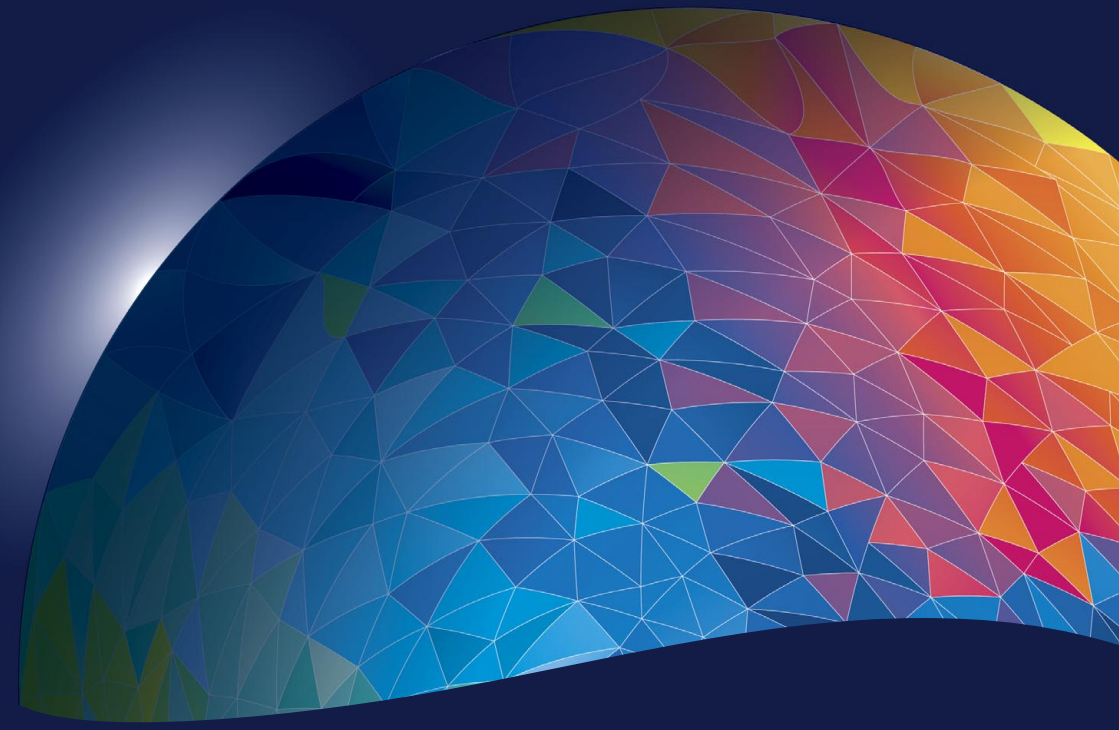
Federation University



HDR RESEARCH CONFERENCE

2023 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 candidatures 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

A special thanks to Elise Whetter (Celtink Creative) who produced the conference artwork and booklet.

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POSTER PRESENTATIONS

Professor Duncan Bentley

VICE-CHANCELLOR AND PRESIDENT

Welcome to this year's Annual Higher Degrees by Research (HDR) Conference. This is a special day in the Federation University calendar, which offers our HDR candidates a valuable opportunity to showcase the outstanding quality and diversity of their research.

As Australia's leading regional university, Federation is committed to transforming lives and enhancing communities while building a strong and sustainable university. Delivering impactful research is key to achieving this aim, and having students join us in this journey through HDR programs not only bolsters our research capability, it provides them with the skills and experience they need to be successful with their research and subsequent career.

Federation is ranked as the number one university in Victoria, and number four nationally, for HDR engagement with industry and community. Our HDR program provides positive outcomes with 42% of our HDR students being engaged in internships, joint supervision, co-funded or formal training on end-user engagement, compared to the national average of just 14%.

This conference provides a platform for our HDR candidates to present the impact of their research and for many, is one of the first opportunities to present their research to an audience of peers and scholars. This valuable learning experience can assist candidates to prepare for later external conferences and speaking opportunities.

This conference aims to inform and inspire our HDR candidates and celebrate all of your research contributions and achievements. I hope that you all have a great day and take full advantage of this exciting opportunity.

Professor Chris Hutchison

DEPUTY VICE-CHANCELLOR
(RESEARCH AND INNOVATION)

It is a pleasure to welcome you to the 2023 Higher Degree by Research Conference 'Connecting minds and communities'. I look forward to being with you on 20th June and will share with you some of our ambitions for research students and their critical role in regional Victoria.

It is now more than a year since the Covid pandemic officially ended and restrictions on travel in Victoria ended. Over the post-pandemic period the new Institutes have now been established and the Graduate Research School (GRS) has been strengthened to provide firm base for the development of research capability and guidance for research post-graduate students. The University has also announced itself as the first co-op University. In this the GRS is leading the way in Industry engagement through our HDR programs with >40% of our research students, engaged with industry through co-funding, co-supervision or through industry internships.

One of the key elements of the University is to 'transform lives and enhance communities'. What does that mean exactly for a HDR student at Federation? In Australia approximately a third of the population live in the regions i.e., not in one of the countries state or territory capital cities. In contrast to metropolitan regions where nearly half of all Australians benefit from a university education, this falls to 30% in regional Australia, and it is well recognised that this limits high quality employment prospects and economic development.

Federation University is Victoria's only regionally headquartered University and is therefore the only dedicated HE provider. 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, usually prosecuted 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 not only allows us to deliver high quality research that makes a difference, but it also allows students to gain experience with our partners which can lead to employment of

those students in regional Australia. Indeed >70% of students who study at our regional campuses remain employed in regional Victoria and are well paid.

It is worth reflecting that our students carry out research in a range of applied disciplines including, health, renewable energy, environmental management, IT disciplines, social sciences and in heritage and culture. All of these disciplines can contribute to healthy, vibrant, and viable communities and all of them do contribute to economic growth. At your conference, please reflect on how your research can contribute in this way. Think about how you can articulate the value of your research to your chosen community! Think also about how you can turn your research into new opportunities, including new start up industries. This will be a strong theme for the current state and commonwealth governments as they both strive to recover from Covid-19.

I would also like to emphasise the importance that the University places on sustainable development goals. The University has now been ranked in the THE world impact ranking system since 2021. This system ranks a university according to its commitment to United Nations Sustainable Development Goals (SDG). I am pleased to say that Federation has been very highly ranked for the again in 2023, placing it amongst the top 200 hundred Universities in the world for its commitment to gender equity (SDG 5), reduced inequalities (SDG 10) and sustainable cities and communities (SDG 11) and the top 300 in the world for SDG 17 partnership in the goals. The sustainable development of our country and our planet is something that every member of our university community can engage with and for which everyone is a stakeholder. I would encourage all of you have a voice in this important initiative.

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.

I hope you will enjoy and remember the day.

Professor Wendy Wright

DEAN, GRADUATE RESEARCH

On behalf of the Graduate Research School, I offer a very warm welcome to all HDR candidates and supervisors participating in our 2023 HDR Conference: 'Connecting minds and communities'. This year, we will connect in an online environment, enabling broader participation from our many campuses and locations.

Our annual HDR conference is an important event in the University calendar. It provides an opportunity to develop networks, share the experience of the HDR journey, practise and refine communication skills and receive constructive feedback in a supportive environment. It is also a showcase and a celebration of the research activity being undertaken by our HDR candidates across the University. As such it is a rare opportunity to engage with peers both inside and outside of your discipline areas. Please do take the opportunity to listen to, and engage with, the incredible research being undertaken by your peers and colleagues

As HDR candidates, you are each contributing to the University and to our communities in various important ways, helping to fulfil the University's key purpose: *to transform lives and enhance communities*. The knowledge that you are creating has the capacity to make a difference to people and communities locally, regionally and globally – while you undertake your own transformational journey as a HDR candidate.

Welcome, and enjoy *your* HDR conference!

Professor Andrew Barton

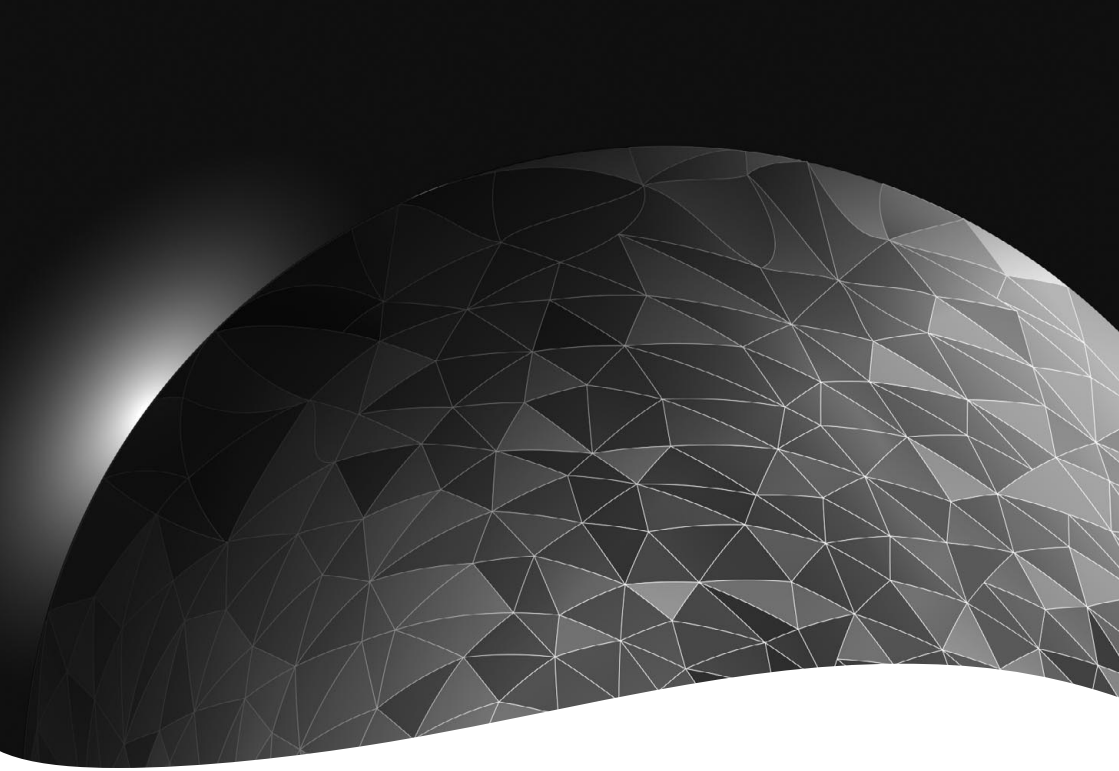
DEPUTY DEAN, GRADUATE RESEARCH

I welcome all HDR candidates and participants to the 2023 HDR research conference. This is a highly anticipated opportunity for the University's HDR community to come together and share our research successes. We are once again meeting online to provide opportunities for all candidates and research staff to connect from the various locations we work.

Sharing and presenting research with colleagues 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 HDRs, and we are eager to provide this opportunity for you. I encourage all HDR candidate to engage fully with the program and to support your peers. 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 'Connecting minds and communities', and so I am particularly looking forward to seeing the broad cross-section of research being undertaken through the industry and community connections many of you have. Federation is very fortunate to have many deep and productive research partnerships which I would like for us to celebrate as we come together for this conference.

Good luck to all presenters!



Federation University

ORAL PRESENTATIONS

Connecting minds and communities

Digital banking and financial inclusion in the Asia Pacific region

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Doctor of Philosophy

The potential of Fintech, digital banking, cryptocurrencies, and financial inclusion to transform the banking sector has gained significant attention in recent years. However, limited attempts have explored the association between these variables and identified the research gaps.

This study aims to provide a comprehensive overview of the current state of digital banking and the financial inclusion of banks in the Asia Pacific Region. The study comprises four studies including a systematic review. This examination focused on the trends, challenges, and opportunities associated with the adoption of digital banking services, financial technology, the adoption of cryptocurrencies and central bank digital currencies on the financial landscape of the region, and the potential for these currencies to improve financial inclusion. Key themes that emerged from the studies include the increasing adoption of digital banking, the growth of digital currencies, the emergence of fintech start ups, and the expanding role of banks in promoting financial inclusion. Also, it highlights the challenges and risks associated with these new technologies, including cybersecurity concerns, regulatory frameworks, and digital divide issues.

Overall, the study provides a comprehensive overview of the digital transformation of the banking sector in the Asia Pacific Region and identifies areas for future research and development.

System analysis of hydrothermal carbonization of biosolids in wastewater treatment plants

Pabasara Attanayake

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The amount of biosolids in Australia that are generated as a by-product of the wastewater treatment process is increasing yearly due to expanded wastewater treatment plants resulting a waste management problem significantly in Victoria. Among the waste management techniques, Hydrothermal Carbonization (HTC) can be considered the most appropriate one as it deals with wet feedstock as in biosolid composition along with the elimination of the pre-drying requirement. Though many lab-scale experiments have been conducted on HTC, only a few studies have been found on scaling up HTC projects to an industrial scale. This study aims to find the technical and economic feasibility of the HTC process for a wastewater treatment plant in Victoria through laboratory analysis and process simulation. Initially, site visits will be arranged to different wastewater treatment plants in Victoria to collect biosolid samples. Then each sample will be subjected to proximate, ultimate, and heating value analysis where those results will be used for the process simulation in Aspen. Later HTC experiments will be conducted, and yields will be calculated. A model has been developed for HTC of biosolids in Aspen Plus using the data in previous studies. Model reveals each fraction of yields along with the mass balance.

A numerical estimation model of cloud-to-ground lightning striking zones for pyroCb thundercloud

Surajit Das Barman

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This paper demonstrates a 2-D numerical model to represent the conceptual tilted dipole thundercloud structure which is hypothesized to explain the occurrence of lightning flashes in pyrocumulonimbus storms that create from severe wildfire events. In contrast to previous works, a more realistic thundercloud charge structure is considered in the presented model to investigate the electrical states and obtain the surface charge density to identify the probable lightning-striking zone on the earth's surface. Simulation results on tilted dipole thundercloud confirm that the wind-shear extension of its upper positive charge reduces the electric field and indicates the initiation of negative surface charge density underneath the anvil cloud. For a lateral extension of the upper positive charge layer by 2 - 8 km, the probable striking zone for -CG lightning is confined within 0 - 23.5 km in the simulation domain and would expect +CG lightning to strike in the zone 23.5 to 30 km around the earth periphery, particularly in the direction of the cloud's forward flank. The proposed model can be extended further into the 3-D domain to simulate the movement of lightning leaders which could facilitate a conceived risk planning management against wildfire-generated lightning events and secondary spot fires.

Surajit Das Barman is supported by the Destination Australia Scholarship Program Stipend and Fee-Offset Scholarship through Federation University Australia.

Statistical assessment of Australian bushfire conditions: Long-term changes and variability

Soubhik Biswas

Dr Savin S. Chand, Professor Wendy Wright, Dr Cameron Foale, Dr Xiaohui Zhao and Dr Andrew J. Dowdy

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Doctor of Philosophy

In the wake of increasing bushfire impacts in recent decades across the Australian landscape, questions arise regarding the role played by weather conditions, climate variability and long-term climate change. This work seeks to quantify the effects of weather and mean climate conditions, large-scale drivers of natural climate variability, the influence of extreme weather events and the contribution of long-term anthropogenic climate change. Bushfire conditions in Australia are generally assessed using indices such as the Forest Fire Danger Index (FFDI). The FFDI used in this study, is calculated from daily values of bias-corrected 20th Century reanalysis rainfall, relative humidity, temperature and wind speed data. A general positive trend in the number of extreme FFDI days was reported across most parts of Australia. Temperature and relative humidity were found to be the most critical climatic variables influencing fire weather trends across the country, noting that relative humidity is partly based on temperature. The applications of this work range from being beneficial to various stakeholders in framing new climate change adaptation policies to being used for seasonal outlooks and planning by fire management teams.

Soubhik Biswas is supported by a Henry Sutton PhD scholarship through Federation University Australia.

Landscape to earthscape: practice and aesthetics in a time of environmental crisis

Stella Clarke

Supervisors: Associate Professor Carole Wilson and Dr Jill Orr

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Master of Arts (Visual & Performing Arts) by Research

This thesis explores an artistic dilemma; in a global environmental crisis, what happens to landscape art? It combines conventional research with a practice-based journey, reflecting the 'intra-connected' or 'entangled' approach suggested by Robin Nelson, aiming for a symbiosis between conceptual context and Haseman's 'enthusiasm of practice'. The exegetic component extends across philosophical, scientific, and theoretical domains, and an established field of visual arts. Its scope is limited by a methodology related to my goldfields situation. The local landscape is populated with native flora and fauna successive to major ecological disturbance; mining caused extensive environmental damage, linking it to 'a global chain of ongoing colonial anthropogenic devastation'. I explore not only what, but how, I see. My artworks reference land art, contemporary art, eco-materialist philosophy and challenges to conventional 'human' perspective. My 'enthusiasm of practice' derives from acknowledging our shared 'living and dying' in this climate-changed world.

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

Emergency nurse practice and attitudes towards public health messaging during disaster

Nicole Coombs

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Doctor of Philosophy

Disasters are occurring frequently across the Australian landscape, often increasing demands on Emergency Departments (EDs) and local healthcare systems. No previous research has explored patient education in the ED during these events, therefore, this study aims to gain unique insight into Australian emergency nurse practice and attitudes towards providing public health messages to patients during disaster, whilst also identifying influencing factors.

An explanatory sequential mixed methods study was conducted, obtaining self-reported perceptions, experiences and suggestions from Australian emergency nurses and nurse leaders, to confirm and further explore findings. Inferential and descriptive statistics, content, and factor analysis, and reflexive thematic analysis was used to analyse data. Integrated results were reported using an underlying theoretical framework, in relation to the nurses' capability, opportunity, and motivation to provide messaging in the ED during disaster.

Findings indicate that current practice is predominantly via verbal interactions, is inconsistent, and ad hoc. Participant consensus suggests nurses lack confidence and knowledge regarding patient education practice during disasters; have insufficient access to training and education resources; nor are they motivated or guided by policy or practice standardisation. Therefore, recommendations call for further nurse training and departmental support strategies, to improve public health messaging practice in ED during disasters.

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

Clemente empowers students who experience coercive control

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Doctor of Philosophy

Anecdotally many students attending the Clemente Course in the Humanities have a history of family violence, including coercive control. Coercive controllers instil negative narratives in their victims to control their everyday activities, including education and employment. This research explores whether Clemente empowers students who experienced coercive control to regain control and rebuild their lives. Clemente is a community-based course targeting marginalised and disadvantaged community members. The research comprises participants from ACT, NSW, and Victoria, including metropolitan and regional areas. This research is informed by a social constructionist epistemology underpinning critical feminist and transformative learning theories, viewed through the lens of coercive control and the Clemente philosophy. Qualitative and quantitative data collection methods included three questionnaires and semi-structured interviews. Using interviews encouraged participants to tell their stories of coercive control within a Clemente transformative learning context. Preliminary findings indicate Clemente plays a role in increasing self-confidence, self-awareness, and self-esteem, enabling participants to regain control and rebuild their lives after experiencing coercive control. This research contributes to the emerging fields of transformative learning and coercive control, encouraging new discourse and a greater understanding of the role Clemente plays in the lives of participants who experience coercive control.

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

Patients' falls risk awareness in regional Victorian hospitals: A mixed methods study

Elissa Dabkowski

Supervisors: Professor Simon Cooper, Dr Jhodie Duncan and Associate Professor Karen Missen

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Doctor of Philosophy

Falls in hospital settings continue to be a global concern. They are one of the greatest sources of patient harm and can result in poor health outcomes for patients, including increased resource demand. Falls can occur in all environments, however there is an expectation that a safe and high-quality health system will keep patients safe from avoidable harm. Many falls by patients are unwitnessed and occur in the hospital bedroom with limited help-seeking behaviour. Understanding patients' perceptions of their falls risk will help to direct fall prevention strategies and understand patient behaviours.

This presentation describes the quantitative findings of a mixed-methods study, which investigated patients' perceptions and influences on their falls risk awareness. A total of 77 patients and 58 clinicians were recruited from three regional Victorian hospitals. Patient demographic data was collected, along with patient and clinician responses to a validated 15-item tool (Self-Awareness of Falls Risk Measure). Statistical analyses indicated a significant difference in patients' falls risk awareness when compared to their clinician. Regression analyses were conducted with the results providing new knowledge, particularly with the association between falls risk awareness and specific medication. The findings have implications for the delivery of falls education and management in hospitals.

Elissa Dabkowski is supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia. She is the recipient of a co-funded industry scholarship between Latrobe Regional Hospital and Federation University Australia.

Information entropy causal graph for identifying anomalies in multivariate time-series data

Falih Gozi Febrinanto

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Anomaly detection in multivariate time series is a critical task that enables the identification of cyber-attacks, disease detection, or fraudulent event in financial data. Its performance is improved by fully mining the interdependencies across variables in multivariate time-series data. For instance, examining interdependencies across collections of sensors that capture time-series data in an industrial process yields more advantages in identifying unusual patterns. Challenges appear that the relationship structure between sensors is practically unknown, and there is a need to find an optimal structure. The current techniques solve those problems by automatically performing correlation analysis and sampling strategies to generate relationships across variables to form a graph. However, there are some problems with those existing methods, such as a lack of flexibility by limiting the number of relations and low interpretability that do not substantially apply domain knowledge. In this work, we propose a framework to improve the flexibility and interpretability of generated graph structures by incorporating a causal discovery technique based on transfer entropy. Moreover, Graph Neural Networks (GNNs) models are implemented to learn generated graph structure representation. Our experiment shows that the framework improves accuracy in detecting anomalies in IoT systems and detecting brain diseases.

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

Evaluate the effectiveness of chronic disease management plan on self-management of diabetes

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Doctor of Philosophy

Chronic Disease Management (CDM) plans must appropriately target patients' needs. Still, patients with chronic conditions are often poorly served by current healthcare delivery and arrangement that fail to coordinate care across different service providers. Therefore, the collective single case study aims to investigate the existing data (demographic, clinical data, and all documents related to the CDM plans) that may help health professionals better understand the effectiveness of the CDM plans on patient self-management. Phase 1: Fifteen patients with a confirmed diagnosis of diabetes type 1 and 2 with consideration of inclusion criteria were recruited at general practice settings. Clinical data and all documents relevant to CDM plan delivery were collected before the CDM plans and six months after the CDM plans, and semi-structured interviews of the patients were conducted. Phase 2: Semi-structured interviews were conducted with ten healthcare professionals involved with those care plans. This case study could indirectly showcase how patients' and healthcare professionals' unique experience helps enrich the future development of the CDM plan. The need for coordination in the multidisciplinary team via CDM plans for people with diabetes to achieve integrated care and an opportunity for better engagement in self-management was emphasized in this study.

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

Deep learning model to empower student engagement in online synchronous learning environment

Cinthia Joy Godly

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Online synchronous learning has increased rapidly after the onset of the pandemic. The shift in course delivery from face-to-face to online synchronous has made the higher education sector look for more innovative ways to deliver content online. Students are getting accustomed to studying online. Studies have found that online synchronous learning impacts student engagement in various ways. The National Survey of Student Engagement data shows that students engage in quantitative reasoning during face-to-face learning are less likely to engage in collaborative learning, student-faculty interactions, and discussions during online learning. In addition, research also shows that students feel more isolated from teachers due to dependency on the devices to attend online classes. Eventually, this has been attributed to the decline in the quality of interactions with peers and teachers.

This research aims to enhance online engagement by using a novel deep learning model to predict learner engagement behaviour in a synchronous teaching environment. The model with smart trigger will induce the disengaged students to engage with the teachers during online interactions. Smart triggers will be based on identified parameters with focus on the disengaged students to give automatic personalised feedback to students by facilitating the teachers in real-time.

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

Tropical cyclone activity in the Solomon Islands region: Climatology, variability and trends

Alick Haruhiru

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Doctor of Philosophy

This study examines the climatology, variability, and trends of tropical cyclones (TCs) affecting the Solomon Islands (SI) territory, in the wider southwest Pacific (SWP), using the South Pacific Enhanced Archive for Tropical Cyclones (SPEArTC) database. During the period 1969/70-2018/19, 168 TCs were recorded in the SI territory. A cluster analysis is used to objectively partition these tracks into three clusters of similar TC trajectories to obtain better insights into the effects of natural climate variability; particularly due to the El Niño–Southern Oscillation (ENSO) phenomenon, which otherwise is not very apparent for TCs when considered collectively in the SI region. We find that TCs in clusters 1 and 3 show enhanced activity during El Niño phase, whereas TCs in cluster 2 are enhanced during La Niña and neutral phases. In addition to being modulated by ENSO, TCs in clusters 2 and 3 show statistically significant modulation at an intraseasonal time scale due to the Madden-Julian Oscillation (MJO) phenomenon. There are also some indications through sophisticated Bayesian modelling that TCs in clusters 2 and 3 are slightly influenced by the Interdecadal Pacific Oscillation (IPO). These results can have substantial implications for cluster-specific development of TC prediction schemes for the SI region.

I am grateful to the Australian Government, for funding my PhD, through the Australian Award Scholarship, at Federation University Australia.

Reversal of type-2 diabetes: Role of the general practice nurse

Sharon Hills

Professor Colette Browning, Associate Professor Daniel Terry and Dr Swapnali Gazula

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Doctor of Philosophy

General practice nurses (GPNs) can play an important role in assisting people with type-2 diabetes to change their diet and exercise behaviours and manage their weight. GPNs are trusted healthcare professionals, and their consultations are valued. Two recently completed literature reviews examined the barriers and facilitators of both GPNs' communication and the views of people with type-2 diabetes about lifestyle discussions. These revealed that GPNs are not meeting the needs of people with type-2 diabetes when, in the consultation, there is little tailored discussion of the lifestyle modifications necessary to facilitate the weight loss required for the management of their diabetes or the prevention of diabetes-related complications.

Skills in behavioural change communication are required to engage in these conversations and improve the confidence of GPNs to raise sensitive topics, such as weight reduction. A deeper understanding of dietary requirements for people with type-2 diabetes is also necessary to assist in achieving sustained weight loss. A behavioural change communication intervention is under development, in collaboration with GPNs, to enhance opportunistic, effective behavioural change conversations to improve their skills and confidence, particularly in raising the issues of weight reduction. Developing GPNs' skills in behavioural change communication may positively facilitate type-2 diabetes management and possible remission.

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

Airborne LiDAR data-based Malleefowl mound detection with an augmented dataset

Nazia Hossain

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Doctor of Philosophy

Being one of the most vulnerable birds in Australia, there are several conservation plans for Malleefowl, and preserving their eggs is one of them. Among, different methods, detecting Malleefowl egg incubators (a.k.a. mounds) via airborne LiDAR (**L**ight **D**etection **A**nd **R**anging) data is getting popular nowadays. However, LiDAR data-based 3D map faces challenges in accuracy and resolution for varying capabilities of the laser system. Also our project-specific main challenge is a limited number of ground truth mound data, taken from Tarawi Nature Reserve.

The project objective is considered as a binary classification problem, where a certain small area or patch of the entire conservation area is to be classified either no-mound or mound class. However, practically, when a patch will be taken randomly, there is a possibility to appear some portion of a mound in the patch. Therefore, in our dataset generation, considering the mound shape as a circle, we proposed a sector angle-based augmented method, such that different proportions of mounds are present in the datasets. The machine learning classifier is being learnt and we have analysed the no-mound and mound patches with different sets of partial mounds and observed how the mound detection accuracy performs for the classifiers.

A psychological treatment of insomnia, nightmares and PTSD in bushfire survivors

Fadia Isaac

Supervisors: Professor Gerard A Kennedy, Dr Samia R Toukhsati, Professor Britt Klein and Dr Mirella Di Benedetto

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Doctor of Philosophy

Bushfires are now considered global crisis as they affect most parts of the world including; Australia, Asia, Europe, and North and South America. Bushfires cost Australia losses on many fronts. The 2019 bushfires resulted in the burning of over 18 million hectares of land, destroying 2,800 homes and the death of 33 people.

In the aftermath of bushfires many survivors have difficulty sleeping, may develop nightmares and post-traumatic stress disorder (PTSD) which may persist for years.

In an international survey, it was found that 49.2 % of bushfire survivors reported insomnia, 28.7% reported nightmares and 77.88% reported symptoms of PTSD (Isaac et al., 2022). If left untreated, sleep difficulties can lead to psychopathology such as anxiety, depression, and suicidal ideation.

Digital therapies are becoming more popular and are in high demand given the shortage of well-trained and specialised psychologists particularly in remote locations.

Sleep Best-i is a digital sleep intervention that incorporates video animated treatment, and role plays of therapeutic sessions over a four-week period. Sleep Best-i has been specifically designed for bushfire survivors and it aims to reduce insomnia, nightmares, and trauma symptoms. It can be easily delivered wherever and whenever bushfires or other natural disasters occur.

Fadia Isaac is supported by an Australian Government Research Training Program (RTP) Fee-Offset Scholarship administered through Federation University Australia. Fadia Isaac is also a recipient of a full Postgraduate Research Scholarship from Natural Hazards Research Australia.

Informing the protection of biodiversity in expanding rural towns of Victoria

Lauren Jakob

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Doctor of Philosophy

In Australia, local governments play a vital role in conservation of local biodiversity of rural towns, through use of land management statutory frameworks. However, they often manage land use conflicts, and may be unequipped with relevant ecological data to put effective conservation methods in place; particularly as the towns expand. Additionally, there has been limited research into the impacts of urban expansion on local biodiversity of rural towns.

This project will develop a methodology to identify the aspects of the environment which are crucial for local biodiversity in a rural Victorian town, and determine how these aspects can best be protected through partnerships with local government, and by collaborating with key stakeholders. The rural town of Ararat will be used as a case study; and the functional diversity and species diversity of mammals (including bats), birds, and frogs will be used as measures of biodiversity. Attributes of the landscape which are determined to be vital will be consolidated with local stakeholders (such as Landcare volunteers and farmers) using structured decision making, then protected during urban expansion by use of Ararat's development policy and the planning scheme.

Lauren Jakob is supported by an Australian Government Research Training Program (RTP) Stipend, as well as funding provided by Ararat Rural City Council, and an RTP Fee-Offset Scholarship through Federation University Australia.

A novella and a critical exegesis: Can storytelling inspire social change?

Rosemary Joiner

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Doctor of Philosophy

In writing a young adult novella accompanied by a critical exegesis exploring the social impact of volunteering, I respond to the question 'Can storytelling seek to inspire social change?'

As part of my creative practice research, I have written a young adult novella as a means of exploring the longitudinal impact of volunteering. Kristal and Marg employs narrative storytelling to depict the direct and indirect impact of volunteer work. The novella tells the story of a younger person, Kristal, and an older person, Marg, coming together at a time when many people are isolated and in need of social connection. This method draws on the universal human activity of storytelling to make sense of the world and gain a shared insight and understanding.

In what ways can a practice-based creative research approach be used to complement and progress traditional research methods to gain greater research insights when answering complex research questions?

This study has been an opportunity to explore and explain the impact of volunteerism with the intention to inspire social change.

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

Employees' ambidextrous system use behaviours and their performance impacts: A mixed-method project

Jane Joseph

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The COVID-19 pandemic disruptions transformed the way businesses operate. Due to enforced lockdowns and mandatory social distancing requirements, many companies have shifted to remote or online work environments. This shift proliferated the adoption and use of information systems (IS) within organisations to address the new service demands. Employees were forced to use systems scrupulously as usual work practices became futile. Prevailing research suggests that organisations' mere adoption of IS does not yield desirable benefits unless the employees use them effectively. Studies indicate that employees' ambidextrous capabilities facilitate the effective use of IS. However, the body of knowledge regarding employees' ambidextrous system use behaviours and their performance impacts is still in its infancy. Therefore, we examine employees' ambidextrous system use behaviours and their consequences in the pandemic-disrupted work environment of higher education institutions. This research will provide valuable insights for organisational decision-makers to comprehend the ambidextrous system use behaviours of employees and its performance outcomes. It will aid in developing effective strategies to optimise the benefits of the adopted systems and the ambidexterity of employees. Additionally, this knowledge will assist employees in enhancing their productivity by leveraging their ambidextrous capabilities.

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

Detecting depression from syntactic complexity of written text

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Language analysis is becoming an increasingly explored method of detecting depression in written text. However, previous research has largely focused on analysing the thematic content of language rather than the underlying structure and grammatical composition. Here, we addressed this limitation by assessing the use of features of syntactic complexity in written text for detecting depression.

Using data from the Black Dog Institute's *MyMood&Me* study, features of syntactic complexity were analysed in samples of written text produced by 196 English-speaking participants (M_{age} = 39.9 years, SD = 12.4) in response to four writing tasks: Personal Biography, Neutral Writing Task, Narrative Imagery Task, and Letter to a Friend. Linguistic features were automatically extracted from writing samples using the Tool for the Automatic Analysis of Syntactic Sophistication and Complexity (TAASSC), and depression severity was measured via the Patient Health Questionnaire-9 (PHQ-9). Bivariate correlations were used to test whether features of syntactic complexity were associated with depression symptomatology. The findings suggested that syntactic complexity features related to noun phrase complexity (e.g., elaboration of sentence element describing a noun), clause complexity (e.g., elaboration of smaller constituents within a sentence), and syntactic sophistication (e.g., diversity of verb-argument constructions) hold value for detecting depression in written text.

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

Changes in organisational resilience from cybersecurity challenges during remote working in COVID-19

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The COVID-19 pandemic has transformed traditional work practices. The COVID-19 pandemic has urged organisations to shift employees to undertake remote work (RW). This RW has resulted in a tremendous increase in cybersecurity challenges. Organisations are encouraged to reassess their cyber-resilience systems to minimise the impact of cybersecurity challenges while practising RW. The purpose of this research project is to develop a deeper understanding of cyber security challenges and the resilience strategies organisations learn to address cybersecurity issues and to perform RW efficiently and effectively. An interpretive approach using a qualitative methodology was adopted, and semi-structured interviews from various stakeholders such as security experts, managers, expert users, and normal users were conducted from the higher education and research sector. These interviews were analysed using two phases – open and theoretical coding. Theoretical coding was carried out using socio-technical system (STS) dimensions and organisational learning (OL) dimensions. This study will provide a comprehensive framework based on analysing changes in organisational cyber-resilience strategies during RW for the higher education and research sector in Australia.

The effectiveness of the Stepped Care Model in delivery of mental health services in Australian primary health care

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Mental illness is a significant challenge globally, including in Australia. Approximately one in five Australians will experience mental illness each year, and nearly half of the population will experience it in their lifetime. Amongst other health issues, mental illness ranks as the second largest cause of ill-health and the fourth largest cause of reduced healthy years in Australia, following cancer, cardiovascular diseases, and musculoskeletal diseases.

This study aims to investigate the effectiveness of the Stepped Care Model (SCM) in delivering mental health services in Australian primary healthcare. The SCM is a staged model that provides patient-centered care through a range of services, starting from less intensive to more intensive based on individual needs. The core principle of the SCM is to deliver tailored and responsive care that meets the varying needs of patients.

While preliminary evidence suggests the acceptability and helpfulness of the SCM in Australia, there is a need for a comprehensive and up-to-date understanding of its elements in the Australian context.

This presentation will: Provide an overview of contemporary literature on the SCM; Outline the proposed plan for the study and progress to date; and, Elucidate the anticipated outcomes from the study.

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

Shingai Mareya acknowledges that the award of a 'Babe' Norman Scholarship funded by the Rosemary Norman Foundation and administered by the Australian Nurses Memorial Centre is facilitating the postgraduate studies.

Discriminating unknown malware families with partitional clustering

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Master of Computing

Malware is a global problem developed by skilled software engineers and is sold in a specialised black market economy. Internet security organisations perform analysis of malware feeds which require malware family identification to enable deeper analysis. Pattern matching malware identification approaches such as Yara rules may fail silently when malware updates occur. Malware clustering provides an alternative method for malware identification that is not disrupted by minor code updates.

The batch mode malware clustering algorithms include DBSCAN, K-means, and Hierarchical clustering algorithms. While these clustering algorithms provide good clustering accuracy, when new malware samples are received the whole dataset including new features must be reclustered, and this can be time consuming process. We present Discriminating unknown Malware Families with Partitional Clustering (DMFPC), an incremental clustering approach, designed for malware analysis.

The aim of this research is to develop new incremental clustering algorithms to detect existing malware families and to identify their new variants. This will be done by considering the sparsity of data sets. The new algorithms will be evaluated using various performance measures including F1 score, the Adjusted Rand Index (ARI), and purity. We will also use internal cluster validity indices to demonstrate the performance of the proposed algorithms and to compare with other algorithms.

This research is supported by a Federation University Fee-offset Scholarship.

Conservation of endangered arid-zone plant community *Tecticornia lylei* low open-shrubland

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With the loss of species occurring at an alarming rate globally, actively managing land to conserve biodiversity is vital to prevent further extinctions. At Nanya Research Station, Federation University collaborates with the NSW Environmental Trust to implement Saving our Species programs for this purpose. *Tecticornia lylei* low open-shrubland, a plant community that grows around the fringes of salt-lakes in semi-arid regions is endangered in NSW. It faces a range of threats, including a lack of knowledge fundamental for effective management. This study aimed to establish data on the spatial distribution, condition and attributes of this community.

Desktop and field surveys were conducted for all known sites supporting this community in NSW (n = 14). Results show soils were acidic (mean pH 5.2) and of varying salinity, with a high proportion of sand (mean 72%). Distances between sites were <1 to 25 km and density of *T. lylei* plants highly variable. While juvenile plants were absent at many sites, the fresh new growth, flowers and fruits were evidence of recovery following recent rainfall and reduced grazing pressure. This data provides a baseline against which to assess future trends, with knowledge generated shared with stakeholders to improve management across the region.

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

Educational intervention to prepare nursing students against workplace incivility: A cross-sectional study

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Incivility refers to deviant workplace behavior that is rude and disrespectful. Educating pre-registration nursing students on workplace incivility is indispensable for improving patient outcomes and fostering more civil, collegial nurses in healthcare. The purpose of this study was to determine whether an educational intervention based on cognitive rehearsal could increase student nurses' awareness and knowledge of workplace incivility, and their self-efficacy in dealing with uncivil behavior. Cognitive rehearsal educational intervention included a pre-test, didactic instruction regarding workplace incivility (PowerPoint), followed by a post-test. The uncivil behaviours were explained further with a 10-minute role played video portraying all uncivil behaviours. Additionally, the intervention concluded with scripted responses to each instance of workplace incivility. Using the Perceived Self-Efficacy scale (PSE), the self-efficacy beliefs of individuals regarding how they might handle workplace incivility were measured. A statistically significant increase in self-efficacy was observed following the educational intervention, which met the study's first objective. Qualitative findings further supported the increase in self-efficacy. We can empower new nurses to deal with uncivil encounters and ensure their successful integration and retention in nursing by teaching them uncivil encounter response strategies.

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

Influence of aquatic plant harvest on phytoplankton communities in Lake Wendouree

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Phytoplankton communities positively influence lake ecology as primary producers, and negatively as problematic blooms. Until now, little is known of the connection between phytoplankton community structure and dynamics and ongoing aquatic plant harvesting regimes in Lake Wendouree. The objective of this study was to compare phytoplankton community structure before and after harvest at different harvesting intensity (low, medium, high) during autumn and spring seasons. Principal Co-ordinate analysis and ANOSIM were used to identify significant differences in phytoplankton community structure between sites and seasons. A two-way crossed SIMPER analysis was performed to investigate which taxa were responsible for the multivariate community patterns. All analyses were performed based on Bray-Curtis similarity using PRIMER v.6.1.13. Although Lake Wendouree is a plant dominated clear water lake, it exhibits considerable abundance of phytoplankton communities, including Bacillariophyta, Charophyta, Chlorophyta, Chrysophyta, Cyanophyta, Dinophyta and Euglenophyta. Phytoplankton community structure differs significantly ($p=0.003$, $R=0.938$) between autumn and spring. However, only the autumn season showed significant variation ($p=0.008$, $R=0.614$) between levels of harvesting intensity. The problematic Cyanophyta was present in both seasons, however more prominent during spring. Thus, this study recommends continuous monitoring of phytoplankton dynamics across harvest regimes and seasons to develop a strategic management protocol for this lake.

Anton Patrick is supported by a Ballarat City Council & Federation University's Future Regions Research Centre Stipend and Fee-offset Scholarship through Federation University Australia.

A gardener's manual for relational autosomatography

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My PhD explores the question of how I can compassionately and respectfully represent my mother's lived experiences of lupus, an incurable and disabling autoimmune disease. As a creative writer, my response to this challenge has been to use autosomatography as a framework to write a relational memoir that entwines our shared stories. Autosomatography is a life writing genre concerned with representing illness and disability experiences from a first-person perspective. However, as I am writing about my mother's and my own experiences of her illness, I have coined the term 'relational autosomatography' to explain and explore this relational dynamic. This paper will discuss how I have adapted and extended the genre of autosomatography in my project, specifically through my choice to use second- and third-person narration and what this enables in terms of my ability to ethically navigate a shared illness and disability experiential space in ways not widely practiced or represented in life writing.

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

FIRST RESERVE

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

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Doctor of Philosophy

Measuring performance in sport can provide valuable information for training plans. Currently, there are no valid tools to measure performance of game-skill activities in women's Australian football (AF). Establishing validity will determine whether the assessment tool is relevant and appropriate for use in women's AF.

A game skill scoring assessment was developed by collating and modifying relevant game skill drills from previous research and using game skill drills currently used in women's AF training. The assessment includes tackling, handballs, ground balls and contested marks and assesses the player's technical ability and measured outcomes for each skill. To establish content validity, five experts representing AF will participate in two consultations between the experts and researchers. The first round of consultations will obtain expert opinions on the technical and measured outcomes of the specified game skills. The second round will focus on confirming the accuracy after modifying the assessment from the feedback from round one. Content validity will be assessed using the item content validity index (I-CVI). The findings from this study will inform the basis for a further study in the PhD where the performance effect of an injury prevention program in women's AF will be determined.

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

Laboratory diagnostic performance of sputum smear microscopy in the Solomon Islands

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Tuberculosis (TB), is a major global infectious disease, causing over 1.6 million deaths annually. Solomon Islands (SI) is a small country (population ~700,000) in the Pacific region. With ~460 new cases and ~50 deaths annually, TB is a considerable challenge to the health system in this small, decentralised island nation. Smear microscopy, commonly used for TB diagnosis, has been used since the 1870s. However, it is time-consuming, requires high levels of expertise, and lacks sensitivity. This study compares the diagnostic capacity of microscopy in SI with a sensitive laboratory method, real-time PCR.

Extracted DNA from 449 archived sputum smear slides were subjected to a real-time PCR assay targeting the *IS6110* and *mpt64* genes to detect *M. tuberculosis*. Laboratory records of microscopy results were compared with real-time PCR results. Microscopy and real-time PCR had 79% concordant results with no significant difference (*p-value* = 0.84) observed. However, the sensitivity and positive predictive value of smear microscopy are low. With approximately 50% sensitivity, true smear-positive cases may be missed by smear microscopy. This low detection rate likely has implications for patient health and TB transmission dynamics. Necessary actions must be taken to improve TB diagnosis in provincial settings in SI.

Initiatives to increase the sustainable and economic utilisation of almond nut waste

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Almond is considered one of the healthiest, most nutritious, and most economically valuable nut species grown in many counties; the USA is ranked one and Australia is sconed in volume.

However, 100 Kg Yield = 30Kg Edible nuts + 70Kg waste+3%. This excessive waste results in serious socio-economic concerns; spontaneous combustion, disease and pest outbreaks and more.

Almond hulls are rich in crude protein and dietary fibre and significant opportunity for them to be used as livestock feed. This option has been identified as an excellent value-added solution to waste. However, the key limitation to using as animal feed (for dairy and beef cows) is chemical pesticide residues; ingested by cattle, which could enter the food chain and emerge in dairy and beef products.

The most effective sustainable solution to this problem is to find alternatives to the highly toxic chemical pesticides used in Almond production.

This Systematic Approach Model involves a three-step process that uses less harmful products; 1. Caffeine should be used due to its pest-repellent and insecticidal properties. For the second step, a 2. Silicon formulation is recommended, which will strengthen the bark and cuticle layers of the Almond trees, which are natural physical barriers to pathogens. Finally, applications of 3. Vitamins B, C and E will increase the tree's internal immunity, thus improving its natural chemical resistance to pathogens.

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

Development of a long-term climatology of tropical cyclones and depressions for the South Pacific Ocean basin

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Tropical cyclones (TCs) are one of the most destructive synoptic systems that can cause enormous loss of life and property damages in the South Pacific Island nations. The impact of tropical depressions (TDs, i.e., weaker systems that do not develop into TCs) can also be staggering in the region in terms of heavy flooding and landslides, but a lack of complete records often hinders research involving TD impacts. A methodology has been developed here to detect TDs in the ERA-5 and 20CR dataset using the Okubo–Weiss–Zeta parameter (OWZP) detection scheme. The new South Pacific Enhanced Archive for Tropical Cyclones dataset (SPEArTC), the Dvorak analysis of satellite-based cloud patterns over the South Pacific Ocean basin, rainfall dataset for various stations in the South Pacific and historical archives have been utilised to validate ERA5/20CR-derived TCs and TDs. Results indicate that the OWZP method shows substantial skill in capturing the realistic climatological distribution of TCs and TDs in both reanalyses dataset. The 20CR-derived long-term records of TCs and TDs can serve as an effective tool for examining historical changes in various characteristics of TCs and TDs, particularly in the context of anthropogenic climate change. Utilizing the reconstructed proxies, their climatic connections with the El Niño Southern Oscillation (ENSO), the Interdecadal Pacific Oscillation (IPO), and the combined ENSO-IPO phases have been examined.

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

Evaluating the Corporate Social Responsibility (CSR) performance of ASX listed companies and their supply chain

Tracy (Jingyan) Zhou

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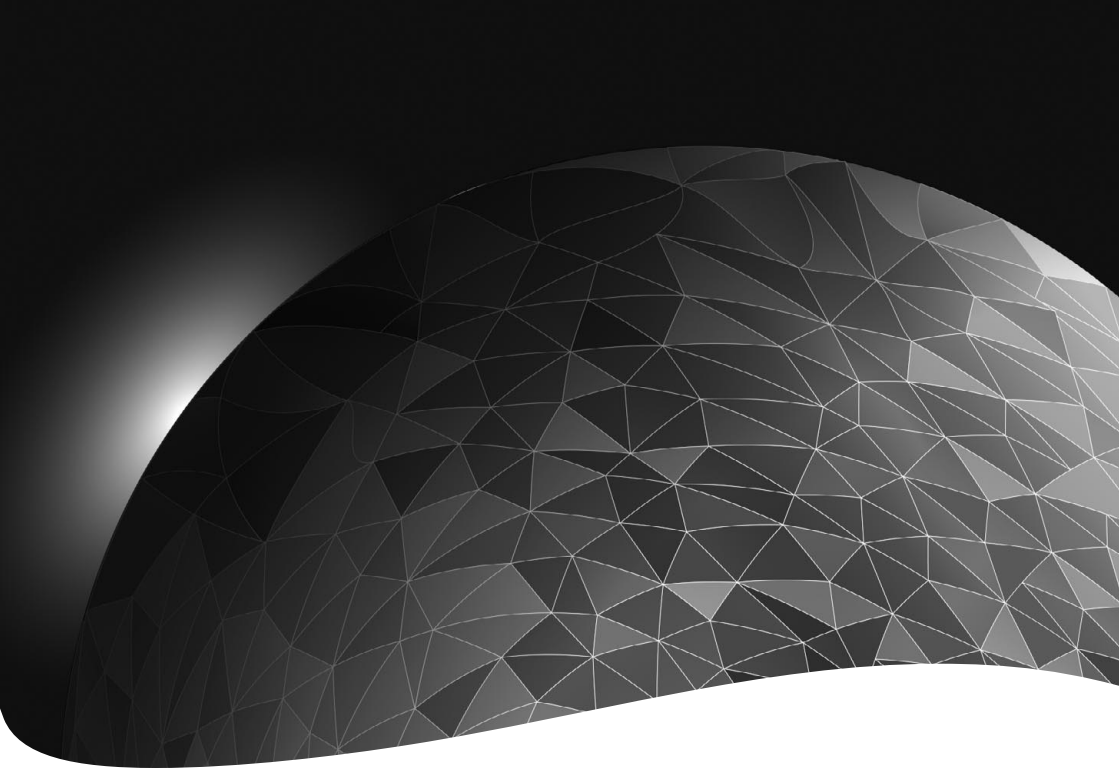
Doctor of Philosophy

This paper investigates the impact of Corporate Social Responsibility (CSR) performance on ASX listed firms and their supply chain contracting. The paper seeks to understand the important role of CSR performance between firms and customer-supplier relationships. This study also applies agency theory and stakeholder theory to examine the consequences of CSR performance at the supply chain level, and whether the green supply chain initiatives are achieved through the collaboration of all supply chain members. Such investigations capture an overall view of whether the voluntary approach to CSR reporting in Australia has led to greater CSR performance amongst the business community.

The paper will present preliminary findings based on selected secondary data collected from the Australian Stock Exchange (ASX) from 2012 to 2021. The CSR information for the firms and their supply chain partners have been collected from the Refinitive database.

This study is part of a larger one that will contribute to the literature and assist managers to adopt appropriate CSR strategies to enhance their CSR performance and evaluate potential suppliers' CSR performance when making business partnership selections.

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



Federation University

POSTER PRESENTATIONS

Connecting minds and communities

Digital banking and financial inclusion in the Asia Pacific region – systematic review

Hemali Abeysooriya

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Doctor of Philosophy

The potential of Fintech, digital banking, cryptocurrencies, and financial inclusion to transform the banking sector has gained significant attention in recent years. However, limited attempts have explored the association between these variables and identified the research gaps.

This systematic review aims to provide a comprehensive overview of the current state of digital banking and the financial inclusion of banks in the Asia Pacific Region. The study comprises of review of 74 articles published in peer-reviewed journals and other publications from 1995 to 2022. This examination focused on the trends, challenges, and opportunities associated with the adoption of digital banking services, the adoption of cryptocurrencies and central bank digital currencies on the financial landscape of the region, and the potential for these currencies to improve financial inclusion. Key themes that emerged from the review include the increasing adoption of digital banking, the growth of digital currencies, the emergence of fintech start-ups, and the expanding role of banks in promoting financial inclusion. This review highlights the challenges and risks associated with mentioned new technologies.

Overall, the study provides a comprehensive overview of the digital transformation of the banking sector in the Asia Pacific Region and identifies areas for future research and development.

Understanding osteoporosis knowledge, beliefs and behaviours of older adults

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Doctor of Philosophy

Health beliefs, behaviour, and knowledge influence health literacy which, efficiently supported, can effectively prevent osteoporosis in older adults Therefore, a systematic literature review was conducted to examine the literature published between 1991 to 2022 to explore osteoporosis knowledge, attitudes, and health beliefs in older adults from interventional and descriptive studies. The review also examined the influence of education programs on older adults' cognitive-behavioural attitudes towards osteoporosis.

Fifteen studies that met the inclusion criteria were critically appraised using the Joanna Briggs Institute (JBI) appraisal tool for study quality assessment. The review used five validated scales which include, the osteoporosis belief scale (OHBS) guided by the modified Health Belief Model (HBM) along with osteoporosis knowledge (OKT) and attitude knowledge scale (OAKT), osteoporosis prevention behaviour (OPBS), and osteoporosis self-efficacy scale (OSES) to identify the knowledge, beliefs, and behaviours of the targeted population. Results revealed greater perceived susceptibility, seriousness, and barriers to exercise for health belief subscales and lower self-efficacy levels, health motivation, and knowledge in the participants. Findings showed that any educational strategy guided by the cognitive-behavioural perspective, offers a promising approach for osteoporosis prevention and management practices and research, aiming older adults to become self-managers of their bone health.

Time, training and transport inaccessibility: Factors preventing bus drivers from enabling accessibility

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Passengers with disability report being driven past, ignored and denied access to the supports they need by bus drivers (Das Neves, Unsworth & Browning, 2022). Missing from this data is why bus drivers engage with passengers in this way. The Listening to Bus Driver Study sought to understand the factors influencing bus drivers' attitudes, behaviour and communication methods in encounters with passengers with disability, and explore bus drivers' recommendations to improve bus inclusivity. A cross-sectional survey was developed to screen bus drivers' attitudes towards disability; their reported barriers to supporting passengers with disability; and their recommendations to improve attitudinal and communicative accessibility on the bus. The themes drawn from the survey were then further explored through focus groups and interviews. The Behaviour Change Wheel was applied to link bus drivers' reported barriers to evidence-based interventions. Time pressure, transport infrastructure barriers, and insufficient training were identified by bus drivers as factors negatively affecting their motivation, capacity and opportunity to engage appropriately with passengers with disability. Practical training, designed and led by people with disability, was recommended by bus drivers, alongside reducing time pressure and improving transport infrastructure and operational supports.

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

Information entropy causal graph for identifying anomalies in multivariate time-series data

Falih Gozi Febrinanto

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Anomaly detection in multivariate time series is a critical task that enables the identification of cyber-attacks, disease detection, or fraudulent event in financial data. Its performance is improved by fully mining the interdependencies across variables in multivariate time-series data. For instance, examining interdependencies across collections of sensors that capture time-series data in an industrial process yields more advantages in identifying unusual patterns. Challenges appear that the relationship structure between sensors is practically unknown, and there is a need to find an optimal structure. The current techniques solve those problems by automatically performing correlation analysis and sampling strategies to generate relationships across variables to form a graph. However, there are some problems with those existing methods, such as a lack of flexibility by limiting the number of relations and low interpretability that do not substantially apply domain knowledge. In this work, we propose a framework to improve the flexibility and interpretability of generated graph structures by incorporating a causal discovery technique based on transfer entropy. Moreover, Graph Neural Networks (GNNs) models are implemented to learn generated graph structure representation. Our experiment shows that the framework improves accuracy in detecting anomalies in IoT systems and detecting brain diseases.

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

Discriminating unknown malware families with partitional clustering

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Master of Computing

Malware is a global problem developed by skilled software engineers and is sold in a specialised black-market economy. Internet security organisations perform analysis of malware feeds which require malware family identification to enable deeper analysis. Pattern matching malware identification approaches such as Yara rules may fail silently when malware updates occur. Malware clustering provides an alternative method for malware identification that is not disrupted by minor code updates.

The batch mode malware clustering algorithms include DBSCAN, K-means, and Hierarchical clustering algorithms. While these clustering algorithms provide good clustering accuracy, when new malware samples are received the whole dataset including new features must be reclustered, and this can be time consuming process. We present Discriminating unknown Malware Families with Partitional Clustering (DMFPC), an incremental clustering approach, designed for malware analysis.

The aim of this research is to develop new incremental clustering algorithms to detect existing malware families and to identify their new variants. This will be done by taking into account the sparsity of data sets. The new algorithms will be evaluated using various performance measures including F1 score, the Adjusted Rand Index (ARI), and purity. We will also use internal cluster validity indices to demonstrate the performance of the proposed algorithms and to compare with other algorithms.

This research is supported by a Federation University Fee-offset Scholarship.

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

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Doctor of Philosophy

Measuring performance in sport can provide valuable information for training plans. Currently, there are no valid tools to measure performance of game-skill activities in women's Australian football (AF). Establishing validity will determine whether the assessment tool is relevant and appropriate for use in women's AF.

A game skill scoring assessment was developed by collating and modifying relevant game skill drills from previous research and using game skill drills currently used in women's AF training. The assessment includes tackling, handballs, ground balls and contested marks and assesses the player's technical ability and measured outcomes for each skill. To establish content validity, five experts representing AF will participate in two consultations between the experts and researchers. The first round of consultations will obtain expert opinions on the technical and measured outcomes of the specified game skills. The second round will focus on confirming the accuracy after modifying the assessment from the feedback from round one. Content validity will be assessed using the item content validity index (I-CVI). The findings from this study will inform the basis for a further study in the PhD where the performance effect of an injury prevention program in women's AF will be determined.

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

Study design of drug repurposing on chronic kidney disease using causal inference

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Chronic kidney disease (CKD) is a chronic condition characterised by reduced kidney function that often leads to kidney failure. While there have been no drugs currently available to cure CKD, there are already some drugs used to manage co-morbidities around CKD, such as hypertension and diabetes.

Drug repurposing is an approach to identify new therapeutic uses from existing drugs used for managing other diseases. One of the methods in drug repurposing is using real-world electronic health records to infer the effectiveness of the existing drugs in treating diseases they were not initially intended for. In the past few years, observational data on drug prescriptions have been collected from patients with hypertension or diabetes, which can be used to emulate randomised clinical trials using a statistical method known as causal inference.

We will present a study design that utilises existing health records for repurposing hypertensive and diabetic drugs. We will use the causal inference method to evaluate the effectiveness of these drugs in preventing the development or progression to CKD.

Nabila Sekar Ramadhanti is supported by a Department of Education and Training with fee-offset scholarship through Federation University Australia.

Enhancing sensor data reliability with self-calculation and declaration process

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Our study aims to strengthen sensor data reliability through an innovative self-declaration approach, alleviating the need for computational complexity at edge and server layers, which is typical in traditional sensor data reliability strategies. It addresses the limitations of multiple sensor data fusion methods that suffer from high communication overheads and inconsistency in the absence of neighbouring sensor data. We propose an intelligent self-declaration process for each sensor to estimate and declare its own reliability solely utilizing the sensor's historical data. In primary stages, we evaluated three lightweight estimation algorithms: Kalman Filter, Holt-Winters Method, and Mahalanobis Distance, to calculate reliability. The reliability level is then incorporated into the unused reserved bits of TCP packet headers for edge-layer delivery along with the data, resulting zero additional overhead. Effectiveness of this innovative approach was confirmed through experiments using real-world water quality and environmental monitoring system data developed in our IoT Lab of Gippsland Campus, with the Kalman Filter emerging as the best performing model.

Epidemiology of Tuberculosis in the Solomon Islands: 2004 to 2018

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Approximately one-quarter of the world's population is infected with tuberculosis (TB) caused by *Mycobacterium tuberculosis*. Almost 10% of those people will develop TB in their lifetime, leading to approximately ten million new cases and 1.6 million deaths annually. The greatest TB burden is in developing low-middle-income countries. One such country is the Solomon Islands (SI) (population ~700,000) in the Pacific region, where TB is common, but detailed epidemiological data is not well analysed to date. This study aims to better understand the basic epidemiology of TB in SI.

Population census and retrospective TB data were collected in SI and analysed. A total of 5,650 TB cases were notified (2004 to 2018), equating to 377 annual average notifications. The national average case notification rate was 68/100,000. Pulmonary TB was the commonest form of TB and was highest among the 15 to 34-year age group. The average treatment success rate for all forms of TB was 89.9%. These findings, and other epidemiological data to be presented, demonstrate that TB continues to be a public health challenge in SI. The analyses conducted may help target interventions, further, engage existing stakeholders, and help inform country-relevant TB health policy.


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