding the case study within this typology serves two purposes: first, it spotlights the parallel processes of heritagisation, re-heritagisation and de-heritagisation to help describe, interpret, and understand them within this volatile setting; and, second, it enables a conceptual and practical mapping of the convolutions regarding the war's productive (heritagisation/re-heritagisation) and destructive (de-heritagisation) effects on cultural heritage on separate sides of the conflict. Ultimately, parallel heritagisation processes related to the war simultaneously unfurled within and between Israel and Gaza, resulting in contrasting consequences on their respective cultural heritage sectors and contexts.

The Pre-1819 Maltese in Corfu

Prof. Arnold Cassola

Department of Maltese, Faculty of Arts

The Maltese state recognises the year 1819 as the year when the Maltese first migrated to Corfu, when under British rule. Indeed, the censuses in Corfu do not record any Maltese present on the island before 1828. However, my ongoing research in the State Archives and the Catholic Archives in the Ionian Island shows that Maltese people were active in Corfu already as from the year 1815. My aim in this presentation is to inform about the Maltese persons present on and operating in the island before the officially recognised date of 1819.

Why They Tell Their Stories: Exploring the Motivations Behind Migration Narratives in French and Francophone African Literature and Cinema

Dr Anabel Said

Department of French, Faculty of Arts

This presentation examines the creative impulse behind authors' and filmmakers' drive to explore the theme of migration. Based on a selection of literary and cinematographic works produced by French and francophone African artists, this study investigates the diverse motivations that inspire the creation of texts and films on this complex yet deeply human subject and provides insight as to why literature and cinema dealing with the figure of the migrant are so essential within the broader context of globalised societies.

For some, the representation of the experience of migration constitutes an act of introspection and retrospection,



offering a way to process personal histories. For others, on the other hand, it requires self-effacement, shifting the focus to the experiences and destinies of others. Still others are compelled by a sense of duty or responsibility to shed light on the multifaceted reality of migration, offering testimony to a phenomenon which is often misrepresented or oversimplified in public discourses.

In fact, the authors and filmmakers in question exhibit a form of artistic commitment that seeks to expose truncated or marginalised narratives, challenging dominant societal perceptions of the migrant as the Other. In doing so, they raise broader questions about the value and utility of art in moments of profound human suffering and highlight the power of literature and cinema to foster reflection and empathy while challenging reductive views, thus underscoring the vital and transformative role of these two media in documenting and understanding migration.

Cecil Satariano's Films: The Archival Challenges

Dr Charles J. Farrugia

Department of Library Information and Archive Sciences, Faculty of Media and Knowledge Sciences

Cecil Satariano was a Maltese film-maker, film critic, film censor and author. He was a self-taught amateur film maker who in 1970 produced his first film "I'm Furious...Red" which gained a Ten Best award in the UK "Movie Maker" magazine competition, the first Super 8 film to do so. He continued to achieve a number of awards for his other films "Giuseppi", "The Beach", and "Katarin". Notwithstanding these successes, the works of Satariano remained stacked in a warehouse and the content was only accessible via unprofessionally produced copies. A project steered by Veronica Galea and the National Archives of Malta is remedying this and is restoring the originals, digitising them, and putting them again on the market. The presentation discusses the archival challenges that in this case were quite unique. All the original footage taken was found together with an unknown music soundtrack composed by Professor Charles Camilleri that was never actually used with the films. Thus, this project presents archival challenges in terms of the level of intervention, the use of AI to enhance the productions, and the challenge of developing an outreach strategy that involves projection in a number of international film festivals. Thus, this project is considered as a prototype in wholistic film restoration on Maltese productions.



Expo Stream 6.1 – 6.7

CHAIR: Prof. Colin Calleja | VENUE: Meeting Room 101



Preserving Traditional Joinery Through Citizen Science Pedagogy: A Model for Engaged Learning

Prof. Russell Smith

Centre for Entrepreneurship and Business Incubation

Traditional joinery, with an oral history dating back to the 1860s, faces the risk of being lost in the absence of active preservation efforts. This study explores the integration of citizen science principles in the teaching of this craft, fostering a dual role for students as learners and investigators. Conducted as part of a Centre of Liberal Arts and Sciences module, the course encouraged students to delve into their personal and family traditions of woodworking and joinery. Through guided exploration, they uncovered historical information, identified family connections to the craft, and restored vintage tools to working conditions, bridging past and present through tangible engagement.

The pedagogical framework emphasised active participation, investigation, and restoration, blending the science and art of joinery with a broader appreciation of cultural heritage. In addition to learning the technical skills of joinery, students reimagined their role as stewards of an endangered tradition. The forthcoming module will further their exploration as students produce two pieces of fine art, drawing on both the technical mastery and historical insights they gained.

This project demonstrates the potential of citizen science as a transformative approach to arts and science education, preserving endangered traditions while cultivating deep, interdisciplinary engagement among learners.

How Maltese /r/ Changed Over Time and How Listeners Perceive It

Prof. Holger Mitterer

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

Based on the observation that media consumption during childhood shifted from Italian to English over the last 20-30 years, we hypothesised that how the rhotic sound /r/ is produced in Maltese may have shifted from an alveolar trill /r/ (as observed in Italian) to an approximant /ɹ/ as observed in English. In a production study comparing older (>45 years) and younger (<25 years), we indeed observed that the approximant variant is more likely for younger speakers. However, in some circumstances, even older speakers prefer the “English” approximant, for instance, if the /r/ is in a coda cluster. This indicates that the language change was already underway in the older cohort.

The situation in which different speakers use different allophones for the same sound leads to the question how listeners deal with that variation, which was investigated in two eye-tracking studies. The case of Maltese is interesting here, because, unlike for many other languages, there is 50/50 split between the approximant and the trill variant of /r/ and any preference cannot be driven by frequency of one of the variants. Participants also completed a short production task to investigate whether listeners prefer the variant they produce themselves. However, the results showed that the alveolar trill /r/ leads to faster word recognition than the approximant independently from the production preferences of the listeners. This is relevant for the paradox why the trill, despite being difficult to acquire and produce, is still so popular in the languages of the world.



The Changing Face of the Foreign Language Classroom in Malta

Dr Denise Camenzuli

Department of German, Faculty of Arts

Over the past years global migration has increased considerably, especially in European countries. Malta is currently experiencing a demographic change as the number of immigrants from all corners of the world including Africa and Southern-Asian countries has increased by 69% over 2010 (NSO, 2022). This has resulted in a change in the classroom demographic population, where during the academic year 2020-2021, the foreigners accounted for 13.9% of the school population, with over 50% being non-EU nationals (NSO, 2022). From traditionally bilingual with the national language, il-Malti, and English as the second language spoken by the majority of the learners, the cohort has become linguistically diverse. This is posing new challenges for teachers, both due to different learning aptitudes and the absence of a common language for explanation. Studies on education in the multilingual classroom in the primary sector have started to emerge (Camenzuli et al., 2022; Panzavecchia/Little, 2020) however studies in the post-secondary and adult foreign language field are still lacking. This study has sought to investigate the foreign language adult classroom with particular reference to learners of German as a foreign language. Qualitative data have been collected from Maltese and non-Maltese adult learners and analysed statistically in order to obtain an insight on the language learning motivation. The data was also analysed to check for differences between the motivation of Maltese and non-Maltese adult learners possibly to develop language courses to meet these needs.

Digital Autonomous Virtual Educator (DAVE)

Mr Benjamin Joseph Spiteri

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Every student deserves an individualised learning experience that is tailored to their specific needs in order to help them reach their full potential. This paper discusses the Digital Autonomous Virtual Educator (DAVE) project which aims to provide a personalised digital tutor for each student. DAVE utilises AI technologies to analyse student academic data, adapt academic material according to individual needs, and provide clear and detailed explanations in real time. DAVE implements advanced automated prompt engineering and a custom multi-stage verification approach to mitigate the known limitations of LLMs. Through the integration of DAVE within an established learning application, testing results highlighted DAVE's efficacy in real world situations, comparing the performance of DAVE against commercial AI systems. Students utilising DAVE achieved improved results on mathematics worksheets by a margin of 32%, while also reporting higher user satisfaction levels of 12%. Students emphasised DAVE's helpfulness, clear explanations, and personalised support. These results demonstrate the feasibility, benefits, and potential of effectively integrating AI into educational systems.



The Perceptions of University of Malta Academics on the Dual Career of Student-Athletes

Dr Adele Muscat | *Co-researcher: Prof. Andrew Decelis*

Institute of Physical Education and Sport

Numerous studies have reported the challenges experienced by dual-career athletes in their quest to succeed in sports and academics. Despite the development of the European Guidelines of Dual-Careers, several studies, as well as Erasmus+ projects on the subject, academics outside the sporting field still lack the knowledge of challenges student-athletes face and how they may support them. This study attempted to explore the perceptions of academics in various faculties at the University of Malta on the dual career of athletes, the challenges academics face in supporting such student-athletes, and how the university can move forward in terms of its support towards dual-career students. Semi-structured interviews were conducted with twelve academics from eleven different faculties within the university using purposive and convenience sampling. Data was analysed utilising reflective thematic analysis. Results showed that the academics experienced several challenges in supporting dual-career athletes; acknowledged the challenges that student-athletes themselves face; the skills dual-career individuals gain as a result of trying to excel in both sports and academics; the support available to students not just from academics themselves but from the university too; the need for better communication and sharing of information across the university; and, ways how the university can improve in terms of supporting dual-career students. This study highlights the need for more awareness of dual-career support and challenges and adaptable, integrated frameworks catering to athletic and academic schedules.

Researching Children's Drawings: Developing a Methodological Tool for Data Analysis

Dr Josephine Deguara

Department of Early Childhood and Primary Education, Faculty of Education

For decades, children's drawings have been a significant focus of research, frequently using narrative and visual approaches to interpret them. In this presentation, I shall describe the use of a novel methodological tool: a data cross-grid designed to analyse young children's drawings. Adopting a social semiotic lens, this tool serves as a complementary approach to narrative and visual analysis. The study involved three 4-year-old children who were encouraged to create drawings both at home and at school over a 4-month period. A total of 223 drawings were generated. The drawings were first examined for their form, that is, the modes that the children used. This was followed by an analysis of the content of children's drawings, which included identifying the different themes children represented and their frequency. Consequently, a data cross-grid was developed for each child, where the drawings were systemically categorised and plotted. These three data cross-grids provided an alternative way for interpreting children's drawings. The findings suggest that the data cross-grid offers an instantaneous graphical snapshot of each child's preferred semiotic modes and themes, which communicate their respective unique personality, and identity as drawers. This methodological tool has potential applications for both researchers and educators in gaining insights into the children's preferred ways of drawing and meaning-making. It can also be adapted to be used with other modes children use such as play, the visual arts and movement, helping adults understand the children's multimodal ways of communication and meaning-making.



Inclusive Leadership in Maltese Childcare Centres: Strategies, Challenges, and Implications for Equity and Inclusion

Dr Charmaine Bonello | *Co-researcher: Dr Jonathan Borg*

Department of Early Childhood and Primary Education, Faculty of Education

The model of inclusive leadership is particularly significant in contexts where diversity, equity, and social justice are at the forefront, especially within childcare centres catering to children (0–3 years), families, and staff from diverse ethnic, racial, religious, and socio-economic backgrounds, as well as infants and toddlers with additional needs. While the concept of inclusion has traditionally been associated with special educational needs, inclusive leadership extends beyond this focus, addressing broader systemic inequities. With increasing diversity among stakeholders, promoting inclusion within childcare settings poses a critical challenge for those in senior leadership positions.

This qualitative study examines the strategies and practices employed by childcare centre managers in Malta to foster inclusive leadership, alongside the challenges they face in implementing and sustaining such practices. Data were collected through two focus groups comprising managers from state and private childcare centres, generating rich discussions on the effectiveness and extent of inclusive leadership within these settings.

The findings highlight how inclusive leadership is manifested in the Maltese childcare context, shedding light on the efforts and challenges encountered by managers striving to create equitable and inclusive environments. The study offers critical insights for policymakers, practitioners, and researchers, presenting recommendations to strengthen inclusive leadership practices at the roots of the education system – childcare centre service provision. By addressing gaps in leadership and inclusion, this research aims to contribute to the development of equitable and sustainable practices in early childhood education and care.



Expo Stream 7.1 – 7.8

CHAIR: Prof. Rebecca Dalli Gonzi | VENUE: Meeting Room 4



Buildings and the Urban Heat Island in Historical Centres in Current and Future Climates: A New Methodology Leading to Wider Use of Thermal Satellite Data for Heritage

Ing. Elizabeth Muscat Azzopardi | *Co-researchers: Prof. JoAnn Cassar, Prof. Charles Galdies, Ms Francesca Soster*

Department of Conservation and Built Heritage, Faculty for the Built Environment

Urban Heat Islands (UHIs) pose significant environmental and health challenges, particularly within historical urban centres. This project studies the contribution of buildings as well as street layout to UHI effects in localised urban areas and projects the future impact of climate change on such buildings and street-level temperatures. Comprehensive monitoring of specific streets and buildings and collecting physical data (air and surface temperature, humidity, wind speed) helps explain their impact on the thermal behaviour of historical urban centres. The project UrbanClimate, funded by Xjenza Malta Space Fund 2023, acquires and processes remotely sensed thermal infrared data from urban historical environments using the high resolution 30m TIR from the SDGSAT-1 satellite, unmanned aerial vehicles (UAVs), hand-held devices, and in-situ sensors. Innovatively, it employs Generative AI and analysis to build high resolution thermal mapping from the combination of all measurements. Geographic Information System (GIS) mapping and model overlays also allow data exploration and analysis using current and projected climate data, facilitating the communication of general spatial thermal patterns and trends under current and future climatic conditions. Integrating thermal data with spatial and climatological analysis provides critical insights into how buildings and streets in local historical centres contribute to UHI formation both currently and in the future. The new methodology is expected to open up a whole new area of research for cultural heritage and its responses to current and future climates, highlighting also the need for adaptive and mitigation strategies to reduce thermal heat stress in urban populations in Mediterranean historical centres.

CHeriSH Coastal Heritage and Safeguards Against Hazards

Ms Annukka Köppen | *Co-researchers: Prof. Ruben Paul Borg, Prof. Reuben Grima, Dr Shirley Cefai, Chev. Prof. Marc Bonello, Dr Ritienne Gauci, Prof. Sebastiano D'Amico, Dr Matthew Agius, Ms Lucia Buhagiar*

Department for Construction and Property Management, Faculty for the Built Environment

CHeriSH develops a strategy for risk assessment of coastal cultural heritage towards climate hazards and impacts through structural vulnerability and cultural significance analysis. The strategy assesses exposed coastal landscapes and hazards, the impacts on heritage assets and the vulnerabilities within a multi-risk environment.

The proposed strategy is divided into three stages: i) a qualitative analysis of cultural significance and mapping of hazard impacts and vulnerabilities, ii) quantification and rating of cultural significance and vulnerabilities, together with a multi-hazard comparative risk analysis and iii) a heritage 'risk to value' assessment where risk and cultural significance are superimposed.

The objective of CHeriSH is to support policymakers in their assessment and management of the vulnerabilities, risks, and cultural significance of exposed coastal heritage assets. The results are compiled in a Certificate of Vulnerability, summarising the hazards, vulnerabilities, and exposures with numerical values and colour codes. It will include the Heritage 'Risk to Value' Map, cross-referencing cultural significance with risk factors and providing recommendations for targeted preservation strategies, preventive conservation, and monitoring. The results will support policymakers in resource allocation, assessing and managing the vulnerabilities, and informing targeted preservation and adaptation strategies.



The framework is being co-designed with key entities and policy-makers to ensure that it will serve their needs and challenges.

As part of Climate-MATCH (TSI-2023-COMMONCOAST 101145916), funded by the European Commission's Directorate General for Structural Reform Support following a request from the Public Works Department of the Ministry for Transport, Infrastructure and Public Works, and the Ministry for Environment, Energy and Climate Change.

The Conservation of Megalithic Temples of Malta: Understanding the Effects of the Open Sided Protective Shelters

Ms Rosangela Faieta | *Co-researchers: Prof. JoAnn Cassar, Prof. Ing. Daniel Micallef, Mr Mantas Valantinavicius*

Department of Conservation and Built Heritage, Faculty for the Built Environment

The site of Mnajdra, one of the UNESCO-listed Megalithic Temples of Malta, is located on the southern coast of the Maltese archipelago. This site was sheltered in 2009 with reversible, open- sided shelters, with the aim of mitigating the critical impact of the aggressive surrounding marine environment. Environmental conditions (rain, wind, salt damage and direct insolation) were identified as a key factor contributing to the progressive stone weathering and are currently being monitored by a multidisciplinary research project.

The Mnajdra complex is widely recognised for its astronomical alignment, with the main (eastern) façade oriented to mark the equinoxes, solstices, and other solar events.

In order to retain the association of the Temples with these alignments and to continue to observe these events, the shelters were designed to remain more open on the eastern side. As a result, surface temperature variations are currently monitored on the eastern façade, where direct sunlight could cause significant temperature fluctuations with possible subsequent deterioration effects such as micro- cracks formation and progressive material weakening.

This presentation will show some of the impacts of the shelters on the temperature variations of the Mnajdra's façade, with particular attention to diurnal and seasonal fluctuations. Results from two analysis campaigns revealed significant surface temperature fluctuations in autumn and smaller variations in summer, likely due to solar incidence angles.

These findings, together with additional chemical data and environmental simulations, will inform conservation strategies to mitigate weathering and ensure the long-term preservation of these unique heritage sites.

Development of Advanced Materials for Restoration of Modern Period Heritage Buildings

Mr Igor Semenov | *Co-researcher: Prof. Ruben Paul Borg*

Department of Construction and Property Management, Faculty for the Built Environment

The development of sustainable construction materials is crucial for restoration and retrofitting modern period heritage including industrial heritage buildings (IHB) while minimising environmental impact. This research focuses on Ultra-High-Performance Concrete (UHPC) incorporating sustainable binders made of low-clinker cements, natural pozzolans, and other supplementary cementitious materials (SCMs), as well as amorphous alloy fibres to enhance durability and



mechanical performance. Phase Change Materials (PCMs) are embedded within the UHPC matrix to improve thermal performance and energy efficiency, reducing operational carbon footprints. Additionally, Textile Reinforced Mortar (TRM) with Alkali-Resistant (AR) glass meshes are employed as a robust and durable solution for retrofitting, addressing the specific structural challenges of modern period heritage preservation.

A significant aspect of this study is the recycling of artificially aged UHPC, repurposing it as both binder and aggregate. This approach aligns with circular construction principles, reducing waste and supporting resource efficiency. The recycled UHPC's mechanical and durability characteristics are evaluated to ensure its suitability in applications.

The novel materials developed in this research aim to address the specific needs of IHB, including enhanced durability, compatibility with existing structures, thermal efficiency, authenticity, and reduced environmental impact. By integrating UHPC and TRM, and the proposed approach offers a tailored solution that combines advanced material performance with sustainable retrofitting practices, preserving structural integrity, cultural significance, and historical authenticity.

The research is conducted at the Faculty for the Built Environment, within the framework of the HORIZON Europe Research Project SINCERE – The second life of modern period architecture: Resilient and adaptive renovation towards net-zero carbon heritage buildings.

Automation of Structural Health Monitoring of Concrete Bridges in Malta Using Computer Vision

Dr Vijay Prakash | *Co-researchers: Dr Muhammad Ali Musarat, Dr Dylan Seychell, Prof. Ruben Paul Borg, Prof. Ing. Carl James Debono*

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

Maintaining the structural integrity of concrete bridges is essential for smooth transportation, and Structural Health Monitoring (SHM) plays a significant role in it. However, traditional SHM processing is time-consuming, subjective and expensive, presenting limitations on the accuracy of damage assessment. Conducting bridge surveys with the traditional SHM approach typically requires the closure of the structure and routing vehicle traffic through alternative roads, potentially leading to traffic congestion. Thus, the role of automated SHM of concrete bridges is essential to mitigate these limitations and nuisances. Our work evaluates the automation of concrete bridge inspection through the application of computer vision techniques on data captured using climbing robots and unmanned aerial vehicles. This approach seeks to facilitate ongoing monitoring, prompt damage identification, and aid preventive maintenance functionalities. The automated SHM approach enables a proactive strategy for bridge maintenance, hence minimising inspection time, bridge closure and maintenance costs. The findings emphasise the solution's capability to highlight defects in the form of crack identification and quantification. Additionally, the technology facilitates adherence to European infrastructure safety rules and fosters sustainable engineering practices by prolonging the service life of bridges. The computer vision techniques address the specific difficulties in the maintenance of concrete bridges in Malta, thereby enhancing structural integrity and establishing a baseline for implementing other innovative infrastructure solutions.

The project DiHICS received funding from Xjenza Malta and the Ministry for Science and Technology of the People's Republic of China (MOST), through the SINO-MALTA Fund 2023 Call (Science and Technology Cooperation).



Climate Resilient Mediterranean Cities: The ReMED Framework

Perit Faye Sciberras | *Co-researchers: Dr Glorianne Borg Axisa, Prof. Edward Gatt, Prof. Ruben Paul Borg*

Department of Construction and Property Management, Faculty for the Built Environment

Buildings and urban areas are particularly vulnerable to the impacts of climate change. The ReMED (Interreg Euro Med Programme) project, aims to support Mediterranean cities in their climate adaptation efforts by developing an innovative set of assessment tools and a comprehensive decision-support framework. This framework is designed to assess climate risks at both urban and building scales, design optimal adaptation measures tailored to local conditions, implement these measures using the most appropriate policy instruments, monitor and evaluate the effectiveness of adaptation measures over time and promote Multi-Level Governance (MLG) in climate adaptation, as recommended by the UN COP26.

To establish the ReMED framework, a review of various methodologies for assessing building and urban resilience was conducted, focusing on climate change impacts and hazards. The findings served as a foundation for developing the ReMED approach, tools, and decision-support system, which are integrated into the ReMED Platform—a web-based tool designed to facilitate the practical application of the project's outcomes.

ReMED also offers capacity-building initiatives for public authorities, including an e-learning platform and pilot activities in five countries. These pilots explore how the ReMED Platform can be applied in conjunction with key policy instruments. By enhancing the ability of public authorities to deploy effective adaptation measures, ReMED aims to strengthen the overall resilience of cities in the Mediterranean region.

The Faculty for the Built Environment, University of Malta is the lead partner of the ReMED Project: Towards Climate Resilient Mediterranean Cities <https://remed.interreg-euro-med.eu/>

Proposing a Multi-Method Phenomenological Approach Exploring the Perceived Daily Life Experience of People with Dementia in their Dementia Care Environments

Dr Alexia Mercieca

Department of Architecture and Urban Design, Faculty for the Built Environment

The environment in this study is presented primarily drawing on the theoretical definition of home, and its experience and meaning to the individual with dementia, with an interest in access to outdoors. Notions of perception, cognitive image and affordance are central to the sense of home, and in turn the sense of self that this may inform and support. This theoretical framework informs the multi-method phenomenological approach proposed, through themes of spatial legibility, cultural appropriateness, fascination, user-centredness and personalisation. The novelty of the methodological toolkit lies in the incorporation of methods that have been traditionally used in research with people with dementia as the basis of the framework, but which are supplemented by additional layers developed from conventional architectural tools to create a more visual representation of the environmental experience. Despite its apparent complexity, the methodology yields a very clear and precise image of the person's presence in her surroundings, at once providing a location in space and time, her mood and engagement, as well as a layering of the affordances that may have informed her behaviour. This method was developed as part of this research, and remains unique to it. Its innovation lies in the progression of the DCM tool (University of Bradford, 2016), the integration of the notion of affordances (Topo et al.,



2012) and architectural mapping techniques (Zeisel et al., 2003) to propose a holistic depiction of the care experience of people with dementia.

Exploring the Role of Higher Education Institutions in Driving the Transformation of Urban Open Spaces Towards a Resilient Urban Environment

Dr Sarah Scheiber | *Co-researcher: Dr Alexia Mercieca*

Department of Spatial Planning and Infrastructure, Faculty for the Built Environment

In a world where ensuring resilient urban environments is essential, urban open spaces are integral, since, if they function as urban green infrastructure (UGI) they have the potential to contribute towards multiple benefits. These being, environmental aspects linked to climate change mitigation, as well as, social ones such as supporting mental health and wellbeing needs. Urban open spaces in Malta are not contributing to urban resilience. Adopting an integrated approach is crucial. The use of 'middle-up' collaborative and transdisciplinary approaches, where authorities, academics, the private sector and the community come together in a coordinated effort, is seen as a strategic mechanism for supporting the integrated planning and transformation of urban open spaces. Educational and research establishments can instigate such an approach through collaborations which drive change. This research studies the impact of ongoing collaborations between a government agency, Project Green and educational programs and research within the University of Malta, which strive for the transformation of urban open spaces. The aim is to understand the impact which current collaborations are having, and the extent to which UGI and best practice design principles are being adopted. A qualitative methodology is adopted using a case study approach. Two case studies are investigated, a residential neighbourhood and a respite centre for persons with mental health problems. Through in-depth semi-structured interviews with representatives of the collaborating organisations, academics and students, the presentation will present: the barriers and challenges experienced; and finally, recommendations as to how such collaborations may be improved to maximise impact.



Expo Stream 8.1 – 8.8

CHAIR: Dr Kenneth Scerri | VENUE: Meeting Room 103



Advancing the Design of Smart and Autonomous Engineering Systems Through Artificial Intelligence

Dr Hani Ahmed

Department of Systems and Control Engineering, Faculty of Engineering

As smart automated systems, such as robots and driverless vehicles, have become more common in today's world, reliable and advanced control algorithms have emerged as a key enabler for this technology. Many of these control algorithms rely on Artificial Intelligence (AI) to handle the complexity and degree of uncertainty typically present in such systems by learning from data that reflects the system's behaviour in real-time. The CONAI project contributes to this discourse by integrating control theory, machine learning, and AI to address such challenges.

This specific study investigates the use of Reinforcement Learning to control a nonlinear, unstable mechanical system known as the cart-pole problem. A comprehensive comparison of three fundamental reinforcement learning algorithms, Q-learning, SARSA, and Double Q-learning, was carried out to control the system using simulation studies in the OpenAI CartPole-v1 Gym environment. These algorithms were evaluated on four key metrics: average reward, stability, sample efficiency, and convergence rate. The results revealed distinct trade-offs among the approaches. Q-learning achieved the highest rewards but exhibited significant stability issues. SARSA demonstrated superior stability but at a considerable performance cost. Double Q-learning emerged as a balanced solution, effectively addressing overestimation bias while maintaining competitive performance. Building on these insights, CONAI is advancing in two innovative directions. Firstly, a novel hybrid algorithm that combines the stability advantages of SARSA with the reward maximisation capabilities of Q-learning. Secondly, the use of Deep Q-Networks to enhance the system's ability to handle complex state spaces, potentially leading to more advanced control strategies for such problems.

DIVE Project – Data-Driven Intelligent Video Evaluation

Dr Vanessa Camilleri

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The DIVE project, funded by Xjenza Malta's Research Excellence Programme (REP), presents an innovative approach to swimming performance analysis through AI and Computer Vision technologies. This 18-month research initiative aims to develop a comprehensive AI-powered system for automated stroke analysis and real-time feedback in competitive swimming.

The project addresses critical gaps in current swimming analytics by developing a large-scale video dataset (50-200 annotated videos) and implementing AI models targeting 85-95% accuracy in stroke recognition. Through collaboration with the Aquatic Sports Association of Malta (ASA), DIVE will advance from Technology Readiness Level 2 to 4, focusing on creating practical solutions for coaches and athletes.

Key objectives include developing AI algorithms for automated stroke mechanics analysis, implementing real-time performance tracking capabilities, and creating a user-friendly interface for immediate feedback. The project emphasises ethical AI development and data privacy, incorporating robust protocols for data collection and management.

The research methodology combines computer vision techniques with machine learning approaches, validated through comprehensive testing with swimmers of various skill levels. Expected outcomes include an open-source dataset, research publications, and a functional prototype demonstrating the system's capabilities in real-world training



environments.

DIVE represents a significant advancement in sports technology research, promising to enhance training methodologies through data-driven insights while maintaining strong ethical considerations. The project's findings will contribute to both the academic understanding of AI applications in sports and practical tools for swimming performance enhancement.

Anomaly Detection for Spacecraft Telemetry Data Using Deep Learning Neural Networks

Dr Asma Fejjari

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

Spacecraft are highly complicated systems that play an important role in many application areas such as Earth observation, planetary exploration, telecommunications and remote sensing.

During a spacecraft's orbit, increasing amounts of time series telemetry data, containing hundreds of measurements, are collected by sensors and other devices. The generated data are then sent to the ground station to be analysed. Constant monitoring of such telemetry data is necessary to ensure the success of space missions and rapidly respond to hazards or possible system failure.

Human evaluation, out-of-limit alarms and different machine learning anomaly detectors have been used over the last decades to analyse data and detect abnormalities in spacecraft data. However, these methods become impractical when they applied to complex spacecraft systems with many sensors. Additionally, they require deep expert knowledge of spacecraft subsystems.

Due to its ability to model complex and high-volume data, deep learning has emerged recently as a critical direction for spacecraft anomaly detection. The ASTRA-AI project exploits recent advances in deep learning neural network architectures to detect anomalies in telemetry spacecraft data and examines the performance of these models using real telemetry dataset. In addition, ASTRA-AI aims to build a digital twin model able to detect and diagnose any irregular or unexpected behaviour while in operation.

Minds and Machines – Exploring Language Processing Through Computational Approaches

Dr Jessica Nieder

Institute of Linguistics and Language Technology

A central focus of linguistics is exploring how humans produce and comprehend language. While classical psycholinguistic research has primarily relied on experimental methods, advances in AI and machine learning now offer new possibilities to enhance linguistic data with insights from large language models.

This talk presents recent studies that combine experimental data with computational methods to investigate language processing. Word embeddings from large language models such as BERT are shown to effectively represent meaning



across diverse tasks, including production experiments, mutual intelligibility tests, and priming experiments (Nieder & List, 2024; Nieder et al., 2023, 2024; Schebesta & Nieder, 2024). This approach enables researchers to detect previously unexplained semantic effects by incorporating meaning representations where no semantic predictors were initially included.

In ongoing research, we are extending this work by investigating the semantic similarity of synonyms in Maltese using word embeddings. Additionally, when feeding these embeddings into existing experimental data on Hebrew and comparing this to Maltese, we observe semantic effects for Maltese (Nieder et al., 2024) but not for Hebrew, despite both languages sharing Semitic roots. This contrast highlights the need for a more nuanced understanding of semantic processing across languages.

This research exemplifies the interdisciplinary integration of computational linguistics and psycholinguistics, opening new avenues for quantitative analysis and offering fresh insights into language processing across diverse linguistic contexts.

Enhancing Flight Deck Decision Support with Distributed GenAI: A Multi-Agent Approach

Dr Jose Pacheco de Almeida Prado

Institute of Aerospace Technologies

The integration of Generative Artificial Intelligence (GenAI) into commercial aviation presents transformative opportunities for enhancing flight deck operations, offering an intuitive natural language interface between pilots and automation. This study investigates a novel GenAI-based multi-agent architecture designed to address the unique demands of aviation, including the need for rapid decision-making and adherence to stringent safety protocols. By employing lightweight, embedded Large Language Models (LLMs), the architecture optimises task allocation among specialised agents, ensuring operational efficiency without reliance on external cloud infrastructure.

Preliminary evaluations, conducted using diverse query datasets, demonstrate that the proposed architecture achieves performance comparable to systems using larger models, such as GPT-4, while operating locally with lightweight models. This underscores the feasibility of implementing autonomous GenAI solutions embedded directly within aircraft systems. Additionally, the architecture effectively handles complex task decomposition and coordination, balancing scalability and precision in cockpit-specific operations. Challenges related to explainability, response latency, and integration with broader Human-Machine Interface (HMI) systems are identified as critical areas for future development.

A Neuro-Symbolic Model for Invoice and Receipt Labelling

Prof. Adrian Muscat

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

Early invoice/receipt analysis systems primarily relied on rule-based methods, such as template matching, to extract data from spatially structured documents. However, these methods lacked generalisability across varying document



layouts and required defining the spatial characteristics for unseen document sources. The advent of convolutional and recurrent neural networks led to models that generalise better over unseen document layouts. Recent developments, such as multi-modal transformer-based models, for example LayoutLM, which consider a combination of text, visual, and layout data, led to an even more significant boost in document understanding capabilities. The work carried out on the ADACE3 project focused on augmenting a neural transformer with symbolic rules to further close the gap between human and machine performance over the receipt labelling task. A comprehensive annotated dataset, comprising both real-world and synthetic receipts, was developed for the purposes of the project. A state-of-the-art optical character recognition model (DocTR) was used to textually scan receipts and together with the image provide input to the multi-modal models that in turn semantically label the text in thermally-printed receipts. In this project, the open-source LayoutLMv3 transformer-based model was modified and fine-tuned for classifying textual data into 12 pre-defined labels, such as date, price, name of shop, etc. Following hyper-parameter tuning and integrating a bespoke rule-based model for error correction, the system achieved 98\% accuracy (on our test dataset) in classifying the textual data from receipts.

PQ Dashboard – A Smart Gateway to Malta’s Parliamentary Questions

Prof. Joel Azzopardi

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Parliamentary Questions (PQs) are a cornerstone of democratic engagement, enabling MPs to seek information and hold ministries accountable. Currently, the Parliament of Malta publishes all answered PQs on its official portal in Maltese, supplemented by standard text-based search functionalities. Nevertheless, public accessibility is limited because the PQs are exclusively in Maltese and do not provide meta-information about overarching topics or facilitate tracking across different themes.

To overcome these limitations, we employ AI-driven techniques—namely LLMs—to enhance both the accessibility and value of these PQs. Specifically, the system automatically translates PQs from the current legislature into English, classifies them into COFOG-99 categories for thematic organisation, and extracts key terms to support targeted research. This enriched data powers an interactive dashboard (<https://pqs.ir.mt>), enabling users to browse PQs by category or keyword, visualise the distribution of categories and terms, and analyse both the MPs posing questions and the ministries addressed. Additionally, the platform supports advanced analytics, offering trend analyses to provide granular insights into MPs’ engagement patterns, frequently queried ministries, and emerging policy issues.

We are currently extending this research to include PQs from previous legislatures published on the Parliament’s portal. We are also expanding knowledge discovery functionalities to extract citations among PQs, thus enabling direct links to cited questions. Moreover, discourse analysis is planned to capture question types (e.g., factual, policy-oriented, or accountability questions) and categorise response types (e.g., factual, explanatory, or evasive answers). We aim to provide researchers a tool to identify and examine policy trends in their fields.



TADA: An AI-Driven Decision Support Tool for Arrival Management in Complex Airspace

Mr Samuel Baldacchino

Institute of Aerospace Technologies

TADA is a SESAR project focused on developing an AI-driven tool to support approach air traffic controllers (ATCOs) in managing and sequencing arrival flights within terminal airspace (TMA). The system aims to reduce ATCO cognitive workload, enhance situational awareness, and improve flight efficiency and safety by dynamically generating and displaying 4D Proposed Trajectories (4DPT) aligned with Arrival Manager (AMAN) sequences. TADA aims to merge the field of AI and aviation through the use of reinforcement learning to provide ATCOs with suggestions such as heading, speed and direct to commands to generate optimised trajectories based on Time to Gain and Time to Lose (TTG/TTL) values generated by AMAN, and alerts ATCOs to deviations.

Additionally, it enhances inter-sector situational awareness by sharing 4DPT data with all relevant sectors within the TMA. Key benefits include increased predictability and safety, improved aircraft energy management, and more efficient, environmentally sustainable flight trajectories.

The solution will be tested in Milan airspace, through two airports; Bergamo and Malpensa, using three use cases incorporating Point Merge System (PMS), Trombone Arrival Routes, and a hybrid of both. TADA introduces significant improvements over current systems by automating 4DPT generation, including Distance to Go (DTG) calculations, thereby enhancing situational awareness and operational efficiency.

The presentation will provide an in-depth overview of the project's scope and objectives, detailing the operational concept, key requirements, and the foundational design of the reinforcement learning (RL) agent. It will explore how these elements integrate to enhance air traffic management and optimise arrival sequencing within terminal airspace.



Expo Stream 9.1 – 9.8

CHAIR: Prof. Alexandra Bonnici | VENUE: Meeting Room 6



Advancing BrainWeb – A Low-Cost Brain-Native Web Browser

Prof. Chris Porter

Department of Computer Information Systems, Faculty of Information and Communication Technology

Funded by the University of Malta Research Excellence Fund, project BrainWeb aims to develop a low-cost, effective and usable solution to provide individuals with severe motor impairments – such as those with advanced amyotrophic lateral sclerosis (ALS) or stroke-related disabilities – unrestricted access to the Internet. This includes facilitating essential activities such as communication, education, employment, entertainment, and other pursuits central to the human experience. The project aligns with both national and international priorities, which emphasise research and collaboration in innovative assistive technologies.

Building on prior findings, this work seeks to develop a novel brain-native, cross-platform web browser designed for use beyond specialised laboratory environments. Existing work in Brain-Computer Interface (BCI)-based web browsing faces several limitations, including insufficient support for core browsing functionality, low Information Transfer Rates (ITRs), reliance on outdated technologies, and a lack of empirically validated data. Additionally, to the best of our knowledge, no significant efforts have been made to develop cross-platform SSVEP-based BCI systems. BCIs based on Steady State Visually Evoked Potentials (SSVEPs) are robust and necessitate negligible amounts of user training to operate. However, the stimuli required to evoke the desired SSVEP responses must be accurate and stable over time. Our prior research demonstrates the feasibility of leveraging native web technologies to generate high-quality SSVEP stimuli across major web browsers and computer platforms. These findings are at the core of this ongoing work.

This talk will examine the state-of-the-art and will also present progress in our cross-disciplinary research, highlighting the potential of this innovative approach.

Optimal Electrode Design for Surface Functional Electrical Stimulation

Prof. Cristiana Sebu

Department of Mathematics, Faculty of Science

This talk presents a new approach to non-invasive functional electrical stimulation (FES) and addresses one of the most important issues in electrical nerve and muscle stimulation, namely the design of optimal skin surface electrodes to suit specific medical applications: control bladder function, spinal cord stimulation and neuromuscular electrical stimulation with minimal tissue trauma.

Nerves can be stimulated using surface or implanted electrodes. Hitherto in clinical practice, only implanted electrodes have been used for bladder control. Although successful, the technology is invasive and in 20% of patients electrodes can move, get infected or become broken, and one in three patients needs a further operation.

Therefore, by means of mathematical modelling the nerve activation induced in a four-layered tissue model consisting of skin, fat, muscle and bone by an unconventional planar concentric ring electrode geometry was determined and the applicability of such electrodes for skin surface FES was assessed. Different sets of tissue layer thicknesses were considered, corresponding to standard categories of patient physical build. The numerical simulations showed that the electrode design can be optimised to maximise the activating function at different depths and reduce the peaks of high current density that occur at the electrode edges. Moreover, the novel electrode configuration gives a better performance than the traditional electrodes currently in use. These results were also validated in COMSOL on a real tissue and bone MRI scanning structure data and demonstrated that skin surface FES can be used to activate the



posterior tibial nerve at the ankle for bladder control.

Automatic Foci Identification Using Deep Convolutional Neural Networks and Vision Transformers

Dr Saeed Ullah

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

DNA double-strand breaks (DSBs), marked by ionising radiation-induced repair foci (IRIFs), are among the most severe DNA lesions, posing significant risks to human health. Monitoring DSB induction and repair is critical in biological, medical, and space research, enabling insights into aging, cancer progression, and radiation effects. However, traditional IRIF quantification methods, though precise, are labour-intensive and prone to variability in fluorescence intensity across cells and experiments.

This study introduces a novel approach leveraging deep convolutional neural networks (CNNs) and vision transformers (ViTs) for semantic segmentation to automate IRIF identification in fluorescence microscopy images. The dataset acquired from NASA Gene Lab comprises mouse fibroblast cells exposed to varying doses of linear energy transfer (LET) and ions, simulating Galactic Cosmic Radiation (GCR). Our models are able to achieve excellent performance, with high Intersection over Union (IoU) and Dice Coefficient scores on the test dataset.

This automated solution precisely identifies and quantifies IRIFs, overcoming the limitations of conventional methods. The proposed approach accelerates biodosimetry research, facilitating insights into DNA damage and repair at molecular and single-cell levels. Beyond advancing radiation protection and personalised medicine, this work has significant implications for astronaut health by assessing GCR exposure effects and contributes to the development of DNA-targeting therapies.

Our findings underscore the potential of deep learning in tackling critical challenges in space exploration and cancer research.

Natural Fibres in Composites: A Greener Approach to Fibre Reinforcements

Dr Brian Ellul Grech

Department of Mechanical Engineering, Faculty of Engineering

The widespread utilisation of glass and carbon fibres dominates the modern industrial landscape, offering high strength and rigidity. However, the environmental impact associated with the extensive use of synthetics, including high energy consumption during production and prolonged degradation timelines, presents significant challenges. Natural fibres represent a sustainable alternative, offering potential solutions to these drawbacks. When combined with biodegradable resins, the environmental benefits of natural fibre composites are further amplified, providing an optimal balance between material strength and sustainability.

The potential of two natural fibres, sisal and flax, for use in composite materials was studied. Flax is a robust and versatile fibre commonly employed in textiles and, more recently, as reinforcement in composites. Despite its



advantageous mechanical properties, flax production is limited by high cultivation costs and specific growth requirements. Conversely, sisal is an abundant, cost-effective fibre that is easy to cultivate and process. However, challenges in its processing and application in composites remain a barrier to its broader adoption. The application of these fibres in traditional composite structures has provided positive results but with limited use, mainly due to either cost or mechanical characteristics.

The use of hybrids could overcome this limitation by tailoring the mechanical properties, reducing overall costs, and providing a novel alternative to traditional single-ply, single-yarn composites. The current research explores the mechanical performance, processing feasibility, and environmental implications of utilising sisal and flax in hybrid intraply and intrayarn composite applications, contributing to the development of sustainable material solutions for industrial use.

Sustainable 3D Concrete Printing: Utilising Industrial By-Products and Alkali-Activated Materials for Low-Carbon Construction

Mr Loai Al-Mawed | Co-researcher: Prof. Ruben Paul Borg

Department of Construction and Property Management, Faculty for the Built Environment

In the past decade Additive Manufacturing of concrete has developed rapidly in the construction industry. This technology has addressed several challenges associated with old traditional casting methods, including eliminating the need for formwork, significantly reducing costs and labour intensity for projects. Additionally, it provides flexibility in creating complex architectural designs. However, the primary concern in 3D concrete printing is the substantial carbon emissions resulting from the heavy use of cement in the mixture (2-3 times higher than conventional concrete).

A primary solution to address the impact of 3D printing material, and reduce the cement content in the concrete mix is achieved by utilising industrial by-products and/or recycled waste material as supplementary cementitious materials. The 3DConcrete Project (Research Excellence Programme, Xjenza Malta) addresses the development of low-carbon concrete for 3D concrete printing by incorporating Maltese globigerina limestone waste as a partial replacement of ordinary Portland cement to reduce the carbon footprint, without compromising on the required performance of the 3D printed elements.

Furthermore, alkali-activated materials (AAMs) can be considered as promising alternative to cement. AAMs can be formed through a chemical reaction between a solid material rich in aluminosilicates with an alkaline solution. Specific sources of Construction and Demolition Waste with the right composition are exploited as ingredients for AAMs as an alternative to cement-based materials. The SMACORT project (TUBITAK, Xjenza Malta) investigates alkali-activated materials based on waste concrete developed for 3D concrete printing of facade cladding elements with enhanced performance. Ultimately, this study develops a novel type of 3D-printed concrete that offers both economic and environmental benefits, providing a promising solution for sustainable and low-carbon construction using 3D concrete printing.



X-ray Micro-CT Study of Maltese Globigerina Limestone Porosity

Dr Gabriel Strugała¹ | Co-researchers: Prof. Ing. Joseph Buhagiar, Prof. Ing. Bertram Mallia, Dr Ing. Anthea Agius Anastasi, Dr Daniel A. Vella

Department of Metallurgy and Materials Engineering, Faculty of Engineering

This research explores the microstructure and chemical composition of Globigerina Limestone using SEM and EDS analyses, which identify the presence of fossils, planktonic foraminifera, surface pores, and a significant calcium content (~90 wt.%). The study primarily aims to enhance understanding of porosity in Maltese Globigerina Limestone, addressing the gap in studies that visualise porosity in three dimensions. High-resolution (1.4 $\mu\text{m}/\text{voxel}$) 3D imaging via X-ray computed microtomography (μCT) revealed micropores and fossils in one sample, while a larger volume sample scanned at lower resolution (4 $\mu\text{m}/\text{voxel}$) showed 9.4% porosity, with 32% attributed to a single interconnected pore network. The analysis utilised 2D cross-sectional images and 3D reconstructions, highlighting a complex micropore network extending multidirectionally throughout the sample. The findings suggest avenues for further μCT -based research on the Globigerina Limestone varieties 'frank' and 'soll,' areas that remain scientifically underexplored.

Detecting the Cosmic Dawn with REACH

Prof. Alessio Magro

Institute of Space Sciences and Astronomy

The Radio Experiment for the Analysis of Cosmic Hydrogen (REACH) is an effort to detect the Cosmic Dawn—the period when the first stars and galaxies formed—by analysing the redshifted 21-cm radio signal. Unlike other experiments, REACH uses new methods, including on-site calibration of analogue chains, simultaneous observations with two wideband antennas, reduction of systematic errors linked to the cosmological signal, and a Bayesian pipeline to model the 21-cm signal, foreground, and instrument. These approaches were essential to the experiment's design and aim to improve reliability in detecting this faint signal.

The REACH collaboration, led by the University of Cambridge, includes researchers and students from more than 20 international institutions. The University of Malta leads the digital and software backend work package. This includes digitising antenna signals, spectrometry, data management, calibration support, and hardware control. The first receiver was deployed at the Square Kilometer Array (SKA) site in the Karoo desert in 2023, where it is being tested and commissioned. A second receiver is under construction and planned for deployment in 2025. This presentation will give an overview of REACH, explain its unique methods, share recent progress, and outline the next steps.

¹ *Department of Materials Science and Technology, Institute of Manufacturing and Materials Technology, Faculty of Mechanical Engineering and Ship Technology, Gdańsk University of Technology. Advanced Materials Centre, Gdańsk University of Technology*



Graph Domination, Graph Isolation and the Art Gallery Theorem

Prof. Peter Borg

Department of Mathematics, Faculty of Science

Graph theory is an area of discrete (finite) mathematics that has soared in popularity during the last century. A graph here is not the usual plot but the abstraction of a network. Thus, graph theory is, loosely speaking, the mathematics of relations and connections, and can be applied to all networks (social / computer / communication / internet / transport / etc.). A graph consists of a set of objects, called vertices, together with a set of relations, called edges; any two vertices are either related (form an edge) or not related. The closed neighbourhood of a set S of vertices consists of the vertices in S together with each vertex that is related to at least one of them. It is denoted by $N[S]$. If $N[S]$ contains all the vertices of the graph, then S is called a dominating set. Domination theory is the popular study of dominating sets. Recently, this has been widened to the study of isolating sets, where the graph obtained by removing $N[S]$ must not contain copies of members of a prescribed set of graphs. The Art Gallery Theorem (AGT) says that an 'art gallery' (a polygon in general) can be guarded completely by at most $n/3$ guards. The author's recent collaborative work on domination and isolation particularly led to extensions of AGT. This work will be outlined.



Expo Stream 10.1 – 10.8

CHAIR: Prof. Luciano Mule'Stagno | VENUE: Meeting Room 5



Roof Mounted Photovoltaics Equipped with Phase Change Materials for Improved Roof Energy Performance: A Preliminary Numerical Study

Prof. Ing. Daniel Micallef

Department of Environmental Design, Faculty for the Built Environment

Roof-mounted photovoltaic (PV) panels often face efficiency challenges due to their sensitivity to temperature and installation angles. Additionally, roofs are a significant source of heat gains, particularly in regions with high solar irradiation. This work proposes a novel approach to address these issues by integrating PV panels with phase change materials (PCMs) within a ventilated roof system. Ventilated roofs are known to enhance thermal performance by improving U-values and reducing heat gains. Building on this concept, the proposed system leverages PCMs to absorb excess heat during peak temperatures and release it during cooler periods, facilitated by naturally occurring air flows within the ventilated roof gap. By selecting specific PCM melting temperatures, the PV maximum temperatures can be delayed to a time of lower irradiance, resulting in less impact on conversion efficiency.

A Computational Fluid Dynamics (CFD) model is employed to simulate various ventilation flow rates, with extreme PV high-temperature conditions applied as boundary conditions. Temperature distributions on the roof surface and PV panels are analysed to evaluate the effectiveness of the PCM compared to a non-PCM configuration. Preliminary results indicate that the PCM-equipped setup improves thermal conditions for both the roof and the panels, supporting enhanced energy performance.

This work proposes a new approach for the integration of renewable energy technologies with innovative building solutions, ultimately contributing to sustainable energy practices. The outcomes are relevant to both researchers in building energy performance and also the building industry.

A Review of Compressed Air Energy Storage for Offshore Wind Farms

Mr Keith Thomas Borg

Department of Mechanical Engineering, Faculty of Engineering

The growing integration of offshore wind poses significant challenges to grid stability, including curtailment and grid congestion. The intermittent nature of renewable energy sources causes a mismatch between energy supply and consumer demand, contributing to volatile electricity prices which negatively impact the market value. Energy storage technologies (ESTs) play a critical role in mitigating these challenges by storing excess energy and increasing revenue. Compressed Air Energy Storage (CAES), a form of mechanical EST, is a promising solution for long-duration energy storage which can be co-located with offshore wind farms. Integrating storage within the same wind farm footprint at sea avoids using additional space on land to locate the storage infrastructure. In this review, CAES systems are analysed in detail, focusing on various configurations: diabatic, adiabatic, and isothermal systems. The advantages and limitations for marinating the different CAES systems are examined. In general, CAES has a high capacity, long lifetime, long discharge time and high durability. However, its installation is primarily limited by the high cost of pressure vessels and the need to manage heat generated during air compression. Adiabatic CAES technologies capture heat generated during the air compression phase, to be used later during expansion. This increases the deck requirements for offshore CAES systems located above the sea surface. Isothermal CAES, which eliminates the need for thermal energy storage, achieves better thermal efficiencies and can be installed subsea. In this review, recent advancements in CAES are explored and several case-studies are examined. Finally, this review explores subsea hydro-pneumatic energy storage, a form of CAES technology where a gas is compressed/expanded by liquid pistons.



Empowered Consumer-Side Battery Energy Storage Systems for Enhanced Network Reliability

Mr Muhammad Hussain

Department of Electrical Engineering, Faculty of Engineering

The increased use of distributed renewable energy sources and electrification of transport feature prominently in internationally accepted mechanisms for reducing the carbon footprint. In low-voltage feeders, renewable sources mainly take the form of rooftop photovoltaic systems. The increasing penetration of intermittent and non-dispatchable photovoltaic systems increases the network operators' challenges to maintain the network power quality and stability. Battery energy storage systems have emerged as a key solution to offer the necessary flexibility to mitigate adverse effects. The project considers the utilisation of consumer-side battery storage systems, an existing resource, for the provision of network services in addition to their conventional operation. A form of remuneration for the provision of the network service is considered. Participation in the proposed service allows increased utilisation of the asset, improved financial feasibility and enhanced network reliability. In this context, the EMBRACE project develops coordinated control strategies for the aggregated operation of multiple consumer-side battery storage systems to assist voltage regulation efforts on low-voltage feeders. The project looks into alternative ways of managing the consumer-side battery systems to provide multiple services and examines the potential revenue from participating in the aggregate service. The project develops new ancillary functionality to equip conventional small-scale battery storage systems to participate in the proposed network service.

Reducing Emissions with Innovative Marine Power and Propulsion Systems Using Alternative Fuels (RIVIERA)

Prof. Alexander Micallef

Department of Electrical Engineering, Faculty of Engineering

Replacing fossil fuelled vessels with hybrid/all-electric alternatives reduces GHG emissions and other pollutants. Low- and Zero- carbon fuels have the potential to make shipping fully climate neutral and independent of fossil fuels. However, the energy content of the alternative fuels is lower than that of the present oil-based fuels. There is also a challenge for system integrators to size the batteries and/or alternative fuel systems in new builds due to different dynamic behaviour of the alternative sources and very limited upfront inputs about the expected vessel operational profile or power load variation.

RIVIERA is aimed at developing new design methods and tools for the integration of alternative fuel systems in innovative shipboard power systems. The objectives of the project are: (1) Develop new knowledge and skills on innovative shipboard power systems.

(2) Promote the use of alternative fuels and innovative power system architectures in shipping to reduce CO₂ emissions in retrofits and new designs.



The EUROfusion Project – Towards the Realisation of Energy Derived from Nuclear Fusion

Prof. Ing. Martin Muscat

Department of Mechanical Engineering, Faculty of Engineering

The University of Malta is one of the beneficiaries within the EUROfusion consortium which is working towards research and development of nuclear fusion science and technology. The consortium is made up of institutes, universities and industry coming from 28 European countries. All are working together towards the commissioning of the DEMO power plant which will be the first nuclear fusion reactor prototype to produce electricity. The current target commissioning year is 2050. A fusion reactor extracts energy from the nuclear fusion of deuterium and tritium atoms (the fuel that will fire DEMO) to raise steam in a boiler to drive a steam turbine and generator to produce electricity. A nuclear fusion reactor is deemed to be safer than a nuclear fission reactor since any kind of instability tends to extinguish the plasma rather than produce runaway conditions. The decay of the generated radioactive waste due to the tritium is much less than for a fission reactor since the half-life of tritium is approximately 12.5 years. A nuclear fusion reactor can supply an abundance of heat energy and this makes the realisation of fusion energy very attractive in order to slow down climate change. The UM nuclear fusion research group is involved in the improvement of structural integrity assessment methods for in vessel components (notably the divertor) and in the conceptual design of a number of key auxiliaries such as remote handling, the central solenoid and the volumetric neutron source test plant, while contributing to a number of technical meetings, reports and publications.

Blade-Resolved Computational Fluid Dynamics Simulations of Two Tandem Wind Turbines

Mr Karl Zammit

Department of Mechanical Engineering, Faculty of Engineering

Wind turbine wake interactions significantly influence energy yield in modern wind farms, particularly as the industry pushes toward increasingly larger turbines and higher-density layouts. Although considerable research has been conducted on the wake effect, most studies have employed simplified engineering models or reduced-fidelity simulations. This work addresses the gap to higher-fidelity models by employing Computational Fluid Dynamics simulations via URANS to investigate the aerodynamic interaction between two utility-scale turbines operating in tandem.

Building on the established theoretical framework of wake behaviour, the study aims to analyse the evolution of complex flow features downstream of a wind turbine and how these affect the performance of a secondary turbine. Numerical simulations resolve three-dimensional flow physics and incorporate realistic inflow profiles to account for the ambient atmospheric boundary layer. By capturing vortical structures and their subsequent breakdown, the simulations offer insight into aerodynamic loading and wake recovery mechanisms that simpler methods often overlook.

The principal objectives of this investigation are twofold. First, to establish whether advanced turbulence modelling within a Navier-Stokes framework improves the predictive accuracy of wake trajectory and velocity deficit when compared to conventional actuator-line or engineering wake models. Second, to quantify how these refined wake predictions translate into differences in power output, fatigue loading, and operational efficiency for downstream



turbines. Emphasis will be placed on dissecting flow phenomena such as vortex instability, wake meandering, and the resultant wake-to-wake interactions.

Leveraging Manufacturing Capabilities Through the Axiomatic Design Model

Dr Edward Abela

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Manufacturing process selection (MPS) during the early product design phase significantly influences the efficiency and success of product development, reducing the need for costly design iterations and rework. Traditional approaches often result in suboptimal manufacturing choices due to a limited consideration of the full range of requirements and available technologies. Our research builds upon the concept of axiomatic design to present a model that enhances the selection of manufacturing processes through a comprehensive assessment of manufacturing capabilities. Our proposed model (AXIDEM) integrates both functional and non-functional requirements with a detailed evaluation of technology capabilities, facilitating a more informed, holistic approach to MPS.

The proposed model aims to guide design teams in making more effective decisions during the early phases of product development, especially in complex systems such as medical devices, where diverse and sometimes conflicting requirements must be considered. By systematically mapping user needs onto appropriate manufacturing technologies, the model supports the alignment of design parameters and process variables, ensuring that the chosen manufacturing process is best suited to the intended product characteristics. The findings suggest that AXIDEM provides significant value in refining the manufacturing process selection, promoting better collaboration between technical teams and users while expanding the range of viable technology options considered. Although preliminary assessments show promise, further validation is needed to establish AXIDEM as a standard practice in MPS decision-making for real-world applications. Our work contributes to the strategic leverage of manufacturing capabilities in the design phase, ensuring a more robust and efficient product realisation process.

Surface Engineering of Wire Arc Additively Manufactured AZ80 Magnesium Alloy

Mr Danjel Grima

Department of Metallurgy and Materials Engineering, Faculty of Engineering

This study investigates the potential of replacing conventional aluminium alloys with wire arc additively manufactured (WAAMed) AZ80 magnesium alloy for aerospace applications. The shift to magnesium is driven by its significantly lower density, which can contribute to substantial weight savings, improving fuel efficiency and payload capacity in aerospace structures. This research utilises the close-to-net-shape technique of wire arc additive manufacturing (WAAM) in combination with surface engineering methods to enhance the mechanical and electrical properties of magnesium. Heat treatment, shot peening, and physical vapour deposition (PVD) coatings are applied to improve the performance of WAAMed AZ80.

A comprehensive experimental approach was adopted to evaluate the impact of surface engineering on both WAAMed AZ80 magnesium alloy and Al6082 aluminium alloy. Additively manufactured AZ80 and Al6082 samples underwent heat treatment and shot peening to enhance mechanical properties. The application of T6 heat treatment, consisting of



solution treatment followed by ageing, improves the strength and hardness of the alloys of WAAMed AZ80 promoting the precipitation of strengthening phases. Characterisation techniques include optical and electron microscopy for microstructural analysis, hardness testing for surface strengthening, X-ray diffraction (XRD) for phase identification and residual stress analysis measurement, energy-dispersive spectroscopy (EDS) for elemental composition, and topography analysis to assess surface roughness. Mechanical performance will be evaluated through tensile, compression, and force-controlled axial fatigue testing, comparing shot-peened and non-shot-peened specimens.

Preliminary findings from shot peening on Al6082-T6 aluminium show an 18% increase in surface hardness and a 44% improvement in fatigue life. These results guide the ongoing optimisation of WAAMed magnesium for aerospace applications. Further comparison with Al6082-T6 will assess the potential of WAAMed AZ80 as a lightweight alternative to aluminium for satellite applications.



Expo Stream 11.1 – 11.8

CHAIR: Dr Marie-Louise Mangion | VENUE: Lecture Room 202



The Relationship Between Entrepreneurs' Dark and Light Triad Traits, Coping Strategies, and Psychological Wellbeing

Prof. Leonie Baldacchino

The Edward de Bono Institute for Creative Thinking and Innovation

It has long been clear that there is a dark side to entrepreneurship, as evidenced by numerous instances of dishonest, harmful and illegal activities by business leaders. To shed light on this phenomenon, entrepreneurship scholars have extensively studied the 'dark triad', a set of three interrelated personality traits known as Machiavellianism, psychopathy, and narcissism. On the other hand, many entrepreneurs make significant contributions to society such as by creating employment opportunities, promoting ethical practices in their organisations, and engaging in social innovation. This implies that entrepreneurship also has a bright side, but the dark triad's antithetical 'light triad', which comprises the traits of Kantianism, humanism, and faith in humanity, has received very limited attention. This paper addresses this gap in the literature by exploring the effects of entrepreneurs' dark and light triad traits on their coping strategies and psychological well-being (PWB). Data were gathered via an anonymous online survey from 179 entrepreneurs in Malta (EU). Findings indicate that the dark triad are detrimental, while the light triad are beneficial, in their effects on coping and PWB, thereby refuting the notion proposed by some authors that there is an upside to the dark personality or a downside to the light personality. These findings have important implications: while personality traits are relatively stable, they may be shaped by environment and experience. Educators and mentors can help reduce dark triad traits by raising awareness of their negative personal consequences, and by encouraging entrepreneurs to work on self-improvement to develop lighter traits.

The Interplay of Technological Cooperation and Competition: Insights from Evolutionary Dynamics and Complexity Theory

Prof. Tanya Sammut Bonnici

Department of Marketing, Faculty of Economics, Management and Accountancy

The central objective of the research project is to determine what contributes towards stable scenarios of cooperation across firms and to build collaboration models that are adaptable, resilient and likely to succeed in competitive markets. The theoretical framework is developed through evolutionary dynamics and complexity theory and their application in collaborative strategy. The methodology adopts a theory-building approach by which rational explanations and representations of observed phenomena are developed, confirmed and improved. The research results will generate knowledge of outcomes with explanatory and predictive insights and a deeper understanding of the characteristics of enduring models of cooperation. The research has the potential to generate new strategic collaboration models for technology firms, industries, regulators, and policymakers.



Exploring Self-Regulation in Human-AI Collaborative Creativity: Implications for Education and Practice

Prof. Margaret Mangion

The Edward de Bono Institute for Creative Thinking and Innovation

Creative process has been traditionally studied from the cognitive perspective, including component processes such as information search or preparation, problem identification and construction, idea generation, and idea evaluation. More recently, theoretical and empirical developments drew more attention to regulatory processes, both in term of relatively state-like metacognition and trait-like self-regulation of creative action (Ivcevic & Nusbaum, 2017; Ivcevic et al., 2023; Lebuda & Benedek, 2023; Zielinska et al., 2022). These approaches focus on the individual and beliefs and strategies that are adopted to advance the creative process from idea generation to product completion. Taking into consideration a sociocultural approach where actors interact with action, their audience and affordances (Glăveanu, (2013), in this paper, we consider the nature of the regulation process when an individual works with an artificial intelligence. To understand this process, we extend the model of self-regulation of creative action to include interaction with a non-human agent. We ask (i) what aspects of forethought can best equip human creators to co- create with AI systems, (ii) how do human creators adjust their approach and reframe goals when using AI, and (iii) how do they evaluate the products and re-engage with the AI (or continue without it). This paper uses examples in education and discusses implications of self-AI regulation for teaching for creativity. Ultimately, we aim to put forward implications for theory and practice to be considered for further research.

Beyond Pandemics: Improving Climate Resilience and Health Systems in Small Island States

Prof. Stefano Moncada | *Co-researcher: Dr Thuan Luca Nguyen Dinh*

Islands and Small States Institute

This project identifies existing climate & public health risks & resilience-building measures in Small Island States (SIS), often disproportionately impacted by external shocks. A crisis like Covid-19 highly impacted the socioeconomic fabric of many SIS already challenged by limited financial capacity & infrastructure, long supply chains & looming climate change scenarios. We employ a mixed-methods approach inclusive of participatory focus groups, elite interviews, household surveys & econometric analysis, to assess health systems in SIS, investigating factors capable of increasing both climate & health resilience. We adopt a Planetary Health Approach recognising the links between the environment & health systems to overcome external shocks.



The Next Chapter for Academic Libraries as Catalysts of Knowledge

Prof. Sandra M. Dingli

The Edward de Bono Institute for Creative Thinking and Innovation

The Academic Library has long been a cornerstone of higher education, evolving to meet the needs of its patrons. This research looks towards the year 2050, when the transformative potential of technological advancements is poised to redefine the academic library landscape.

Grounded in current trends, various speculative scenarios that reflect how technology may reshape library services, spaces, and user interactions will be presented. To gauge the plausibility and desirability of these scenarios, a survey was disseminated among University of Malta Library users, inviting them to identify the scenarios they believe are most likely to materialise or those which they consider most desirable. The results of this survey will be presented. This participatory approach emphasises the role of user perspectives in envisioning the future and fostering a collaborative future vision of academic libraries.

This research seeks to ignite dialogue within the academic community and beyond, highlighting the opportunities and challenges that lie ahead. The study further underscores the critical role of libraries as adaptive institutions capable of harnessing technological advancements to support knowledge creation and dissemination. The main aim of the research is to inspire informed discussions that shape strategic planning for academic libraries as they navigate the path toward 2050.

Religion and Cognitive Resilience: A Pathway to Wellbeing

Prof. John Berry

Department of Fundamental and Dogmatic Theology, Faculty of Theology

Can cognitive challenges be countered by religion's resilience? This presentation examines recent studies on the role of religion, particularly Christianity, in fostering cognitive resilience and enhancing individuals' ability to navigate challenges in an increasingly complex world. While critics have historically viewed religion as harmful—Nietzsche denouncing it as a source of guilt and Heidegger as alienating—these critiques, epitomised in Marx's description of religion as "the opium of the people," often reduce it to a distortion of reality shaped by human needs.

Contrary to such stereotypes, this presentation highlights how contemporary research challenges these views, demonstrating religion's enduring relevance and its significant contributions to individual and societal well-being. It will explore findings that link religion to improved mental health, reduced suicide rates, effective stress management, and even mitigating the effects of illnesses like Alzheimer's disease. These insights reflect religion's resilience and dynamic role in human life.

The presentation will also illustrate how religion functions as a dynamic epistemological framework. It critiques dominant cultural narratives, supports emotional regulation, and provides effective coping strategies. Mechanisms such as religious rituals, community support, and the construction of meaningful narratives will be shown to help individuals reinterpret adversity, maintain ethical integrity, and strengthen group identity.

Ultimately, the presentation will argue that these resilience mechanisms naturally flow from the act of faith, showcasing the interplay between grace and human nature in cultivating adaptive cognitive and emotional capacities essential for thriving in a disorienting world.



Sense Action: The Role of the Sensorial Body in Sustainable Urban Planning

Dr Paula Guzzanti

School of Performing Arts

Sense Action is an interdisciplinary research project led by dance scholar Dr Paula Guzzanti from the University of Malta and Dr John D'Arcy from the Sonic Arts Research Centre at Queen's University Belfast. Launched in 2021, the project centres on carrying out somatic audits on a section of sites. The projects include two case studies of Malta's Marsa Junction (2021) and the University Track (2024). Sense Action explores how somatic movement research and new digital technologies can document the body's intimate sensorial and perceptual experience within specific urban environments. Sense Action aims to develop both critical and practical research methodologies to guide the design of urban spaces that promote the well-being of local communities.





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