



HDR RESEARCH CONFERENCE
2024 PROGRAM

Fed

Acknowledgements

Federation University Australia acknowledges the Traditional Custodians of the lands and waters where our campuses, centres and field stations are located and we pay our respects to Elders past and present, and extend our respect to all Aboriginal and Torres Strait Islander and First Nations Peoples.

The Conference Committee would like to acknowledge and thank staff and HDR candidates who assisted with the organising of this event and contributed to the success of the conference.

CONFERENCE COMMITTEE

Professor Wendy Wright

Dr Robert Watson

Mrs Lauren James

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FOREWORDS

Professor Remco Polman

PRO VICE-CHANCELLOR RESEARCH
& EXECUTIVE DEAN, IHW

Welcome to the 2024 Higher Degree by Research Conference ‘Sharing the journey: Connect, inspire and celebrate’. Unfortunately, I will not be able to attend this important day (I will be at another conference in Europe!). However, I do recognize the significant impact HDR students have on the research landscape in Australia and how they drive research regionally and nationally. Conferences like this are the ideal opportunity to tell others about the details and intricacies of your research and provide opportunities for constructive feedback and discussions with your peers and other researchers.

Presenting and synthesizing your work at a conference might be nerve-wracking but provides you with an opportunity to celebrate on what you have achieved to date and tell the world about it. It is also a good time to reflect on what you have done so far in your research project and discuss this with a diverse audience. The topics and background of presenters and the audience will be diverse. Hence, the research conducted by HDR students at Federation University includes areas like health, science (e.g., renewable energy, environmental issues, IT), social science and in heritage and culture. These projects are often co-sponsored with local or regional companies and organisations often contributing to regional development and knowledge generation.

Federation University is the only regionally-based Higher Education provider in Victoria. This unique position means that we can assist regional industry and government partners in promoting sustainable economic development through research and training. In research we usually achieve this through co-designed projects with our partners, often conducted by a HDR student. Importantly, through our regional precincts at Ararat, Horsham, Ballarat and in Gippsland our students live and work with our community partners. This allows us to deliver high quality research that makes a difference, and students to gain experience with our partners which can lead to employment in regional Australia. Indeed >70% of students who study at our regional campuses remain employed in regional Victoria and are well paid.

Lastly, I'd like to thank everyone who will help make this year's Research Conference a success. This includes the organising committee, and the staff of the Graduate Research School who make this event possible – and especially Lauren James for her coordination – and of course, all participants.

Have a great day.



Professor Wendy Wright

DEAN, GRADUATE RESEARCH

It is my very great pleasure to welcome all HDR candidates and supervisors to our 2024 HDR Conference, being held at the Mt Helen Campus. Our conference theme this year is: '**Sharing the journey: connect, inspire and celebrate**' and I trust that delegates will take advantage of our time together to develop networks, share the experience of the HDR journey, practise and refine communication skills and receive constructive feedback in a supportive environment.

In 2024 we will meet face to face at the Mt Helen Campus, with support in place for students from our other campuses across Victoria to participate. As such, the conference provides a rare opportunity to showcase the range, diversity, and strength of HDR research and HDR researchers. Please do take the opportunity to meet, listen to, and engage with, your peers and colleagues throughout the day.

The annual HDR conference is a wonderful celebration of the work and contributions of the Higher Degree by Research candidates across our university and a great opportunity to understand how HDR-led research at Federation is *transforming lives and enhancing communities*.

Welcome, and enjoy *your* HDR conference!



Professor Andrew Barton

DEPUTY DEAN, GRADUATE RESEARCH

I welcome all HDR candidates and participants to the 2024 HDR research conference. This is a highly anticipated event for the University's HDR community to come together and share our research successes. This year, we are meeting on campus to provide opportunities for candidates to present and discuss their research with their colleagues, supervisors, and network of collaborators.

Sharing and communicating research to your peers is an important element of research training, with the experience and skills developed being things that will stay with you for the whole of your research and professional careers. The University is invested in the training and success of our HDR candidates, and we are eager to provide this opportunity for you. I encourage all HDR candidates to engage fully with the program and to support your colleagues. I hope you are inspired by what you see and hear, and take renewed excitement to be working on your research and within the wider research sector.

This year our theme is 'Sharing the Journey: connect, inspire and celebrate', and so I am particularly looking forward to being inspired by the research I see, and to celebrate the industry and community collaborations many of you have. Indeed, Federation University is very fortunate to have many deep and productive research partnerships, and I would like for us all to recognise this as a strong and positive feature, as we come together for this conference.

Good luck to all presenters and participants!



ORAL PRESENTATIONS

Sharing the journey:
connect, inspire and celebrate



Financial technology and digital banking boost financial inclusion in the Asia-Pacific region

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Doctor of Philosophy

Financial characteristics in the Asia-Pacific (APAC) region are rapidly changing, shaped by cultural, demographic, and regional influences. The APAC region is undergoing a transformative era in financial services, with financial technology (fintech) and digital banking emerging as powerful drivers of financial inclusion.

This study investigates the vibrant interaction between innovative financial technologies and the expansion of banking services to underserved and unbanked communities in the APAC region. It delves into how digital platforms and fintech innovations are breaking down traditional barriers to financial access, such as geographical isolation, elevated service fees, and the absence of formal financial infrastructure. This study highlights the role of mobile banking, digital banking, digital wallets, and blockchain technology in creating inclusive financial ecosystems that cater to the diverse requirements of the APAC population. Additionally, the study examines the regulatory framework that either facilitates or hinders the adoption of fintech solutions, emphasizing the need for regulations that support innovation while ensuring consumer protection and financial stability.

This study concludes by identifying the challenges, including the need to overcome cultural resistance and address cybersecurity concerns, while proposing strategic approaches for utilising fintech and digital banking as catalysts for economic growth and financial inclusion in the Asia-Pacific region.



The regulatory role of circular RNAs in response to RAAS inhibitors

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Doctor of Philosophy

Circular RNAs (circRNAs) are a class of non-coding RNA that may play an important role in disease progression and diagnosis. This study aimed to investigate the role of renal circRNAs in hypertension and to identify circRNAs pathways explaining chronic reset in blood pressure. Two groups of young spontaneously hypertensive rats (SHR) were used: rats treated with or without losartan (RAAS inhibitor, $n = 18$ in each group). Through established circRNA identification and quantification tools, we identified five significant circular RNA candidates ($P < 0.05$), each aligning with differentially expressed and biologically significant miRNA. Furthermore, these candidate circRNAs aligned with expression pathways found in both treatment and control groups. In conclusion, this study identified several circRNAs which may play an important role in blood pressure regulation. It may advance our understanding of circRNAs in mediating losartan-induced blood pressure reduction. Future studies on validation, expression networking and methylome analysis may shed light on these circRNAs' significance and identify potential therapeutic biomarkers.

Benjamin Atchison is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Modelling and optimisation of a micro-CHP system for small scale applications

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Doctor of Philosophy

Micro-Combined Heat and Power (CHP) systems provide both power, as in mechanical work or electricity, and heat, in the form of space or water heating, at a scale suitable for domestic purposes. To minimise losses and improve efficiency, a thermodynamic cycle which expands a liquid and vapour mixture, often referred to as two-phase fluid, is investigated. A design for the system is presented where a suitable prime mover is considered, which can be of positive displacement type i.e., limaçon positive displacement machine, and the excess thermal energy is used to heat water for use in a hot water system or potentially for space heating. Following this, the multi-objective grey wolf optimiser is employed to determine an optimal system configuration for a given set of design parameters and for a fixed prime mover design. Findings suggest that the prime mover is suitable for use in such a system and can produce the desired work output of around 5 kW while heating water to the temperature range of 60-70°C. The optimisation procedure can also investigate the suitability and adaptability of the thermal system to different prime movers.

Christopher Belfiore is supported by a Federation University Research Excellence Stipend Scholarship and an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Hospital in the home models of care in Australia: A systematic review

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Doctor of Philosophy

Hospital In The Home was first introduced in Australia in 1994 and has been instrumental in transforming the way in which patients receive their healthcare. However, as there is limited HITH research completed within Australia there is limited guidance available for health professionals and health services looking to improve their HITH models of care. Models of care are used to describe the delivery of healthcare within the healthcare system context and can provide an overarching strategy for the implementation of healthcare. Key characteristics of models of care can include admission pathways, medical management, health professional involvement and location of care delivered. Utilising a systematic approach, seven databases were searched from 1994 – 2024 to determine the models of care utilised within Hospital In The Home (HITH) in Australia. Ten articles met the inclusion criteria, and three models of care were described using narrative synthesis. The findings from this systematic review could help enhance future models of HITH care and highlight how the implementation of telehealth and the inclusion of rural health services in HITH research can improve outcomes for HITH patients across Australia.

Natalie Bransgrove is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Understanding interventions for justice-involved young people – young people’s perspective

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Doctor of Philosophy

Young peoples’ voices are often missing from the conversations when analysing the impacts that interventions have on justice involved young people (Munford & Sanders, 2016; O’Reilly & Dogra, 2018). The aim of the research is to give a voice to young people’s experiences by examining whether their perceptions and experiences of these interventions are appropriate and beneficial to their needs. The research will also explore the experiences of young people and that of facilitators of the interventions to see if there are correlations or gaps between how experiences are delivered compared to perceived.

The research consists of a constructionist approach which will underpin this research design. The theories applied, which include labelling theory and critical criminology, will aim to explain and inform our understanding of the challenges young people face in a criminal justice setting. The method includes interviews to elicit the lived experiences of young people. Juxtaposing these narratives will be responses captured through qualitative data collected from workers. Data will be obtained through working with organisations that are linked with the Ballarat Youth Justice Innovation Partnership and once completed, will assist their practice by highlighting how their young people feel about their intervention approaches.

Kerrie Bryant is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Bridging narratives: A meta-synthesis of older adults' experiences with osteoporosis preventive strategies

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Doctor of Philosophy

Osteoporosis, a global public health concern, significantly increases the risk of fragility fractures, contributing to substantial morbidity and mortality (Rizzoli et al., 2018). However, understanding the experiences and needs of individuals with osteoporosis, especially among older adults, remains limited. Hence, a meta-synthesis was conducted to explore qualitative literature from 2010 to 2023, focusing on older adults' engagement with osteoporosis preventive strategies.

Critical appraisal, utilising the CASP checklist for qualitative studies, was applied to twenty-two studies meeting inclusion criteria. Synthesised themes included challenges and opportunities in managing osteoporosis for life balance, enhancing patient involvement in its management, navigating support systems, and identifying barriers and facilitators to preventive behaviours.

Older adults encountered challenges in managing osteoporosis while striving for overall well-being. They emphasised the need for strategies empowering their acceptance and engagement in its management. Additionally, they expressed the importance of accessing support systems to cope effectively. The synthesis highlighted various factors influencing individuals' adherence and decision-making toward osteoporosis prevention.

Given the limitation of studies to the Western region, further research from diverse backgrounds is essential to understanding the experiences and needs of older adults with osteoporosis. Recognising their experiences and support needs offers the potential for tailored promotional and preventive interventions.



Psychological distress and depression among Bangladeshi migrants in Australia

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Doctor of Philosophy

Objective: An estimated 4.3 million Australians adults experienced a mental illness in the past year. This study examines the prevalence, levels, and predictors of psychological distress and depression among Bangladeshi migrants in Australia.

Methods: Quantitative survey data were collected in 2023 from Bangladeshi-born adult migrants living in Australia for ≥ 1 year. Psychological distress and depression were assessed using the K-10 scale and CESDR-10 scale respectively. Predictors were identified using logistic regression.

Results: The prevalence of 'moderate to very high levels' of psychological distress among Bangladeshi migrants was 71% and that of depression was 35% ($n = 196$), about double the Australian average. Novel risk factors include non-engaging in activities with family/friends (AOR 5.34, 95% Cis 1.35-26.77) and community (2.65, 1.16-6.09), and absence of prior income in Bangladesh (3.37, 1.09-13.13). Migrants from rural Bangladesh (0.42, 0.17-0.97), aged ≥ 30 years (0.17, 0.04-0.63), and active on social media (0.26, 0.08-0.78) were less likely to be depressed. Other predictors identified are loneliness (6.24, 2.64-16.69), poor friendship (4.51, 2.01-11.12), discrimination (2.72, 1.32-5.79) and racism (2.71, 1.27-5.91), multiple comorbidities (3.37, 1.34-9.07), and low English proficiency (2.52, 0.96-6.71).

Conclusions: This study emphasizes the need for policy changes to develop targeted mental health interventions/support services for migrants, promoting community-based initiatives that enhance social connectedness, language skills, and address discrimination.

Pritimoy Das is supported by an Australian Government Destination Australia and Federation University Research Excellence Co-funded Stipend Scholarship with Tuition Fee Scholarship through Federation University Australia.



Speech based detection of Alzheimer's disease using AI techniques

Kewen Ding

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Doctor of Philosophy

Alzheimer's disease (AD) is a prevalent neurodegenerative condition that significantly impacts patients' cognitive abilities, imposing substantial personal and societal burdens. This research project aims to develop an innovative framework for the early detection of AD using advanced AI techniques focused on speech analysis. By leveraging pre-trained Language Models (LMs) and integrating acoustic features from Automatic Speech Recognition (ASR) systems, the study seeks to enhance diagnostic accuracy and applicability. Given the limited availability of public speech datasets, the project employs Generative AI approaches such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) for data augmentation, addressing data scarcity challenges. The objectives are threefold: to construct a pre-trained LM-based detection model enriched with temporal speech features; to evaluate the integration of ASR and acoustic features with LMs; and to develop robust synthetic data generation methods to improve model performance. This comprehensive approach aims to create a reliable, adaptable, and cost-effective system for early AD detection, potentially leading to improved patient outcomes through earlier diagnosis and intervention and contributing to the advancement of AI-driven healthcare solutions.

Kewen Ding is supported by a Department of Education and Training and Federation University Research Excellence Co-funded Stipend Scholarship with Tuition Fee Scholarship through Federation University Australia.



Assessing the Wimmera's readiness to address gendered violence

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Doctor of Philosophy

Gendered and family violence statistics in the Wimmera Southern Mallee region of Victoria remain significantly higher than the state average. This trend is consistent despite ongoing community and government efforts to address the issue.

This project will examine the intersection of the cultural and structural drivers of gendered and family violence and rurality, specifically as it is experienced in the Wimmera Southern Mallee region. The researcher will also apply the Community Readiness Model to the region, which assesses how prepared the community is to address the problem.

The researcher is conducting semi-structured interviews in both group and individual settings, as well as the Community Readiness Model's structured questions, with an aim of interviewing approximately 40 individuals in the study area. Interviews are targeting victim-survivors, community leaders and change makers, and social services sector workers.

All the data will undergo an inductive thematic analysis, using a flexible approach that facilitates both latent and semantic analyses. Ultimately the project aims to contribute to the growing body of literature highlighting the importance of considering rurality when addressing gendered and family violence, as well as provide community changemakers with practical insights into the barriers the region faces in addressing gendered and family violence.

Jessica Duncan is supported by a Women's Health Grampians and Australian Government Research Training Program (RTP) Co-funded Stipend Scholarship and RTP Fee-Offset Scholarship through Federation University Australia.



Investigating ERPsim's role in enhancing SFIA competencies for improved job-readiness: A mixed-method study

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Doctor of Philosophy

This mixed-methods study investigates the impact of ERPsim, a simulation-based educational tool, on the acquisition of SFIA-aligned skills among Information Systems (IS) students in Australian universities. SFIA (Skills Framework for the Information Age) is an industry framework for mapping the competencies and skills critical for IS professionals in a dynamically changing technological landscape, providing a robust framework for assessing job readiness. ERPsim, integrated within the curriculum, allows students to manage virtual companies using SAP software, offering a realistic environment to develop both technical and soft skills essential for the IS industry. The study has three primary objectives: assessing ERPsim's effectiveness in enhancing SFIA-aligned technical skills, evaluating knowledge gains in enterprise systems, and exploring the development of behavioral competencies such as creativity, resilience, and adaptability.

Quantitative data were collected from 120 postgraduate students through pre- and post-game surveys, which demonstrated significant improvements in communication, decision-making, and problem-solving skills ($p < 0.001$). Qualitative insights from instructors complemented these findings, highlighting notable advancements in student engagement and practical knowledge application.

The results suggest that ERPsim effectively bridges the gap between theoretical knowledge and practical application, ensuring that learning outcomes align with professional competencies demanded by the modern IT landscape. This study not only contributes to educational technology by validating a novel approach to skill development but also provides a framework for enhancing job readiness through targeted educational tools.

Nadia Faisal is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Leveraging graph neural networks for multiple time series analysis

Falih Gozi Febrinanto

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Doctor of Philosophy

Multiple time series data, which record dynamic system changes, can be generated from multiple sensors or variables. Time series analytics help identify long-term trends in the data, which is essential for making informed business decisions or actions, for example, in understanding market price movements, detecting anomalies in cyber-physical systems, or analysing network traffic. The quality of time series analytics can be improved by examining the interdependencies across collections of multiple time series within the same system. In this work, we study to model graph structures in multiple time series and to improve its analytics quality. We propose frameworks to address the challenges of constructing and modelling graphs in multiple time series data. We employ statistical-based approaches to construct graph structures and use Graph Neural Networks (GNNs) to learn the representation of graph structures. The experiments we conducted show that our framework improves the performance of several downstream tasks, such as anomaly detection and brain disease detection.

Falih Gozi Febrinanto is supported by a Data61 PhD Stipend Scholarship and Tuition Fee Scholarship through Federation University Australia



A review of disturbance impacts on ant interactions in different climatic zones

Norma Fernando

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Doctor of Philosophy

Ants are widely used as bioindicators in land management studies, as the composition of ant communities undergoes changes in response to habitat disturbances. An understanding of the disturbances that impact ant interactions across different climates is important for land management and biodiversity conservation. Over the past 30 years, there has been a significant increase in research assessing disturbance impacts on ant interactions with other taxa, including plants, other invertebrates, vertebrates, and microorganisms. We aimed to synthesize current information to identify knowledge gaps and guide future research. We conducted a systematic review, gathering data from 98 studies published between 1990 and 2023, representing four major climatic regions. These studies were conducted across 22 countries, with the highest proportion in Brazil (31%). Our findings revealed that studies on ant-plant and ant-ant interactions were conducted in every climatic region, whereas studies examining disturbance types such as fire, grazing, vegetation clearing, and cropping varied among climatic regions. Ants mostly interact with plants, with ant-mediated seed dispersal being particularly prominent in arid zones, and studies on ants and extrafloral nectar (EFN) plants being mainly studied in tropical regions. Furthermore, we observed a limited number of studies conducted in arid landscapes, highlighting the need for more research to identify disturbances specific to arid zones and understand ant interactions.

Norma Fernando is supported by a NSW Biodiversity Conservation Trust and Federation University Co-funded Scholarship with Tuition Fee Scholarship through Federation University Australia.



The academic-industry divide in the Australian-New Zealand video games sector

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Doctor of Philosophy

Efforts in communication, collaboration, and knowledge transference between industry and academia in the game development sector have been limited, leading to what is commonly termed the Academic-Industry divide. This thesis contends that this divide encompasses multifaceted issues beyond mere collaboration or knowledge transfer interactions, a perspective not fully explored in previous studies. Identifying and understanding the factors perpetuating this divide, especially within the video gaming field in Australia, has been insufficiently addressed. This research aims to fill this gap by investigating the question: “How can the Academic-Industry divide within the Australian-New Zealand video game sector be characterised?” Employing mixed-method research using the Concurrent Triangulation Theory, the study included a quantitative survey involving 103 participants and qualitative interviews with 16 individuals, representing academia, industry, and those bridging both sectors. Utilising Kelly’s Personal Construct theory and Homans’ Social Exchange theory, the research revealed original insights that led to a framework to delineate the divide’s multifaceted nature and informed an analysis of its impact on the Australian-New Zealand video gaming industry. Key findings highlighted time constraints as the primary barrier, followed by perceptions of value, limited awareness between communities, and systemic issues involving government bodies, university management, and funding agencies.

Jordan Greenwood is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Trophic transfer and PPCPs: Can we predict it? A meta-analysis

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Doctor of Philosophy

Modern ecosystems harbour increasing amounts of chemical contaminants, with constant inputs from industry and urban waste. In order to better understand the effect of these contaminants on the environment, it is important to characterise how chemical contaminants, such as pharmaceuticals and personal care products (PPCPs), move throughout environmental food webs via trophic transfer. This meta-analysis followed PRISMA guidelines, analysing 44 papers for a series of parameters, including trophic magnification factors, environmental information, and chemical information parsed via online databases. A total of 148312 data points was generated and compiled for analysis in R.

Analysis into these properties, such as hydrophobicity and a propensity to bioconcentrate, has indicated that these previously prioritised parameters cannot predict trophic transfer on a global scale. The meta-analysis highlighted a high degree of variability in reported PPCP bioconcentration and trophic magnification, even among studies of the same PPCP class. The meta-analysis highlighted PPCP classes, such as antibiotics, as priority chemicals of concern globally. The data has identified key knowledge gaps within current research and has highlighted the variability in PPCP behaviour globally and demands an increase in whole ecosystem monitoring.

Samantha Harriage is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Bushfires, trauma and sleep: Help me sleep please

Fadia Isaac

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Doctor of Philosophy

Wildfires lead to the development of sleep and trauma symptoms. Accessing mental health services is challenging in communities subjected to natural disasters. Therefore, we developed a digital, self-paced intervention that includes cognitive behavioural therapy for insomnia, and exposure, relaxation, and rescripting therapy for nightmares.

A pilot study was conducted over a four-week period with wildfire survivors from Australia, Canada and the USA. Twenty participants, including 14 females and 6 males, completed the Insomnia Severity Index (ISI), the Nightmare Disorder Index (NDI), and the PTSD CheckList – (PCL-5), and were sequentially allocated to either the treatment ($n = 11$) or the waitlist control groups ($n = 9$). Participants' ages ranged from 18 to 79 years ($M = 53.75$, $SD = 16.54$).

Repeated measures ANOVAs showed that symptoms of insomnia, nightmares and PTSD were significantly lower from baseline to post-treatment for the treatment group in comparison to the waitlist control group, $F(1,18) = 5.49$, $p = .03$, $\eta^2 = .23$), $F(1,18) = 14.82$, $p = .001$, $\eta^2 = .45$ and $F(1,18) = 6.72$ $p = .018$ $\eta^2 = .27$ respectively.

Digital sleep interventions may be a promising and viable alternative when mental health services are not easily accessible in the aftermath of natural disasters.

Fadia Isaac is supported by a Natural Hazards Research Australia Stipend Scholarship and an Australian Government Research Training Program (RTP) Fee-Offset Scholarship administered through Federation University Australia.



Analyzing control requirements for inverter-based power grid under evolving dynamics of loads

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Doctor of Philosophy

The growing adoption of sustainable energy sources, such as solar power, battery energy storage, and wind power, presents difficulties for electrical networks. While traditional generators have been essential for ensuring the stability of the power system, renewable energy sources occasionally depend on converters that are unable to provide the same functions. Grid-following inverters possess a restricted capacity for grid support and demonstrate inadequate stability. Grid-forming inverters (GFM) have been recently suggested as a means to enhance the dynamic performance and stability of converters that are linked to the grid. Moreover, understanding the dynamics of loads is also important since different load models might lead to varied, and sometimes conflicting, conclusions regarding system voltage stability.

This study presents an innovative approach to calculating the control needs of future grids that rely on inverters. It considers the nonlinearity and dynamic properties of both generators and loads. A study conducted on a 9-bus system with composite load models demonstrates that the integration of renewable energy is confined without compromising voltage stability when converters without voltage regulation characteristics are employed. A virtual synchronous machine (VSM) based grid-forming inverter (GFM) can be used to replace the grid-following inverters (GFL) and maintain a constant voltage and overall performance. Voltage stability-related results vary when using composite load models instead of simple static loads. Regulators may find this method useful in determining the control specifications for prospective stability studies, ensuring an uninterrupted integration of renewable energy sources, and achieving challenging clean energy goals. While the results are specific to the 9-bus system, the overall methodology may be adjusted to accommodate a larger power infrastructure in Australia.

Muhammad Ismail is supported by a Tuition Fee Scholarship through Federation University Australia.



Development of digital resilience among HE students: Impact of Generative AI

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Doctor of Philosophy

Digital resilience refers to an individual's ability to safely navigate digital challenges and opportunities. Digital resilience development is important for university students to handle issues such as cyber-attacks effectively and securely. It is argued that Gen AI could be used to develop such resistance. Generative AI tools offer customized learning with 24/7 support from vast databases, unlike traditional technologies that simply process or retrieve pre-existing information. Thus, developing digital resilience in higher education students is crucial. However, digital resilience in the context of Generative AI-assisted learning has not been thoroughly analysed. This study aims to determine whether Generative AI impacts the development of digital resilience among higher education students. It proposes a model with components such as risk awareness, help-seeking, proactive learning, and emotion regulation. Data will be collected through surveys and analysed using SPSS. The conceptual model of digital resilience will be tested and validated, contributing to the literature by extending knowledge of AI adoption within organizations.



The future of beef production: from risk assessment to sustainable management

Priyambada Joshi

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Doctor of Philosophy

The beef sector contributes significantly to supplying protein demand and meaningful livelihoods to millions of farmers and producers worldwide. However, like any agricultural activity, it comes with its share of risks. This study examines the risk of cattle farming, current mitigation strategies used by beef producers, and their perceptions about the future of protein by understanding their awareness of alternative proteins and cellular agriculture. We conducted an online survey in the United States. Based on responses from 111 beef producers, we categorised risks into production, financial, market, human and personal, and political domains; we rated them, analysed their intensity, and studied their temporal and spatial aspects. Key risks identified with cattle farming were production risks (climate-related incidents and land availability), financial risks (price of inputs), market risks (price volatility and competition with meat alternatives), human and personal risks (labour scarcity and succession planning), and political risks (environmental protection regulations and policy changes). The key risk management strategies identified were collaboration, diversification, technology adoption, and insurance. 93.5% of respondents know alternative proteins (plant-based and cultivated meat). The presentation will elaborate on these aspects and provide insights into building resilience and sustainability in the future of beef production.

Priyambada Joshi is supported by an Aleph Farms Industry Stipend Scholarship and a Tuition Fee Scholarship through Federation University Australia



Oral health among children attending boarding schools globally: A scoping review

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Doctor of Philosophy

Introduction: The review aims to provide an overview of the literature about oral health: status, knowledge, hygiene habits and health seeking behaviour among boarding school children globally.

Methods: Following the PRISMA-ScR protocol, literature search was conducted within 8 databases and selected studies were critical appraised.

Results: Out of 7,250 search results, 12 key studies were included. A quasi-experimental and nine cross-sectional studies from Islamic boarding schools, one from indigenous boarding school and one study included secondary data. The children ages ranged from 2 years to a high of 25 years. Prevalence of dental caries was reported in five studies with a range from 55.4% to 86.4% from 2826 children. Gingivitis (37%) and periodontal disease (89%) prevalence were reported in two studies from 1,119 children. Associations were found between boarding school children's better oral health knowledge and: caries free teeth ($p < 0.001$), prevalence of caries ($p < 0.05$) and intention to improve oral health behaviour (OR = 3.179, 95% CI).

Conclusion: Focusing on oral health education will improve oral health and oral hygiene behaviour among boarding school students. Health promotion strategies should be incorporated into the school curriculum, so that students are not disadvantaged as compared to students from conventional schools.

Shariq Ali Khan is supported by a Tuition Fee Scholarship through Federation University Australia.



Australian farmer's perception of carbon farming and implications for broadacre agriculture

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Doctor of Philosophy

Carbon farming is defined as a set of practices that enable carbon sequestration in soil and vegetation to reduce greenhouse gas emissions in agriculture. Its adoption depends on farmers' attitudes and beliefs. We surveyed broadacre farmers across Australia using an online survey instrument to understand their perceptions of carbon farming and explored various drivers and barriers to its adoption. The survey was completed by 161 farmers, comprising 37% responses from Victoria, 24% from Western Australia, 10% from New South Wales, and the rest from other states and territories. It showed that 90% of respondents are familiar with the term 'carbon farming'. Among the respondents, more than 87% are practicing stubble retention, minimum tillage, and no-till cropping, followed by planting tree lines and protecting remnant vegetation, which are considered carbon farming practices. The key drivers that can help the adoption of carbon farming were identified as improvement in farm yield, soil health, biodiversity, and appropriate carbon incentives. Barriers to its adoption identified by respondents were uncertainty in the carbon price, policy, and difficulty in carbon assessment. The presentation will elaborate on these results and provide insight into the opportunities for broadacre farmers to participate in carbon farming.

Kashif Khaqan is supported by an Australian Government Destination Australia and Ararat Rural City Council Co-funded Stipend Scholarship and Tuition Fee Scholarship through Federation University Australia.



Exploring cohesion of written text as a linguistic marker of depression

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Doctor of Philosophy

There is increasing need for depression detection methods that are efficient, rapid, and conducive to clinical application. Techniques of language analysis can be used to identify 'linguistic markers' that aim to detect depressive symptoms. The current study examined 'cohesion' of writing – the underlying connection of ideas and semantic continuity throughout written language – and its potential to detect depressive symptoms.

Using data from the Black Dog Institute's *MyMood&Me* study, features of cohesion were analysed in samples of writing produced by 196 English-speaking participants ($M_{age} = 39.9$ years, $SD = 12.4$). Features of cohesion were assessed across four writing tasks: Personal Biography, Neutral Writing Task, Narrative Imagery Task, and Letter to a Friend. Linguistic features were extracted from these samples using the Tool for the Automatic Analysis of Cohesion (TAACO), and depression severity was measured via the Patient Health Questionnaire-9 (PHQ-9). Bivariate correlations were used to explore the associations between linguistic features and depression symptomatology, and machine learning models were used to examine the combined predictive value of linguistic features. The current study is ongoing and seeks to establish whether depressive symptoms manifest via the composition and cohesion of written linguistic expression.

Clara Khuon is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Digital resilience framework to address socio-technical cybersecurity challenges amidst major crisis

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Doctor of Philosophy

The recent crisis has resulted in a tremendous increase in cybersecurity challenges. Australia's Higher Education and Research Sector (HERS) must adopt digital resilience strategies to tackle these cybersecurity challenges and manage major crises effectively. In this study, we have developed a digital resilience framework integrating learning loops to mitigate identified cybersecurity issues. The qualitative methodology was adopted, and semi-structured interviews with cybersecurity experts and top managers were conducted. The results classified identified challenges into social and technical cybersecurity challenges using the SocioTechnical Systems (STS) theory. Our findings suggest a range of keystone resilience strategies for crisis management, such as implementing cybersecurity awareness programs, providing cyber support, redefining roles, and responsibilities, implying risk management tools, partnerships with external security organisations, introducing policies, reconfiguring technologies, adopting new technologies, and evaluating current changes to combat these cybersecurity issues. These keystone factors will help achieve digital resilience and significantly minimize cybersecurity issues in HERS, not only during the current major crisis but also in the future. This research offers valuable theoretical and practical contributions that can be applied beyond the context of the recent crisis.

Samreen Mahmood is supported by a Tuition Fee Scholarship through Federation University Australia.



Being – thinking – doing: Practice-led research in action with visual arts practice

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Doctor of Philosophy

Practice-led research is a methodology that provides visual artists the opportunity to contribute to research outcomes through two components, a body of artistic work (development of a creative artefact) and an exegesis. Practice-led researchers explore what are you going to do, why are you doing it, and how will the research be of use to others? It is studio-based scholarly research that has the capacity to reveal research outcomes that other types of research are unable to uncover.

This presentation explores this unique research methodology through the lens of visual arts, drawing on specific examples that have been produced during the PhD research process. Specifically, the presentation will examine the creation of textiles-driven work reflecting personal experience and the themes that have arisen during the research process, including visibility, memory, childhood, home, social change, and assumptions of safety in the familiar.

This presentation discusses the presenter's current research. Through a visual examination of art created during the PhD, the presenter will explore how the practice-led research process sees the artist and materials equally participate in the research process, illustrating the interrelated and continuous flow used to create a series of textile works and ultimately research outcomes.

Lauren Matthews is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



The experiences of nurse leaders in fostering civility: A constructivist grounded theory

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Doctor of Philosophy

Nursing is often conceptualised as the 'caring profession' with patients and their families treated with the greatest civility. Yet rudeness is surprisingly commonplace between nurses, harming not only their health and wellbeing but care and safety patient. Known as workplace incivility, widespread examples in nursing include gossiping, eye-rolling and ignoring others. While civility interventions and leadership styles have been proposed to address this issue in the literature, their effectiveness remains unclear. It may be argued that a deeper understanding of how nurse leaders manage this issue within their daily working lives is first needed.

The aim of this research was to explore how nurse leaders fostered civility amongst nurses in rural and regional health and aged care settings in Victoria, Australia. Nurse leaders were defined as any nurse working in a management role who were required to support nurses and other healthcare personnel in teams. Eleven nurse leaders were interviewed using constructivist grounded theory. Two themes were developed from the data including *A Disconnect in Practice and Leading with Courage*.

The findings from this study not only confirm the concerning prevalence of workplace incivility amongst nurses in Australia, but the courage required to address this ongoing issue. By practicing awareness, reflection and clear communication, civility can be upheld to ensure each nurse is supported and empowered to deliver quality patient care.

Marianne Ota is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



Effectiveness of various herbicide strategies for managing the rhizomatous population of *Cyperus aromaticus* (Navua sedge)

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Doctor of Philosophy

Managing infestations of the tropical weed Navua sedge (*Cyperus aromaticus*), known for its resilience and invasive nature particularly when established via rhizomes, is difficult. This study evaluates the efficacy of six herbicides (semptra, glyphosate, paraquat, imazamox, imazapyr and MCPA) in controlling Navua sedge infestations originating from rhizomatous growth. This research seeks to identify the most effective strategies for mitigating Navua sedge infestation in Northern Queensland by assessing application timing, dosage, mode of action, and combinations of herbicides. The controlled experiments measured the suppression of potted rhizomatous Navua sedge plants under glasshouse conditions. Fifteen herbicide treatments were evaluated for two growth stages (pre-flowering, and flowering) and mowed plants. The impact of various herbicide treatments was recorded using a visual score system, and the number of green tillers in each treatment pot was recorded every 6 weeks. After 18 weeks of herbicide spraying, the dry weight of the above-ground plant and rhizomes were recorded. The germination potential of seeds collected from treated plants was also tested. The findings identify potential tailored herbicide treatments that may effectively control Navua sedge infestation in the field. This research offers practical solutions for combating the threat of Navua sedge in Northern Queensland and similar environments.

Bhagya Gamage is supported by an Tuition Fee Scholarship through Federation University Australia.



Establishing validity and reliability of a game skill assessment in women's Australian football

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Doctor of Philosophy

Measuring game skill performance in sports can provide valuable training and player development information. This study aimed to determine the validity and reliability of a game skill scoring criteria for use in women's Australian football (AF).

A scoring criterion involving five-game skills was developed by collating and modifying drills used in training. These drills measured players' technical ability and skill outcomes. To establish content validity, five AF experts participated in two consultations to confirm criterion accuracy. Content validity was assessed using the item content validity index (I-CVI). To establish inter-rater reliability for each drill, five AF experts assessed 30 sub-elite players using the scoring criteria and inter-rater reliability was assessed using Cohen's weighted kappa coefficient.

The scoring criteria achieved content validity for the five-game skills (I-CVI = 0.9 to 1.0). Inter-rater reliability calculations achieved a fair to substantial agreement (0.34 to 0.87) for the game skill scores. The study is the first to determine a valid and reliable tool to assess a player's technical ability and skill outcome in various game skills in AF. The study provides valuable information as a dynamic field-based assessment so coaches can adapt training methods to improve a player's physical preparation and development.

Lee Scullion is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



UV-C radiation as a viable source to control selected submersed aquatic weeds

Dian Udugamasuriyage

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Master of Engineering Science (Research)

The presence of aquatic weeds in irrigation canals poses several issues. Herbicides are a common method for controlling aquatic weeds, but they pose significant environmental risks. This study investigates the suitability of UV-C radiation for controlling two submerged aquatic weeds in Macalister Irrigation District (MID), Gippsland: *Elodea canadensis* and *Vallisneria australis*. UV-C radiation at 254 nm wavelength was applied to plants at varying exposure times, ranging from 30-120 minutes, to determine the effective radiation energy that can impact cell bio-physical activities. To observe plant cell death, a 0.5% (w/v) Evans blue staining was used, and the impact on cell metabolism was assessed by quantifying the chlorophyll content. Numerous bio-physical changes in treated plants were observed, including cell membrane disruption, loss of plant buoyancy, cytoplasmic streaming cessation, and chloroplast agglomeration after exposure to a minimum UV-C energy of 180 kJ/m². This research addressed two questions: 1. What is the effective UV-C radiation energy that can kill study species by impacting their cell metabolism? 2. What are the early visible indications in plants in response to UV-C? Findings of these controlled environmental studies will be tested in-situ in selected canals to assess the feasibility of this technique to reduce usage of weedicides.

Dian Udugamasuriyage is supported by a Federation University Research Excellence Stipend Scholarship with Tuition Fee Scholarship.



Global Digital Financial Resilience Index: The prognostic value of digital financial literacy and inclusion

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Doctor of Philosophy

In today's dynamic digital financial landscape, mastering digital financial literacy and fostering inclusion are crucial for achieving resilience. These factors empower individuals to manage personal finances effectively and shield against economic shocks, enhancing financial security and adaptability on both personal and national levels. This study investigates the predictive value of digital financial literacy and inclusion in determining individual resilience, introducing a novel Digital Financial Resilience (DFR) Index for comparative analysis.

The DFR Index, developed through Exploratory Data Analysis (EDA), Structural Equation Modelling (SEM), and a three-stage Principal Component Analysis (PCA), will rank nations based on their digital financial literacy and inclusion metrics. Utilising data from the 2022 Global Findex report and other reputable sources, this index aims to provide actionable insights for policymakers, educators, and fintech startups, driving strategies to enhance global financial resilience.

By leveraging a comprehensive approach and robust data analysis, the DFR Index will serve as a vital tool in measuring financial resilience among countries. It will highlight areas of strength and identify opportunities for improvement, offering a roadmap for stakeholders to develop targeted interventions. This innovative index supports informed decision-making and fosters a more inclusive and resilient financial ecosystem worldwide.



Perspectives on ageing well from Australian Holocaust survivors

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Doctor of Philosophy

Australians are living longer. Understanding what it means to 'age well' is increasingly important, such that society can support our expanding older population. In particular, understanding what it means to 'age well' in marginalised groups is necessary to ensure their representation in research and decision-making, and help support future older populations who have experienced marginalisation and discrimination. In this study, 13 Holocaust survivors were interviewed to obtain their perspectives on ageing well; this is the first study investigating such perspectives among this population. Thematic analysis identified five key themes, which contributed to a model of 'ageing well'. Among this group, ageing well is considered a continuum, involving (1) positive attitudes (2) sufficient health, (3) a sense of belonging, (4) active life involvement, and (5) autonomy. Participant responses indicated that not all five areas need to be satisfied for individuals to consider themselves to be ageing well. Further, and despite the extreme adversity they experienced in early life, many survivors considered themselves to be 'ageing well'. These findings suggest that childhood adversity, discrimination, and marginalisation do not preclude people from 'ageing well' later in life. This study contributes to Chloe's broader PhD research project, aimed at understanding ageing well in Australia.

Chloe Waddell is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.



POSTER PRESENTATIONS

Sharing the journey:
connect, inspire and celebrate



Digital finance and financial inclusion in the Asia-Pacific region – Systematic review

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Doctor of Philosophy

The Asia-Pacific (APAC) region exhibits a dynamic financial landscape, constantly evolving under cultural, demographic, and neighbourhood factors.

This study delves into various aspects of financial progress, focusing on security in digital banking, cryptocurrencies, and financial technology (fintech), and explores how these developments are shaping financial inclusion in the region. Virtual banking is expanding access to remote areas, enabling people to become financially empowered and included. Cryptocurrencies reduce reliance on traditional financial institutions, but disparities in regulations and persistent security concerns remain. Fintech advancements offer a powerful tool to bridge financial gaps and fuel economic growth. However, regulatory hurdles can hinder their full implementation. Anticipating the importance of robust regulatory frameworks is crucial to implementing these financial practices, ensuring transparency, and protecting clients. The region faces encounters and prospects due to profit disparities, cultural influences, and local infrastructure, and education can enhance financial inclusion and promote economic growth in the APAC region.

This systematic literature review recommends a multi-pronged approach to address the aforementioned challenges. By harnessing the power of virtual finance, coupled with robust regulatory frameworks, advanced technological infrastructure, and comprehensive educational programs, policymakers can create a fertile ground for fostering inclusive and thriving economic environments across the Asia-Pacific region.



Transition of care among elderly patients with heart failure — A scoping review

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Doctor of Philosophy

Background: Elderly patients with heart failure (HF) are at high risk of readmission and adverse events after discharge. Current HF management guidelines emphasise the importance of transition of care (TOC) to prevent such incidents. Identifying the factors that promote TOC without unplanned readmission is crucial, as the evidence is limited.

Aim: To explore the evidence on potential interventions and associated factors to improve TOC in elderly patients with HF after they are discharged home.

Method: Scoping review was conducted using the Joanna Briggs Institute methodology. A three-step search strategy was used to identify relevant studies in CINAHL, Web of Science, MEDLINE, and Scopus.

Results and conclusion: This scoping review provides a comprehensive overview of effective interventions for a smooth transition home, rigorously assessed with hospital readmission as the primary outcome measure. The review suggests that patient assessment to select multi-component interventions can provide more targeted and personalised care during the transitional period. Furthermore, the review underscores the vital role of skilled nurses trained as TOC coordinators in enhancing hospital-to-home TOC. However, there were inconsistencies in the educational training of health professionals, and further research must be conducted to determine the impact of training on care delivery.

Sumaira Amin is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Driving change: Designing bus driver training on disability inclusion

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Doctor of Philosophy

Whilst the inequitable treatment of passengers with disability* by bus drivers is well-established in transport literature, no identified studies were led by people with disability themselves, limiting a lived-experience-informed perspective on such encounters. Drawing from lived-experience-led and co-design research approaches, a collaborative project between advocates with disability, researchers and bus drivers was undertaken. The team created a training program for bus drivers that reflected the needs of both bus drivers and passengers with disability, through a collaborative design process. The team collated recommendations from 200 passengers with disability and bus drivers from previous studies to inform the design of the training program. The final program was evaluated by how successfully it reflected these recommendations. The design process was evaluated using The Victorian Mental Illness Awareness Council (VMIAC)'s *Lived-Experience-Led Research Checklist* and a survey reflecting collaboration principles. The *Better Transport Inclusivity for all Passengers (Better Trip) Training Program* was developed, including all relevant recommendations. The process evaluations described the relevance and importance of the project for the disability community. This study explored an application of collaborative design principles to encourage future researchers to better understand how to ensure people with disability are heard in research concerning them and their communities.

Bonnie Das Neves is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia.

*'people/passengers with disability' is the term preferred by our team members with lived experience and therefore is used here. The researchers acknowledge and affirm alternative preferences.



Are length of stay and readmissions indicators of healthcare performance? A systematic review

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Doctor of Philosophy

Appraisal of hospital performance is important to provide insights to assess quality and drive service improvement. Two important indicators used to appraise hospital performance include length of stay and readmission to hospital. This review explores whether length of stay and readmission rates can serve as effective indicators of healthcare performance.

Searches for articles were conducted in the databases SCOPUS, MEDLINE, CINAHL complete, APA PsycInfo, APA PsycArticles, Web of Science and Google Scholar. The initial search strategy identified 520 unique articles, 20 of which met inclusion criteria.

There is a fine balance between length of stay and readmissions. Reduced length of stay is desirable, however if a patient is discharged before they are medically ready, this may increase their risk of unplanned readmission and increase patient complications. It is unknown whether a length of stay should be shorter or longer to minimise unplanned readmissions or in-hospital mortality.

Although length of stay and readmission rates are promising as quality indicators, care needs to be taken in interpreting these measures. Performance indicators such as length of stay and readmissions should be considered together and there are many underlying hospital characteristics that influence these indicators and should be considered when appraising hospital performance.

Kerry de Vent is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Investigating ERPsim's role in enhancing SFIA competencies for improved job-readiness: A mixed-method study

Nadia Faisal

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Doctor of Philosophy

This mixed-methods study investigates the impact of ERPsim, a simulation-based educational tool, on the acquisition of SFIA-aligned skills among Information Systems (IS) students in Australian universities. SFIA (Skills Framework for the Information Age) is an industry framework for mapping the competencies and skills critical for IS professionals in a dynamically changing technological landscape, providing a robust framework for assessing job readiness. ERPsim, integrated within the curriculum, allows students to manage virtual companies using SAP software, offering a realistic environment to develop both technical and soft skills essential for the IS industry. The study has three primary objectives: assessing ERPsim's effectiveness in enhancing SFIA-aligned technical skills, evaluating knowledge gains in enterprise systems, and exploring the development of behavioral competencies such as creativity, resilience, and adaptability.

Quantitative data were collected from 120 postgraduate students through pre- and post-game surveys, which demonstrated significant improvements in communication, decision-making, and problem-solving skills ($p < 0.001$). Qualitative insights from instructors complemented these findings, highlighting notable advancements in student engagement and practical knowledge application.

The results suggest that ERPsim effectively bridges the gap between theoretical knowledge and practical application, ensuring that learning outcomes align with professional competencies demanded by the modern IT landscape. This study not only contributes to educational technology by validating a novel approach to skill development but also provides a framework for enhancing job readiness through targeted educational tools.

Nadia Faisal is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Leveraging graph neural networks for multiple time series analysis

Falih Gozi Febrinanto

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Doctor of Philosophy

Multiple time series data, which record dynamic system changes, can be generated from multiple sensors or variables. Time series analytics help identify long-term trends in the data, which is essential for making informed business decisions or actions, for example, in understanding market price movements, detecting anomalies in cyber-physical systems, or analysing network traffic. The quality of time series analytics can be improved by examining the interdependencies across collections of multiple time series within the same system. In this work, we study to model graph structures in multiple time series and to improve its analytics quality. We propose frameworks to address the challenges of constructing and modelling graphs in multiple time series data. We employ statistical-based approaches to construct graph structures and use Graph Neural Networks (GNNs) to learn the representation of graph structures. The experiments we conducted show that our framework improves the performance of several downstream tasks, such as anomaly detection and brain disease detection.

Falih Gozi Febrinanto is supported by a Data61 PhD Scholarship and Tuition Fee Scholarship through Federation University Australia



Disturbance impacts on ant interactions in different climatic zones

Norma Fernando

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Doctor of Philosophy

Global environmental change has altered ecological communities through direct losses of biodiversity as well as changes to species interactions. Ants are a diverse and highly abundance group with a broad range of interactions with taxa and food webs. Knowledge of the disturbances that impact ant interactions is therefore important for understanding the implications of global change for biodiversity and ecosystems. Here we synthesize current knowledge of disturbance effects on ant interactions with other taxa. We conducted a systematic review, gathering data from 98 studies published between 1990 and 2023, representing four major climatic regions spanning 22 countries. Ants were reported as interacting with a wide range of taxa, including plants, other insects, vertebrates, and microorganisms. Interactions with plants were frequently studied, with ant-mediated seed dispersal being particularly prominent in arid zones, and studies on ants and extrafloral nectar (EFN) plants being mainly studied in tropical regions. Disturbance types that can impact ant interactions were varied among climatic regions. However, arid region disturbance studies retrieved from our search were limited to fully explore its effects on arid ecosystems. In this review we outlined many ways of disturbances modify ant interactions. We conclude by suggesting future areas that help better understand the disturbance impacts on ant interactions.

Norma Fernando is supported by a NSW Biodiversity Conservation Trust and Federation University Co-funded Scholarship with Tuition Fee Scholarship through Federation University Australia.



Achieving net zero emissions in agriculture: developing decision support systems for land and enterprise managers

Pramod Gautam

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Doctor of Philosophy

Global anthropogenic greenhouse gas (GHG) emissions are increasing steadily, making the goal of achieving net zero a significant challenge. About 30% of global GHG emissions are from food systems. In Australia, agriculture sector contributes 17.9 % to the total emissions and must therefore respond effectively to achieve net zero emissions by 2050. This study aims to develop a conceptual model for a decision support system (DSS) tailored to GHG management in agriculture. It intends to integrate stakeholder perspectives, scientific knowledge, and technological advancements based on decision rules. This will inform development of a conceptual model for a tailored DSS that will be evaluated at the farm level. This model will serve as a roadmap for a decision-making tool to manage GHG emissions at the farm level, with the goal of supporting sustainable agricultural production without compromising productivity and profitability. This study will assess existing DSS and then conduct online survey and interviews to collect qualitative data on the perceptions of farmers, researchers, agriculture consultant, policymakers. After assessing DSS and perception of stakeholder, conceptual model will be developed for appropriate decision-making tools to achieve net zero and evaluated at farm level. The poster will elaborate on different aspects of the study and provide insights into objectives, methodology and expected outcome.

Pramod Gautam is supported by a Destination Australia and Department of Education Scholarship from the Australian Government, Food Agility CRC, and a Tuition Fee Scholarship through Federation University Australia.



An assessment of Australian region tropical cyclones using observational data

Sarvesh Kumar

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Doctor of Philosophy

This study utilizes Bureau of Meteorology (BOM) Tropical Cyclone (TC) data (post-1970) to assess its homogeneity by comparing it with three other available TC data sources for the Australian region. In doing so it provides an in-depth report of homogeneity and fosters confidence in the level of accuracy of the BOM data. This database is then used to examine some fundamental TC matrices for the Australian region. These parameters include TC frequency, intensity, TC days, seasonal accumulated cyclone energy, and spatial distribution of genesis, max intensity, termination, and track density.

A critical issue identified is the lack of consistency in data across all sources, primarily due to variations in data recording methodologies and technologies. This compounded with the varying approaches adopted by researchers for classifying and defining tropical cyclones (TCs) in various studies contributes to discrepancies in results. Despite these challenges, an analysis of basic trends post-1980 reveals a general decrease in fundamental cyclone matrices over time.

Sarvesh Kumar is supported by a Federation University Centre for New Energy Transition Research Stipend Scholarship with Tuition Fee Scholarship from Federation University Australia.



Time-frequency consistency-based graph contrastive learning for brain network analysis

Mujie Liu

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Doctor of Philosophy

Graph contrastive learning has found wide application in brain network analysis under the limited samples in real-world medical datasets, by revealing the intrinsic structure or features of the data. However, existing works predominantly emphasise analysing time domain features, neglecting the relationship between frequency information and brain functionality. This results in biased learning of brain network representations, ultimately impacting the model performance. To fill this gap, we propose a novel model, a time-frequency consistency-based graph contrastive learning (TFC-GCL), which performs joint analysis over graph networks in both time and frequency domains for accurate disease detection. Specifically, we design graph encoders tailored for the time and frequency domains respectively, and learn key features through contrastive learning while preserving the feature consistency between time and frequency domains. Experimental results indicate that TFC-GCL substantially enhances the performance of disease classification across various metrics on real medical datasets, particularly improving accuracy by 24.6% compared to state-of-the-art methods. Importantly, its effectiveness has been confirmed even with the availability of highly limited samples.

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Expanding research output using curated State government datasets in restoration ecology research

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Master of Applied Science (Research)

Limitations in ecosystem dynamics and restoration research include the extensive time and cost of undertaking field work, long-term response to restoration efforts and access to land providing variation in the target ecosystem. As such, detailed ecosystem dynamics models and restoration experiments are often highly targeted and may not capture variation in ecosystem occurrence and function across larger scales.

Our project aims to overcome these limitations by utilising extensive curated ecological and environmental datasets from the NSW Biodiversity Conservation Trust (BCT). The BCT manages private land conservation agreements in NSW and has collected over 2600 ecological monitoring plots across 455 properties spanning 343,000ha. Access to these datasets has broadened our research scope far beyond what is possible for a postgraduate research project of this nature which requires collection of primary data. The benefit to our research output is anticipated to be significant, allowing the research program to encompass several systematic reviews, a multivariate statistical investigation of variation in our target ecosystem across NSW, development of an ecosystem dynamics model and predictive model of restoration methodologies. This is the first use of this data by a research team outside BCT and aims to set a precedent for future research to benefit.

Thomas Munro is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship through Federation University Australia.



Bioremediation of pharmaceuticals from wastewater streams

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Emerging Contaminants (ECs), such as pharmaceuticals, pose a potential risk to human health and the environment. Conventional wastewater treatment plants (WWTPs) were not specifically designed to remove pharmaceuticals, but there are several treatment technologies which have been studied and implemented in WWTPs to remediate pharmaceuticals.

Among the technologies, Constructed Wetlands (CWs) have drawn more interest in recent years, due to their cost effectiveness, ease of use, sustainability, and environmental friendliness. CWs are artificial engineered system that utilize natural processes to enhance water quality. Plants can play an effective role in remediation of ECs in CWs. However, early studies are focused on evaluating the effectiveness of CWs in removing organic compounds, nutrients, and heavy metals. There are limited studies on the phytoremediation of pharmaceuticals in CWs, especially at concentrations relevant to real world scenarios.

The aim of this project is to evaluate the potential use of plants in remediation of pharmaceuticals and find a cost effective and sustainable solution. This would bring clear benefits to humans and the broader environment, as only the treated and improved quality water would then be discharged from WWTPs to downstream waterways.

To achieve this goal, hydroponic and mesocosm experiments will be performed at Federation University.

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Smart farming: using big data to improve decision making

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Smart farming leverages modern technologies to transform agricultural production into a data-driven, sustainable practice. Throughout history, advancements in technology have aimed to improve farming efficiency. Sensors, internet of things (IoT), robots, and drones are some smart farm technologies that generate valuable farm data. However, current data use often prioritizes short-term gains in yield and efficiency, neglecting long-term sustainability. Environmental and sustainability regulations are increasingly important for farmers, particularly for accessing global markets. Yet, there's a lack of farm-level tools to measure sustainability using existing data. This project aims to fill this gap by developing a tool for farmers to assess their Environmental, Social, and Governance (ESG) impacts. The project will first explore farmer perceptions of sustainability and their current data collection practices through a questionnaire survey. Existing sustainability frameworks will then be reviewed to develop a comprehensive farm-level ESG framework. Finally, a tool will be built based on this framework, enabling farmers to utilize their data to calculate their ESG impacts. This impact assessment can help farmers improve their productivity, access better investments, and implement risk management strategies. The project's scope can be further expanded to regional and national levels by incorporating data from broader geographic regions.

Bhola Paudel is supported by Destination Australia and Department of Education Stipend Scholarship with Tuition Fee Scholarship from Federation University Australia.



UV-C radiation as a viable source to control selected submersed aquatic weeds

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The presence of aquatic weeds in irrigation canals poses several issues. Herbicides are a common method for controlling aquatic weeds, but they pose significant environmental risks. This study investigates the suitability of UV-C radiation for controlling two submerged aquatic weeds in Macalister Irrigation District (MID), Gippsland: *Elodea canadensis* and *Vallisneria australis*. UV-C radiation at 254 nm wavelength was applied to plants at varying exposure times, ranging from 30-120 minutes, to determine the effective radiation energy that can impact cell bio-physical activities. To observe plant cell death, a 0.5% (w/v) Evans blue staining was used, and the impact on cell metabolism was assessed by quantifying the chlorophyll content. Numerous bio-physical changes in treated plants were observed, including cell membrane disruption, loss of plant buoyancy, cytoplasmic streaming cessation, and chloroplast agglomeration after exposure to a minimum UV-C energy of 180 kJ/m². This research addressed two questions: 1. What is the effective UV-C radiation energy that can kill study species by impacting their cell metabolism? 2. What are the early visible indications in plants in response to UV-C? Findings of these controlled environmental studies will be tested in-situ in selected canals to assess the feasibility of this technique to reduce usage of weedicides.

Dian Udugamasuriyage is supported by a Federation University Research Excellence Scholarship with Tuition Fee Scholarship.



Global Digital Financial Resilience Index: The prognostic value of digital financial literacy and inclusion

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In today's dynamic digital financial landscape, mastering digital financial literacy and fostering inclusion are crucial for achieving resilience. These factors empower individuals to manage personal finances effectively and shield against economic shocks, enhancing financial security and adaptability on both personal and national levels. This study investigates the predictive value of digital financial literacy and inclusion in determining individual resilience, introducing a novel Digital Financial Resilience (DFR) Index for comparative analysis.

Objectives: Empower individuals to manage personal finances effectively; Enhance economic adaptability on personal and national levels; and Provide actionable insights for policymakers, educators, and fintech startups.

Methodology: Using data from the 2022 Global Findex report and other reputable sources, the DFR Index is developed through: EDA to uncover underlying patterns; SEM to identify relationships between variables; and PCA to consolidate data into a comprehensive index.

Impact: Measures financial resilience among countries and ranks; Drives low-ranked nations to take immediate action; Identifies areas of strength and opportunities for improvement; Supports informed decision-making for stakeholders; and Promotes a more inclusive and resilient global financial ecosystem.

Research Output: The DFR Index is a vital tool for driving strategies to enhance global financial resilience, fostering a more secure and adaptable financial future for all.



The journey of a teacher-researcher: an autoethnography in a community of practice

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Communities of practice (CoP) are recognised as a way to ease teachers' professional challenges and contribute to their development through collaboration, support and inquiry. While much has been produced in this area, are still scarce studies that detail the journey of teacher-researchers in fostering a teacher-only community with their peers. Through an autoethnography, I describe and reflect on my path of nurturing a CoP with physical education teachers belonging to my school network in Brazil.

The CoP is formed by 21 teachers, who met in 24 meetings since April 2023. Content analysis is used as data analysis, having as data sources meetings records with a critical friend, with CoP, field notes and artifacts.

Feelings of isolation and disconnection with peers brought concerns that guided me to conduct this study. After a year of working together, I have recognised various emotions as a teacher-researcher when facing challenges in nurturing this CoP with my peers through a democratic and dialogical approach. During this journey, I have faced institutional support and teacher motivation as a challenging situation, which brought feelings of uncertainty and responsibility that have been teaching me how to navigate the path of a teacher-researcher as a facilitator of a CoP.

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