



Department of Computer Science and Software Engineering

2025 Postgraduate Conference

Thursday 4th and Friday 5th September 2025
JE031, Jack Erskine Building

Sponsored by:

IEEE NZ South - Computer Society Chapter



Thursday 4 September

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| 12:30 – 1:30pm | LUNCH (upstairs in the level 2 tea-room) |
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| Session 1 Chair: <i>Tim Bell</i> | |
| Masters (Judges: Tim Bell, Ke He, Andrew Davidson) | |
| 1:30 – 1:45 | Melody Zhu (ME) <i>Driver Stop Purpose Classification From GPS Data Using Machine Learning</i> |
| 1:45 – 2:00 | Phyu Wai (Swan) Lwin (ME) <i>End-to-End Automation of Vine Pruning with Prefect Orchestration</i> |
| 2:00 – 2:15 | Edward Rycroft-Sinclair (ME) <i>Tree branch motion prediction algorithms for assisting UAV manipulators</i> |
| 2:15 – 2:30 | Philip Stenger (ME) <i>Hybrid LiDAR-3DGS Localisation for Precise Robot Perception in Unstructured Vineyard Environments</i> |

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| 2:30 – 3:00 | Afternoon tea (upstairs in the level 2 tea-room) |
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| Session 2 Chair: <i>Matthias Galster</i> | |
| PhD (Judges: Aluna Everitt, Christoph Bartneck, Judith Fuchs) | |
| 3:00 – 3:15 | Raul Vincent Lumapas (PhD) <i>Investigating the Effectiveness of Explanations in Active Video Watching (on Zoom)</i> |
| 3:15 – 3:30 | Ehsan Bojnordi (PhD) <i>Enhancing Social Learning in Active Video Watching</i> |
| 3:30 – 3:45 | Sujan Warnakulasooriya (PhD) <i>A Time-efficient Prioritised Scheduling Algorithm to Optimise Initial Flock Formation of Drones</i> |
| 3:45 – 4.00 | Maria Kainat (PhD) <i>Improving Advanced Persistent Threat Detection through Integration of Threat Intelligence Reports and Provenance Graphs</i> |

Friday 5 September

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| 11:00 – 11:30 | Morning tea (upstairs in the level 2 tea-room) |
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| Session 3 Chair: <i>Tanja Mitrovic</i> | |
| PhD (Judges: Aluna Everitt, Christoph Bartneck, Judith Fuchs) | |
| 11.30 – 11.45 | Nick Lee (PhD) <i>Feature Information and Motion Estimate Accuracy</i> |
| 11:45 – 12:00 | Reilly Haskins (PhD) <i>Distilled Circuits: How Knowledge Distillation Restructures Language Model Internals</i> |
| 12:00 – 12:15 | Matthew Minish (PhD) <i>Automated Nudges in Support of Student Reflection in Software Engineering Education</i> |
| 12:15 – 12:30 | Pitigalage Pasan Peiris (PhD) <i>Impact of Gamification on Engagement and Learning in Video-Based Platforms</i> |

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| 12:30 – 1.30pm | LUNCH (upstairs in the level 2 tea-room) |
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| Session 4 Chair: <i>Amelia Samandari</i> | |
| PhD (Judges: Aluna Everitt, Christoph Bartneck, Judith Fuchs) | |
| 1:30 – 1:45 | Zhouyu Qu (PhD) <i>Title: Exploring the Value of Cooperation in Drone Guidance Algorithms within a Drone Road System</i> |
| 1:45 – 2:00 | Tim Rensen (PhD) <i>Deep Learning Based Survey of New Zealand Cryptic Scallops</i> |
| 2:00 – 2:15 | Juliet Samandari (PhD) <i>Online/Offline Signatures for Post-Quantum Security on IoT Devices</i> |
| 2:15 – 2:30 | Bradley Scott (PhD) <i>You Only Prune Once: YOLO Pose Estimation for Autonomous Forestry</i> |

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| 2:30 – 3:00 | Afternoon tea (upstairs in the level 2 tea-room) |
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| Session 5 Chair: <i>Kourosh Neshatian</i> | |
| PhD (Judges: Aluna Everitt, Christoph Bartneck, Judith Fuchs) | |
| 3:00 – 3:15 | William Valentine (PhD) <i>Multi-Agent Simulation and Reinforcement Learning to Optimize Moving Target Defense</i> |
| 3:15 – 3:30 | April Clarke (PhD) <i>Improving Communication in Agile Software Engineering Teams</i> |
| 3:30 – 3:45 | Xilong Zhuo (PhD) <i>Formal Analysis of Consensus Protocols</i> |
| 3:45 – 4:00 | Benjamin Le Brun (PhD) <i>Phantom costs perception in human-robot interaction</i> |
| 4:00 | Staff Club upstairs for prizegiving and celebration upstairs Location: https://www.ucc.org.nz/contact-us |

Abstracts

Masters

Phyu Wai (Swan) Lwin

Title: End-to-End Automation of Vine Pruning with Prefect Orchestration

Abstract:

This research presents the development of a fully automated, scalable data processing pipeline tailored for vineyard pruning operations, utilizing Prefect as the core orchestration framework. The system integrates key stages including image capture, preprocessing, 3D reconstruction, grapevine structure extraction, and pruning decision modeling within a unified, distributed pipeline. Prefect enables dynamic task scheduling, dependency management, error recovery, and real-time monitoring across a distributed pool of GPU-accelerated workers. A Dockerized testing environment with continuous integration ensures early issue detection and reliable deployment. Leveraging parallel execution on multi-GPU and distributed worker resources, the pipeline efficiently processes large vineyard datasets to generate timely pruning recommendations. Evaluation metrics focus on throughput, robustness, and maintainability, illustrating how modern orchestration tools can significantly improve the efficiency, resilience, and scalability of agricultural automation workflows. This work advances vineyard management practices and lays a foundation for future innovations in precision agriculture.

Edward Rycroft-Sinclair

Tree branch motion prediction algorithms for assisting UAV manipulators

Abstract:

Tree pruning is a hazardous and labour-intensive task, with dynamic environments posing significant challenges for robotic automation. This research aims to investigate the feasibility of short-term tree branch motion prediction models for integration on a drone-mounted chainsaw end-effector. Successful forecasting will enable more efficient tool-branch interception tasks, reducing physical control effort requirements. Various forecasting algorithms will be explored and tested, the existing chainsaw tool upgraded, and a control framework developed to integrate hardware and software.

Philip Stenger

Hybrid LiDAR-3DGS Localisation for Precise Robot Perception in Unstructured Vineyard Environments

Abstract:

Autonomous agricultural robots require millimeter-precision localisation to perform delicate manipulation tasks such as pruning in unstructured vineyard environments. While existing SLAM techniques provide adequate navigation capabilities, they fall short of the spatial accuracy demanded by precision manipulation applications. This thesis presents a multi-stage localisation framework that bridges the gap between high-fidelity 3D Gaussian Splatting (3DGS) models and real-time robotic operations in the vineyard. The proposed system first establishes coarse localisation through multi-sensor SLAM, then fuses and processes dual stereo-camera point clouds through a filtering and clustering pipeline before aligning them with existing 3DGS models via Generalized ICP registration.

Melody Zhu

Driver Stop Purpose Classification From GPS Data Using Machine Learning

Abstract:

This project proposes a novel approach to classifying the purpose of stops performed by a commercial driver during a day of work. This study uses GPS data traces from these vehicles. These stopping events will be categorized into work and non-work-related activities. First, stop points will be extracted from the GPS data using a threshold-based method. Then, various machine learning models will be employed to classify the purpose of the detected stop points. By evaluating the performance of different machine learning algorithms, we aim to improve the accuracy of stop purpose classification, and contribute valuable insights to the broader field of commercial vehicle management.

PhD

Ehsan Bojnordi

Enhancing Social Learning in Active Video Watching

Abstract:

In the context of video-based learning, particularly Active Video Watching (AVW), social learning can significantly enhance understanding and knowledge retention. One effective way to foster social learning in AVW is to prompt learners to review and rate their peers' comments on videos, helping them recall key content and discover concepts they may have missed. Despite notable advancements in AVW, there remains untapped potential to further strengthen social learning. To address the lack of personalization in existing approaches, I developed a comment recommender system based on individual learner models. This system delivers each learner a personalized list of comments to review, tailored to their specific knowledge level. The results show that these interventions increased learner engagement in social interactions and improved learning outcomes.

April Clarke

Improving Communication in Agile Software Engineering Teams

Abstract:

Effective teamwork requires strong communication and balanced team member contributions. Weaknesses in team communication can lead to a lack of knowledge sharing, and eventually hinder team performance. We used data from 2023 and 2024 group projects to identify problem areas in communication that correspond with decreased team productivity, and then we developed visualisations to help students identify these problem areas in their own communication. Now, we are studying how students interact with the visualisations, and the effects on team and individual performance. In this presentation, we introduce the visualisations with their rationale, and discuss the results and implications of the study so far.

Reilly Haskins

Distilled Circuits: How Knowledge Distillation Restructures Language Model Internals

Abstract:

Knowledge distillation compresses large neural models (teachers) into smaller, faster students by training them to mimic teacher output probabilities directly. While this approach is widely used, little is known about how it restructures the internal circuitry of student models. We bring tools from mechanistic interpretability to study these changes in depth. Using GPT-2 Small and its distilled counterpart DistilGPT-2, we analyse circuits, representations, and activation patterns, finding that distillation reorganises, compresses, and discards teacher components, often leading students to rely more heavily on fewer components. To move beyond output-level comparisons, we propose an alignment metric based on influence-weighted component similarity, and validate it across multiple tasks. Our results show that knowledge distillation preserves broad functional behavior but induces substantial shifts in internal computation, with implications for robustness and generalisation in compressed language models.

Maria Kainat

Improving Advanced Persistent Threat Detection through Integration of Threat Intelligence Reports and Provenance Graphs

Abstract:

Advanced Persistent Threats (APTs) are difficult to detect due to their stealthy nature, often leading to excessive false positives and false negatives alerts in traditional systems. This work will explore a multi-modal learning framework that integrates threat intelligence with provenance graph to improve both detection accuracy and resource efficiency. Threat intelligence provides contextual enrichment, while provenance graph captures fine-grained system behavior, enabling precise alert reduction. To handle the high volume of data, the system will apply memory-efficient learning strategies that support real-time detection and scalable forensic analysis. This research aims to enhance precision, reduce noise, and strengthen proactive defense against APTs through a multi-modal approach that integrates threat intelligence reports with provenance graph.

Benjamin Le Brun

Phantom costs perception in human-robot interaction

Abstract:

People sometimes reject unreasonably generous offers from others because they infer hidden drawbacks—or “phantom costs”—such as perceived risks and ulterior motives. While this phenomenon has been studied in human-human interactions, it remains unexplored in human-robot interaction (HRI). We conducted a series of human-centered experiments to examine whether and how people perceive phantom costs when interacting with robots in economic decision-making contexts. Our results indicate that participants do perceive phantom costs in HRI, particularly when interacting with autonomous robots. These findings highlight the importance for programmers and designers to create robots that can adequately explain their decisions to human users to avoid unwanted costs and promote effective HRI. Our next study will explore whether these perceptions are driven by superficial cues (such as the robot’s physical appearance) or deeper mental-state attributions.

Nick Lee

Feature Information and Motion Estimate Accuracy

Abstract:

The present state of research on the accuracy and robustness of visual odometry or SLAM usually focuses on the quantity gradient, entropy, the number of features, or some other proxy metric. Not only do these lagging metrics fail to predict the live performance of an algorithm, their relationship with the result is also weak at best. Our research takes a more direct approach to measuring the quality of detected information. Using the Fisher Information Matrix, we will compute the geometric constraints that the detected feature points provide, allowing us to measure whether the algorithm has received sufficient information. More importantly, this will serve as an indicator as to whether we need to adjust the camera parameters in search for more information. This will allow us to measure performance during operation and take immediate corrective measures when necessary, improving both robustness and accuracy.

Raul Vincent Lumapas

Investigating the Effectiveness of Explanations in Active Video Watching

Abstract:

The use of video-based learning (VBL) has increased in recent years due to its effectiveness in distance learning. However, challenges in VBL, such as passive learning and low levels of engagement, continue to exist. Active Video Watching (AVW) addresses these challenges by supporting students' engagement and learning via features such as personalized nudges and visualizations. Furthermore, the AVW platform used in our research utilizes an AI model to classify comments students write on videos into several comment quality categories. Explanations of how comments are classified may enable students to understand the comment quality and, subsequently, write better comments. To determine whether explanations of comment quality would benefit students, we conducted a quasi-experimental study wherein we compared data collected from software engineering students at the Ateneo de Davao University (control group, 55 students using the AVW platform without explanations) to data collected from a comparable course at the University of Canterbury (experimental group, 45 students who received explanations). This study included a survey on students' perceptions on explanations. Results show that students in the experimental group, especially those who accessed explanations for multiple comments, wrote more higher-quality comments. Results of the survey show students are satisfied with explanations, particularly regarding the clarity, correctness, and the level of detail of explanations. This research contributes to using explanations in VBL platforms to increase learning and engagement.

Matthew Minish

Automated Nudges in Support of Student Reflection in Software Engineering Education

Abstract:

Self-reflection is an essential component of software engineering education, yet students often produce shallow reflections lacking critical analysis. Our research explores a novel approach to improving student reflection quality through automated nudges.

We developed an assessment framework comprising eight indicators of reflection adapted for our software engineering project course context, including elements such as descriptions of experiences, understanding, feelings, reasoning, and future planning. Using this framework, we trained a deep learning classifier on annotated student reflections to automatically identify the presence of reflective indicators in student writing.

We then designed an intervention that leverages this classification of reflection indicators to provide nudges (brief feedback messages suggesting specific areas for improvement) to students when relevant indicators are missing from their reflections.

We evaluated this intervention by employing it as an add-on to the ScrumBoard project management tool in a real software engineering course earlier this year. In this presentation we report on the suitability of this approach for improving student reflectivity in real-world project based software engineering education.

Pitigalage Pasan Peiris

Impact of Gamification on Engagement and Learning in Video-Based Platforms

Abstract:

Video-based learning provides flexible and self-paced learning. However, passive video consumption results in shallow learning. To address this, reflective activities such as commenting on videos and reviewing peers' comments are used to increase engagement. Incorporating gamification can further boost engagement. This study investigates the impact of gamification, specifically badges, on student engagement and learning in video-based learning. We conducted a comparative study between a gamified and a non-gamified version of the same platform. Findings show that badges significantly increased learner engagement. Student feedback indicated a positive reception of badges. Also, students who used the gamified platform wrote higher quality reflective comments on videos, leading to increased learning.

Zhouyu Qu

Title: Exploring the Value of Cooperation in Drone Guidance Algorithms within a Drone Road System

Abstract:

Efficient and safe management of multiple drones in shared airspace remains a significant challenge, particularly under high traffic density and limited communication reliability. In previous studies, we design a drone road system standard and developed a related coordination-free short-term decentralized greedy (STDG) guidance algorithm for collision avoidance and drone guidance. We then conducted a series of simulations to systematically evaluate the impact of both wireless communication parameters and key algorithm parameters on safety and efficiency. Sensitivity analysis reveals the difficulty of simultaneously maintaining high efficiency and a near-zero collision rate. Building on this finding, we propose to explore the value of cooperation among drones to further enhance traffic safety and efficiency. Cooperative strategies have the potential to reduce collision rates while maintaining high average speeds and throughput, even under dynamic and high-density scenarios. However, the form of cooperation must be carefully chosen, as it may raise privacy concerns since drones belong to different institutions and individuals. This work provides insights into how drones can work together to complement coordination-free approaches and helps guide the design of future traffic management systems.

Tim Rensen

Deep Learning Based Survey of New Zealand Cryptic Scallops

Abstract:

The cryptic Scallop endemic to New Zealand is *Pecten novaezelandiae*, or *kuakua/tipa*, and their populations are at all-time lows. A combination of factors likely resulted in the closure of most of New Zealand's commercial, recreational, and customary fisheries, including over-fishing, habitat damage from dredging, and sediment run-off from eroding land. Currently stock assessments are performed by Crown Research Institutes (CRI) by way of divers, cameras, or dredging. The most accurate method with diver transects is costly and limited. Alternatively, dredge surveys are more economical but are invasive and cause damage to the fishery they are protecting, with high variability depending on habitat and seabed

topology. Camera survey approaches have been trialled, although AI has only in the last decade become powerful enough to analyse the ten's of thousands of images in a camera survey, making this method feasible. Our aim is to develop a cost-effective and accurate deep-learning and Autonomous Underwater Vehicle (AUV) based method for surveying NZ cryptic scallops, measuring both scallop size and count. This research culminated in the successful completion of a 2024 scallop fishery survey for Fisheries NZ.

Juliet Samandari

Online/Offline Signatures for Post-Quantum Security on IoT Devices

Abstract:

The Internet of Things (IoT) has been identified as a key tool for enhancing industries' operation and performance. As IoT deployment grows worldwide, so do the threats. Ensuring the security of these devices by maintaining authentication and integrity is critical. One significant future threat is quantum attacks, which can best be addressed using Post-Quantum (PQ) cryptosystems. New Digital Signature (DS) standards for PQ security have been selected by the US National Institute of Standards and Technology (NIST). These DS standards aim to maintain PQ authentication and integrity. However, IoT comes with its own technical challenges from the constrained resources allocated to sensors and other similar devices. As a consequence, the use and suitability of these PQ DS schemes for IoT remains an open research area. In this presentation, I will discuss how our findings indicate that the use of the online/offline construction for PQ DS schemes can make these schemes suitable for IoT devices, decreasing computational cost whilst maintaining the necessary security level.

Bradley Scott

You Only Prune Once: YOLO Pose Estimation for Autonomous Forestry

Abstract:

Although pruned forestry timber commands premium prices, most New Zealand *Pinus Radiata* plantations forego pruning regimes despite potential improvements to tree health and timber quality. Although forestry managers recognise the value of improved tree quality, barriers including difficult terrain access, labour shortages, and entrenched practices prevent widespread adoption of pruning programmes that would otherwise yield higher timber values. Recent advances in Unmanned Aerial Vehicle (UAV) technology offer the potential to automate forest pruning operations even in challenging terrain conditions, potentially balancing the cost equation by reducing labour requirements and increasing access to premium timber markets.

Previously, we proposed a method for identifying branch cutpoints in 3D point clouds but failed to meet real-time performance requirements for practical deployment.

This presentation will introduce the forestry pruning problem, detail our dataset development and annotation methodology, and discuss our recent work on a novel pipeline for real-time automated pine branch cutpoint localisation.

William Valentine

Multi-Agent Simulation and Reinforcement Learning to Optimize Moving Target Defense

Abstract:

As cyber threats continue to evolve, Moving Target Defense (MTD) strategies have emerged as a promising approach to enhancing network security by dynamically altering system configurations. However, optimizing MTD requires balancing security improvements with system availability. In this work, we propose a framework for optimizing MTD strategies, leveraging reinforcement learning (RL) and a cybersecurity simulation environment (named CybORG-MTD), to train defensive agents. Our approach introduces a reward function that explicitly models the trade-off between security and availability, enabling RL agents to learn effective defense policies. Through empirical evaluations, we demonstrate that our proposed methodology outperforms existing techniques in optimizing MTD strategies. While our results highlight the effectiveness of RL-based cyber defense, we also discuss key challenges, including scalability, and adaptive attacker behaviors.

Sujan Warnakulasooriya

A Time-efficient Prioritised Scheduling Algorithm to Optimise Initial Flock Formation of Drones

Abstract:

This research introduces a prioritised scheduling method designed to enhance the efficiency and accuracy of the initial formation of a drone flock. The proposed method establishes a hierarchy among the drones based on the number of potential collisions with other drones and the likelihood of a drone arriving at its final position and obstructing others. Once the hierarchy is established, each drone calculates its corresponding delay to ensure a collision-free path. Simulation results confirm that the proposed algorithm can generate collision-free paths for flocks of up to 5000 drones. Additionally, simulations demonstrate that the proposed algorithm outperforms the coupling-degree-based heuristic prioritized planning method (CDH-PP) in terms of performance and computational efficiency.

Xilong Zhuo

Formal Analysis of Consensus Protocols

Abstract:

In distributed systems, consensus protocols ensure consistency and agreement among nodes despite failures and adversarial conditions. This research focuses on the formal analysis and verification of consensus protocols, providing a rigorous mathematical framework to validate their fundamental properties.

This study aims to utilize automated theorem provers to formally specify and verify key security properties of distributed consensus protocols. By constructing formal models and verifying them with an automated theorem prover, this work seeks to establish provable correctness guarantees for consensus algorithms.

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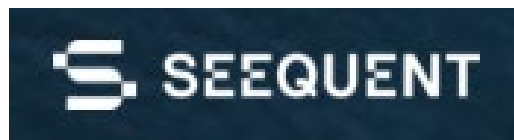
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Our 3D modelling tools and technology are widely applied across industries and projects, including road and rail tunnel construction, groundwater detection and management, geothermal exploration, resource evaluation and estimation, subterranean storage of spent nuclear fuel, and a whole lot more.

At Seequent, we help transform raw, complex data and give it a form that is easily communicated to stakeholders and collaborated on by remote teams. Having a common picture brings clarity to complexity and empowers everyone with knowledge.

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Since 2004, we've integrated three unique companies at the top of their game:

QG were brought on to contribute to the geology and geostatistics expertise within Seequent. Their deep experience and market insights solidify our position in the mining industry.

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