# Department of
# Computer Science and Software Engineering

## 2024 Postgraduate Conference

**Thursday 5th and Friday 6th September 2024**
**JE031, Jack Erskine Building**

## Sponsored by:

# Thursday 5 September

| Session 1   *Chair: Mukundan* | |
|---|---|
| **BSc Hons** (Judges: James, Mukund, Fabian) | |
| 10.30 – 10.45 | Alex Widogast (BSc Hons) *A General Framework for Order-Statistic Trees* |
| 10:45 – 11:00 | Eric Wong (BSc Hons) *Acetabulum alignment and best-fit hemisphere from instance segmented images of a plastic hip model* |

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|---|---|
| 11.00 – 11:30 | ***Morning tea*** *(upstairs in the level 2 tea-room)* |

| Session 1   *Chair: Fabian* | | |
|---|---|---|
| **Masters** (Judges: James, Mukund, Fabian) | | |
| 11:30 – 11.45 | Vincent Kenworthy (MSc) *The Episodic History and Uncertain Future of Automated Prediction of Judicial Decisions* | |
| 11.45-12:00 | Yuanji Shi (MSc) *Traffic Sign Detection and Recognition* | |
| 12:00-12:15 | James Houghton (MSc) *Fusing Remote Sensing datasets in a Neural Network model to estimate MNDWI in Landsat Observations* | |

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|---|---|
| 12:15 – 1:30pm | ***LUNCH*** *(upstairs in the level 2 tea-room)* |

| Session 3   *Chair: Trevor* | |
|---|---|
| **PhD** (Judges: Tanja, Walter, Ben) | |
| 1:30 – 1:45 | Raul Lumapas *Integrating Explanations in Active Video Watching* |
| 1:45 – 2:00 | April Clarke *Improving Social Networks in Agile Software Engineering Teams* |
| 2:00 - 2:15 | Harry Dobbs *Integrating Synthetic and Sparsely Labelled Real-World Data for Vineyard Point Cloud Semantic Segmentation* |
| 2:15 – 2:30 | Jack Patterson *Toward Robust Strategies for Satellite Streak Identification* |

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| 2:30 – 3:00 | ***Afternoon tea*** *(upstairs in the level 2 tea-room)* |

| Session 4   *Chair: Mengmeng* | |
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| 3:00 – 3:15 | Benjamin Lebrun *Perception of phantom costs in human-robot interaction* |
| 3:15 – 3:30 | Nick Lee *Visual Odometry and Pose Estimation Error* |
| 3.30 – 3.45 | Minyi Wang *Ethical Asymmetry in Human-Robot Interaction* |

# Friday 6 September

| Session 5 | Chair: Etienne |
|---|---|
| **PhD** contd. | |
| 10:30 – 10:45 | Henry Hickman *Automated Assessment: Does It Align With Teachers' Views?* |
| 10:45 - 11:00 | Ehsan Bojnordi *Supporting Social Learning in Active Video Watching by Using a Recommendation System* |

| 11:00 – 11:30 | ***Morning tea** (upstairs in the level 2 tea-room)* |
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| Session 6 | Chair: Chenyi |
|---|---|
| 11:30 – 11:45 | Pasan Peiris *Gamification for Enhancing Soft Skills Development: A Systematic Mapping Study* |
| 11:45 – 12:00 | Hirasha Pooliyadda *A Gamified Approach to Reduce Test Anxiety in Computer Science and Software Engineering Undergraduates* |
| 12:00 – 12:15 | Rosalyn Rough *Improving the Reliability and Ease of Bloodstain Pattern Analysis with Quantitative Techniques* |
| 12:15 – 12:30 | Amelia Samandari *Distributed Time Slot Allocation For Transmission of Sensor Data in UAV Formations* |

| 12:30 – 1.30pm | ***LUNCH** (upstairs in the level 2 tea-room)* |
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| Session 7 | Chair: Ben |
|---|---|
| 1:30 – 1:45 | Juliet Samandari *Post-Quantum Authentication and Integrity in 3-Layer IoT Architectures* |
| 1.45 - 2.00 | Aaron Smith *Neural Radiance Field Spectral Computerised Tomography Reconstruction* |
| 2:00 – 2:15 | Zhouyu Qu *Coordination-Free Path Planning Algorithm on a Drone Road System* |
| 2:15 – 2:30 | Sharon Temtsin *A Rigorous Three-Player Imitation Game: Preliminary Results* |

| 2:30 – 3:00 | ***Afternoon tea** (upstairs in the level 2 tea-room)* |
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| Session 8 | Chair: Kourosh |
|---|---|
| 3:00 – 3:15 | William Valentine *Optimisation of MTD Strategies with Cyber Defence Simulation and Reinforcement Learning* |
| 3:15 – 3:30 | Sujan Warnakulasooriya *Novel method for optimising initial flock formation time of N drones* |
| 3:30 – 3:45 | Di Wang *Enhancing Bug Reproduction in Web Applications: The Role of Application Monitoring in Real-World Software Development* |

| 4:00 | ***Staff Club upstairs for prizegiving and celebration upstairs*** <br> *Location: **https://www.ucc.org.nz/contact-us*** |
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# Abstracts

## BSc Honours

**Alex Widogast**

**Title: A General Framework for Order-Statistic Trees**

**Abstract:**
Binary Search Trees are widely used in all areas of computer science, and have been modified in many different ways to support additional operations or better efficiency. The motivating example, the Order-Statistic Tree, stores at each node the size of its subtree, allowing efficient queries relating to the rank of each element without compromising the space or time complexity of other operations. The aim of this project is to find general algebraic frameworks for many of these modifications, such as Red-Black, AVL, and Segment Trees. While each of these trees have been studied extensively, no work has been done to unify them.

**Eric Wong**

**Title : Acetabulum alignment and best-fit hemisphere from instance segmented images of a plastic hip model**

**Abstract :**
Hip replacement surgery, a medical procedure known as Total Hip Arthroplasty (THA), involves the removal of a damaged ball and socket and its replacement with a synthetic ball and socket (acetabulum). Successful THA requires that the replacement socket (acetabular component) be correctly aligned and positioned with the acetabulum. We propose a method to compute acetabulum alignment and to fit a hemisphere to the acetabulum based on instance segmented depth images of a plastic hip model. Our method outputs a 3D acetabulum point cloud and a fitted hemisphere oriented in the same direction as the acetabulum. Our approach forms an initial step to help a surgeon evaluate acetabulum alignment and position from depth images. We train a YOLO v8.2 model to instance segment the acetabulum : our trained model has segmentation accuracy of 0.91 IoU for plastic hip model images, and of 0.82 IoU for surgical images. We compute acetabulum inclination angles with a mean absolute error (MAE) of 2.3 degrees (4.5 degrees) in anticlockwise (clockwise) rotation scenarios. Our computed hemisphere radius has MAE of 0.4cm (0.2cm) in anticlockwise (clockwise) scenarios.

# Masters

**Vincent Kenworthy**

**Title: The Episodic History and Uncertain Future of Automated Prediction of Judicial Decisions**

**Abstract:**
Despite having been proposed more than sixty years ago, progress in judgment prediction has only quickened within the past decade. The most significant development is the prediction of judicial decisions on the basis of natural language descriptions of the facts of cases. The literature has focussed on explainable artificial intelligence methods, including support vector machines and linear regression, although less explainable models have also been used. Due to the difficulty in obtaining access to factual information upon which judicial decisions are based, most researchers have used the text of final judgments to make predictions, a method which does not generally permit prediction of future decisions. The concerns relating to access to data are likely to hinder future development in this area.

**Yuanji Shi**

**Title: Traffic Sign Detection and Recognition**

**Abstract:** In this research project, a machine learning-based pipeline that is used to recognize and classify traffic signs would be built based on an existing innovation project owned by Verizon Connect. With this pipeline, data captured from truck-based cameras would be used as the input, and the type of traffic sign and its geo-information would be the output. This input video data will be sourced from the Berkeley Deep Drive video library, licensed by Verizon Connect. Deep learning techniques will be implemented in this project, and models with candidate architectures would be measured by accuracy rate, information density, and NetScore. GTSRB, the German Traffic Sign Recognition Benchmarks (CC0 1.0 license, i.e. copyright free) is used for validation. Other datasets would also be used for more complex tasks in this research.

**James Houghton**

**Title: Fusing Remote Sensing datasets in a Neural Network model to estimate MNDWI in Landsat Observations**

**Abstract:**
We present a method to fuse multiple remote sensing datasets in a neural network model to estimate the modified normalized difference water index (MNDWI) in Landsat observations when the observation is obfuscated or omitted from the record. These estimates are used to construct an annual surface water percentage estimate for a region in Bangladesh. Capturing daily surface water dynamics is challenging due to discontinuities in the remote sensing data records. Spatial and temporal discontinuities in the data cause daily surface water dynamics to be missed and large scale surface water dynamics to become obfuscated in the record. Remote sensing datasets have a variety of spatial and temporal resolutions that makes aligning them a non-trivial task.

Remote sensing data from Landsat, Climate Hazards Centre Infrared Precipitation estimates with Station data (CHIRPS), NASA Digital Elevation Model (DEM), and Land Use / Land Cover are used to construct a dataset train a deep learning model to estimate MNDWI in Landsat observations for an area of interest in Bangladesh between 2005 and 2009. A flood heuristic is proposed to use the model MNDWI estimates to construct an annual surface water percentage estimate for a subset of the area trained on. The proposed neural network achieves a Mean Absolute Percentage Error (MAPE) of 2.005 on average, compared with

a baseline weighted-linear regression model achieving an MAPE of 32.29. The flood heuristic annual surface water percentage was compared against the Joint Research Centre (JRC) surface water occurrence map giving a Mean Absolute Error (MAE) of 7.04. These results demonstrate that the proposed model is able to reasonably estimate MNDWI in Landsat.

# PhD

**Ehsan Bojnordi**

**Supporting Social Learning in Active Video Watching by Using a Recommendation System**

**Abstract:**
In the context of video-based learning, particularly active video watching, social learning is facilitated by allowing students to review comments written by their peers. In previous studies with AVW-Space, all students had access to the same comments, despite differences in their knowledge. We provided students with a personalized list of comments to review, based on their student model, by using a comment recommendation system. The results show that our intervention encouraged students to engage more in terms of responding to their peers (quantitatively and qualitatively) and students who requested more recommendations increased their conceptual understanding compared to others.

**April Clarke**

**Title: Improving Social Networks in Agile Software Engineering Teams**

**Abstract:**
Effective teamwork requires strong communication and balanced team member contributions. Weaknesses in team communication, like knowledge silos and unequal participation in discussions, can prevent knowledge sharing and hinder performance. We aim to improve knowledge sharing and discussion participation by identifying problem areas in team communication and applying interventions to mitigate these. In this presentation, we discuss our progress on visualising social networks and analysing team communication, and future work applying the results to software engineering teams.

**Harry Dobbs**

**Title: Integrating Synthetic and Sparsely Labelled Real-World Data for Vineyard Point Cloud Semantic Segmentation**

**Abstract:**
Accurate semantic segmentation of vineyard components is crucial for precision agriculture and robotic pruning applications. However, the complexity of grapevine structures and the scarcity of labelled 3D point cloud data pose significant challenges. In this study, we investigate the effectiveness of different data strategies to address these challenges: using synthetic data, sparsely annotated real-world data, and a mixture of both. We employ a submanifold sparse convolutional neural network architecture and data augmentation techniques in our experiments. The proposed approaches are evaluated on real-world vineyard datasets, comparing the performance of the three training strategies. Results demonstrate that training on sparsely labelled real-world data alone achieves the best performance. Furthermore, the t-SNE visualization of feature spaces reveals a notable domain gap between synthetic and real-world data. This study highlights the importance of considering the domain gap when utilising synthetic data for vineyard semantic segmentation tasks and the potential benefits of focusing on sparsely annotated real-world data.

**Henry Hickman**

**Title: Automated Assessment: Does It Align With Teachers' Views?**

**Abstract:**
In Aotearoa New Zealand, assessment of programming for the national NCEA standards is carried out manually by teachers, many of whom are not experienced programmers. In an attempt to decrease teacher workload, we have adapted Moodle CodeRunner to assess a widely used recently released high school programming standard. This presentation explores how we have automated the new standard, including dealing with judgement calls for the more subjective criteria.

We then report on interviews with experienced programming teachers who were shown example tasks from our system, as well as model answers for each example. We found that teachers were enthusiastic about using automated assessment to assess the standard, and while there wasn't one agreed upon interpretation of the standard, teachers were happy with how the system supported marking. We also found no universal agreement among the level of context desired in programming questions to assess the standard, despite the small sample size.

**Benjamin Lebrun**

**Title: Perception of phantom costs in human-robot interaction**

**Abstract:**
A recent study in psychology suggested that people sometimes reject overly generous offers due to perceived phantom costs (i.e., imagining hidden reasons and motives) in seemingly generous transactions. Phantom costs arise when a person appears unusually generous without a clear rationale. In our first study, we examined this phenomenon by having an agent (either a human or a human-like robot) offering participants either a cookie or a cookie plus $2, justifying the offer by stating that they were eating cookies with friends. Results showed that participants were more likely to accept the cookie alone, supporting the idea that transparency (here, the reasons why the agent offered money) is crucial in social exchanges with humans and robots. However, we think that the implausibility of the robot's statement (i.e., eating cookies with friends) undermined transparency. We plan to further investigate how the implausibility of explanations provided by robots influences the perception of phantom costs and how this, in turn, affects human decision-making during interactions with robots.

**Nick Lee**

**Title: Visual Odometry and Pose Estimation Error**

**Abstract:**

Visual odometry estimates the robot's pose by analysing images captured by it and is integral to autonomous navigation. However, when devices operate outdoors, the large changes in brightness may cause localisation failure. This short-coming motivates us to find methods that ensure visual odometry can function in high dynamic range environments. To offset the negative impact of operating in high dynamic range environments, researchers proposed automatic exposure algorithms to select a camera exposure time that maximises their selected quality metric. However, direct comparisons between the selected image metric and visual odometry performance is scarce. Many of the proposed algorithms go through multiple steps, making it difficult to determine whether the improved pose estimation accuracy is the result of optimising the metric. In this submission, we generated sets of synthetic images in a simulation environment at different exposure levels. We estimate trajectories ten times for each data set

and compare the resulting errors with the image quality metrics. Our tests showed that none of the selected image quality metrics had a strong, negative correlation with absolute translation error. The findings suggest that the current automatic exposure algorithms have yet to find an image quality metric that truly impacts visual odometry performance. Ongoing research should consider alternative metrics or metric combinations

**Raul Lumapas**

**Title: Integrating Explanations in Active Video Watching**

**Abstract:**
Recent studies on Explainable Artificial Intelligence (XAI) in education show benefits for student learning. However, integrating XAI in AI-based education (AIED) systems requires understanding students' explanation needs. Some approaches to adding XAI to AIED systems include participatory design and co-design involving learners. This study presents a participatory approach to implement explanations in Active Video Watching (AVW). We designed explanations based on the requirements on timing and presentation of explanations and additional feedback from learners during the participatory activity. The implemented explanations support students who made low to medium-quality comments on video content by explaining how comment quality was determined. Furthermore, explanations included recommendations to improve future comments. We present the results of a pilot study on explanations in an AVW platform.

**Jack Patterson**

**Title: Toward Robust Strategies for Satellite Streak Identification**

**Abstract:**
The exponential growth of low-Earth orbit megaconstellations has triggered a surge in satellite streaks within astronomical survey images, presenting substantial challenges for observational astronomers. These streaks, appearing prominently in wide-field images, have the potential to complicate celestial object detection and tracking methodologies, compromise astrometric precision, skew photometric measurements, and lead to distorted population statistics. Accurately identifying streaks is therefore essential for gaining a comprehensive understanding of their impact.

We assessed the effectiveness of deep neural networks for detecting satellite streaks in wide-field survey data, comparable in depth to the upcoming Legacy Survey of Space and Time (LSST). Eleven distinct methodologies for detecting and localizing streaks in CFHT MegaCam images were evaluated, ranging from traditional approaches such as Hough/Radon Transforms and ASTRiDE as a baseline, to several state-of-the-art deep neural network architectures. A standardized execution and testing framework was developed to ensure uniformity across evaluations, encompassing image manipulation and model output processing. Leveraging a labeled dataset of images containing streaks, the performance of each approach was quantitatively evaluated.

Examination of the results revealed challenges stemming from significant variability in streak width, brightness levels, and time-varying morphology within individual satellite passes, which resulted in detected streaks of incorrect widths, streak angle misalignments, and high false positive rates. These challenges highlight the need for the development of more robust methodologies to address them effectively. Moving forward, we intend to refine the most promising approaches identified during our evaluation to improve the effectiveness of streak detection and localization.

**Pasan Peiris**

**Title: Gamification for Enhancing Soft Skills Development: A Systematic Mapping Study**

**Abstract:**
Soft skills (such as the ability to communicate or work in a team effectively and efficiently) are essential in most professional domains, including healthcare, software and technology development. Training soft skills (either for students at universities or professionals in industry) is challenging. Gamifying soft skills training can increase engagement and learning. We present a systematic mapping study to analyze the state of the research of gamification to enhance soft skills training: We examine game elements used, which soft skills they target, who the training is for, how gamification affects engagement and skill development, and tools used to implement gamification. Based on the analysis of 17 primary papers published up until 2023 we found that Points, Badges, Leaderboards, Levels, Narratives and Characters are dominating game elements in gamified soft skills training. Undergraduate students are the primary type of learners targeted by gamified soft skills training, while industry professionals as a type of learners are less explored. Our findings also indicate that gamification can have a positive impact on soft skill development and increase learner engagement in training activities.

**Hirasha Pooliyadda**

**Title : A Gamified Approach to Reduce Test Anxiety in Computer Science and Software Engineering Undergraduates**

**Abstract:**
Test anxiety is a significant challenge for tertiary students, often hindering academic performance and mental well-being. This is preponderant in Computer Science (CS) and Software Engineering (SE) education, especially during programming assessments. This project explores the potential of gamification as a tool to help students manage and reduce test anxiety in these contexts. We propose the development of a digital, gamified solution specifically designed for CS and SE students, with the goal of assessing its effectiveness in lowering test anxiety and enhancing academic outcomes.

**Rosalyn Rough**

**Title: Improving the Reliability and Ease of Bloodstain Pattern Analysis with Quantitative Techniques**

**Abstract**:

Rosalyn is a forensic scientist employed at ESR. One of her main areas of expertise in in Bloodstain Pattern Analysis (BPA) a discipline of forensic science which is often used at scenes of bloodshed to assist with the reconstruction of events. Seen as a pattern recognition discipline, BPA has received criticism of its subjective nature and lack of quantitative techniques. In an attempt to improve its reliability, Rosalyn has been investigating quantitative classification methods and their application to BPA over the last (nearly) six years. This presentation will summarise the key highlights of her research including developing a method utilising computer vision methods to quantitatively analyse images of bloodstain patterns and applying machine learning algorithms including deep learning for classifying patterns. The highs and lows of embarking on a part-time Phd mid- life and mid- career will also be discussed.

**Amelia Samandari**

**Title: Distributed Time Slot Allocation For Transmission of Sensor Data in UAV Formations**

**Abstract:**
Unmanned Aerial Vehicles (UAVs) in multi-UAV systems rely on sensor data to achieve a collective goal, and for command and control. This talk presents Distributed Assignment and Resolution of Time slots (D-ART), a Time Division Multiple Access (TDMA)-based Medium Access Control (MAC) protocol that supports the dissemination of safety-critical sensor data between UAVs in a formation. D-ART allows for each UAV to self-organize their time slot allocation, and has provisions for UAV-driven changes to the superframe size as necessary. We determine the best settings and evaluate the performance of D-ART using time to convergence as a key performance measure, as time to convergence directly corresponds to the time taken to generate the smallest possible TDMA schedule for a formation of unknown size.

**Juliet Samandari**

**Title: Post-Quantum Authentication and Integrity in 3-Layer IoT Architectures**

**Abstract:**
The Internet of Things (IoT) is a growing area of technology and has been identified as a key tool for enhancing industries' operation and performance. As IoT deployment rises worldwide, so do the threats; hence, security, especially authentication and integrity, is a critical consideration. One significant future threat is quantum attacks, which can only be defeated 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). 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 schemes for IoT remains an open research area. In this presentation, we will identify an IoT architecture built from three distinct layers represented by a server, a gateway and an IoT device, respectively. We will then discuss the experiments conducted and the design suggestions that have arisen.

**Aaron Smith**

**Title: Neural Radiance Field Spectral Computerised Tomography Reconstruction**

**Abstract**:
Computerised Tomography (CT) reconstruction is the act of generating a 3D volume from a series of 2D projections typically captured in a helical pattern of a CT scan, which is a special case of an image mapping problem. Most modern CT reconstruction algorithms are based on a model-based reconstruction method where the representation of the object in the scanner is repeatedly updated and tested to analyse the accuracy of the generated model. Recently, implicit models have become an area of interest, where the CT reconstructions are represented as the weights of neural networks. We propose the adaptation and utilisation of a Neural Radiance Field (NeRF) network as an implicit model-based spectral CT reconstruction approach.

**Zhouyu Qu**

**Title: Coordination-Free Path Planning Algorithm on a Drone Road System**

**Abstract:**
Unmanned Aerial Vehicles (UAV) or drones are expected to become increasingly common for the delivery of small items in urban environments. This trend requires a structured road system and a corresponding pathfinding algorithm to help drones avoid collisions and improve efficiency. In this presentation, we will introduce a new standard, articulated through a simple markup language, for designing a drone road system. Additionally, we will present a short-term, coordination-free pathfinding algorithm. This algorithm only takes the position and speed information of other drones—communicated via beacon signals—as the input to make an immediate decision such as stopping, lane changes, or slowing down for the next few seconds. Preliminary simulation results indicate that our algorithm shows strong potential to reduce collisions and alleviate traffic congestion. However, its actual performance will depend on the specific algorithm settings, the wireless communication parameters for beacon exchanges, and the design of the road system itself.

**Sharon Temtsin**

**Title: A Rigorous Three-Player Imitation Game: Preliminary Results**

**Abstract:**
Conversational agents based on Large Language Models (LLM) have been rapidly adopted by users since the public release of ChatGPT. These systems have demonstrated exceptional performance that has never been witnessed before in their capability to generate human-like texts and responses. They have excelled not only in their conversational abilities but also in dealing with tasks such as professional exams, and complex problem-solving. Such performance fosters the expectation that we are on the brink of creating an intelligent machine. However, measuring intelligence remains elusive without a proper test. Alan Turing proposed a test for machine intelligence based on imitation and unconstrained conversations between a machine and a human. To the best of our knowledge, no one has ever conducted Turing᾽s test as Turing prescribed, even though the Turing Test has been a bone of contention for more than seventy years. Conducting a bona fide Turing Test would not only significantly contribute to the advancement of research in machine intelligence evaluation but also hold the potential to advance AI researchers in their ultimate quest of developing an intelligent machine.

**William Valentine**

**Title: Optimisation of MTD Strategies with Cyber Defence Simulation and Reinforcement Learning**

**Abstract:**
Machine Learning for the optimisation of cyber defence strategies becomes viable with the automation of cyber security, and necessary with the increasing importance and complexity of cyber systems. Our research aims to optimise the use of several Moving Target Defence (MTD) techniques using Reinforcement Learning (RL) for the purpose of countering Advanced Persistent Threats (APT). We explore the utility of a comprehensive environment reward function that accounts for the system's security, Quality of Service (QoS), and resource costs. We also consider the role of Intrusion Detection Systems (IDS) in informing MTD strategies, in particular the performance metrics of anomaly-based IDS such as precision and recall, as well as the inherent ability of signature-based IDS to classify intrusions. The CybORG environment provides a foundational cyber defence simulation framework which we extend to enable MTD functionality.

**Di Wang**

**Title: Enhancing Bug Reproduction in Web Applications: The Role of Application Monitoring in Real-World Software Development**

**Abstract:** Today's software are deployed and delivered as web-based applications. In this paper, we treat "web-based applications" and "web applications" as synonyms. Identifying and comprehending bugs at runtime often hinges on the ability to reproduce or replicate them. Furthermore, challenges in bug reproduction arise due to various factors, such as insufficient information in bug reports or the complex nature of web-based applications, which complicates data collection regarding the user interactions that trigger bugs. For example, unlike "traditional" web applications that perform most of the application logic on the web server (e.g., by re-loading the full web interface from the web server to a user's browser), SPAs perform most of the user interface (UI) logic in a web browser, communicating with the web server primarily using web APIs. Previous research also pointed out that incomplete bug reports and limited cooperation from clients to help developers reproduce and understand a bug hinder bug replication efforts.

Our previous work demonstrated that application monitoring can mitigate some of these challenges and can simplify the bug reproduction process by effectively capturing necessary data about user and application behavior. The goal of this study is to extend previous research by exploring how application monitoring (i.e., an "intervention") affects a real-life software development context, specifically by examining bug report data requirements for web applications in real-world settings, and assessing how application monitoring can bridge gaps in understanding and reproducing bugs.

**Minyi Wang**

**Title: Ethical Asymmetry in Human-Robot Interaction**

**Abstract:**
Integrating robots into our daily lives opens many open questions. The Ethical Asymmetry Hypothesis stipulates that cruel behaviour towards robots leads to vice, whereas kind behaviour does not lead to virtue. My project focuses on testing this hypothesis empirically within the framework of Virtue Ethics. Moreover, I will investigate if a similar asymmetry exists in human-human interaction. My goal is to contribute to the development of moral guidelines for the development of social robots. My presentation will introduce Ethical Asymmetry and propose a method for investigating it.

**Sujan Warnakulasooriya**

**Title: Novel method for optimising initial flock formation time of N drones**

**Abstract:**
Unmanned Aerial Vehicles (UAVs) can significantly improve their performance when working as a flock. One key area of research under drone flocking is the formation of the initial flock. This proposed research would be to investigate how to optimise the initial formation of a flock of N drones, with the goal of minimising drone initial formation time. Proposed algorithm will calculate a hierarchy among the drones and schedule drones with delay to achieve collision free travel while minimising the overall flock formation time.

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Though best known for GPS technology, Trimble integrates a wide range of positioning technologies including GPS, laser, optical and inertial technologies with application software, wireless communications, and services to provide complete commercial solutions. Its integrated solutions allow customers to collect, manage and analyse complex information faster and easier, making them more productive, efficient and profitable.

Trimble products are used in over 141 countries around the world. Employees in more than 30 countries, coupled with a highly capable network of dealers and distribution partners serve and support our customers.

For over 33 years, Trimble has created unique positioning products that help customers grow their business. Our portfolio includes over 1,800 patents and serves as the basis for the broadest positioning offerings in the industry. Trimble augments its organic product development with strategic acquisitions to bring the latest positioning technologies to a wider market.

www.trimble.com
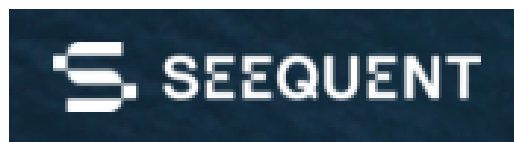


Seequent is a global leader in the development of visual data science software and collaborative technologies. Our solutions enable people to create rich stories and uncover valuable insights from geotechnical data, and ultimately make better decisions about their earth, environment and energy challenges.

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.

 Seequent used to be ARANZ Geo.  Formed in 2004, the company built its flagship 3D geological modelling product 'Leapfrog' based on a pioneering algorithm that enables fast and automated formation of 'surfaces' directly from geological data. Today Leapfrog has thousands of users and is relied on by top mining and exploration firms, major geothermal energy companies, civil construction leaders and environmental science specialists.

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.

> **Bloy** are one of the world's only product specialists in the grade control field. They develop and support Blockbuster®, a full-featured, off-the-shelf grade control solution.

> **3Point Science** specialise in cloud solutions and geophysics, and in creating highly engaging 3D data visualisation.

We have evolved from a software company developing geological modelling tools and services, into a technology leader offering truly integrated solutions for shared, global challenges. We see the industries we serve in a bigger context and see new possibilities in the areas of earth, the environment and energy.  Seequent is who we are.

**Dynamic Controls** is a world leading designer and manufacturer of electronic controls for power wheelchairs and scooters. Focusing on innovation and growth in the bio medical engineering sector, Dynamic Controls works to go above and beyond expectations to ensure end users receive the best product possible in order to enhance their quality of life. Dynamic Controls is unique in that we specialize in the medical mobility market. Products range from cost effective controllers to a world leading modular control system that can be customised to suit a wide range of user needs. In addition we have a range of scooter controllers suitable for small, lightweight mini shoppers to rugged outdoor scooters. All our products are renowned for reliability. Dynamic Controls is a global organization which employs over three hundred people, with corporate headquarters in New Zealand and regional offices in the United Kingdom, North America and Asia.

www.dynamiccontrols.com