UNIVERSITY OF THE WEST of SCOTLAND
UWS
Artificial Intelligence, Virtual Communications & Networks

2nd Artificial Intelligence, Virtual Communications & Networks (AVCN) Institute Conference

AVCN 2026

Date: 5 June 2026
Time: 9am – 5pm
Location: P Block, UWS Paisley Campus

Programme & Book of Abstracts

University of the West of Scotland (UWS)

Contents

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University of the West of Scotland - School of CEPS

Welcome

Welcome to the 2nd Artificial Intelligence, Virtual Communications, and Networks Institute Conference (AVCN2026)!

AVCN2026 is a one day conference filled with opportunities for discussions and insights in the world of AI, virtual communications, and networks. Network with academics from the Division of Computing in the School of CEPS in person at this exciting event. Don't miss out on this opportunity to expand your knowledge and connect with like-minded individuals.

We look forward to seeing you there!

The AVCN Institute Leads
School of Computing, Engineering and Physical Sciences (CEPS)

About AVCN

The AVCN research Institute is one of the UWS's strongest research hubs in terms of research outputs, intellectual property (IP), and income generation. For the past 10 years AVCN developed a strong track record in areas such as Artificial Intelligence (AI), Extended Realities, 5G+ Networks, Big Data, Deep Learning, IoT, Blockchain, Autonomous Systems and Cyber Security, winning prestigious awards, generating research impact and IP, and securing significant grants from national and international funding agencies and industries.

AVCN is the UWS leading force for cutting-edge technology research for a sustainable future. AVCN has a proven track record of leading national and international projects from European Commission, EPSRC, Research Councils UK, Innovate UK, Scottish Funding Council (SFC), Scottish Innovation Centres and industries. Since 2014, the AVCN research institute has hosted over 40 small and large externally funded research and knowledge transfer projects, including coordinating large consortiums of EU projects. The institute has been collaborating with over 50 international partners.

Connect with us

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1 List of Presenters

Opening & Closing Speakers

- **Prof. Robert MacIntosh** - Deputy VC & PVC (R&I)
- **Prof. Gordon Morison** - Dean of the School of CEPS
- **Prof. Keshav Dahal** - AVCN Institute Co-Lead
- **Prof. Naeem Ramzan** - AVCN Institute Co-Lead & UoA 11 Lead
- **Prof. John Smith** - ADRI School of CEPS

Parallel Session 1

- **Dr Marco Gilardi** - UWS Creative Computing Technologies (UWS CCT)
- **Mr Julius Bernikas** - UWS Creative Computing Technologies (UWS CCT)
- **Ms Lara McIntyre** - UWS Creative Computing Technologies (UWS CCT)
- **Ms Panagiota (Penny) Trevlopoulou** - UWS Creative Computing Technologies (UWS CCT)
- **Mr Dave Johnston** - UWS Creative Computing Technologies (UWS CCT)

Parallel Session 2

- **Dr Tahir Mahmood** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)
- **Dr Joanna Olszewska** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)
- **Dr Paul Keir** - UWS Creative Computing Technologies (UWS CCT)
- **Dr Gabriel Okolo** - Digital Connectivity & Innovation Centre (DCIC)
- **Mr Edward Jennings** - Digital Connectivity & Innovation Centre (DCIC)

Parallel Session 3

- **Dr Thomas Hainey** - UWS Creative Computing Technologies (UWS CCT)
- **Mr Liam Mcphee** - UWS Creative Computing Technologies (UWS CCT)
- **Ms Qi Chen** - Beyond5G (B5GHub)
- **Mr Wei Ning** - UWS Creative Computing Technologies (UWS CCT)
- **Mr Adebowale Osanyingbe** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Parallel Session 4

- **Dr Yingbo Zhu** - Digital Connectivity & Innovation Centre (DCIC)
- **Mr Timo Lange** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)
- **Mr Sujan Sharma** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)
- **Mr Muhammad Tufail Khan** - Affective and Human Computing for Smart Environments (AHCSE)
- **Dr Fahad Ayaz** - Digital Connectivity & Innovation Centre (DCIC)

Parallel Session 5

- **Dr Ahren Hart** - Digital Connectivity & Innovation Centre (DCIC)
- **Mr Adam Ashford** - Digital Connectivity & Innovation Centre (DCIC)
- **Dr Alexander Dow** - Drone Systems Laboratory (DSL)
- **Mr Michal Oszczudlowski** - Drone Systems Laboratory (DSL)
- **Mr Tamas Ilcsik** - Drone Systems Laboratory (DSL)

Parallel Session 6

- **Mr Md Abdul Kalam** - Digital Connectivity & Innovation Centre (DCIC)
- **Ms Shehrzad** - Digital Connectivity & Innovation Centre (DCIC)
- **Mr Samson Adetutu-Amao** - Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)
- **Ms Ogochukwu Ejike** - Digital Connectivity & Innovation Centre (DCIC)

2 Conference Programme

Time	Activity	
09:00	**Coffee & Participants Registration (P-Block Entrance)**	
09:30	**Conference Opening (P118)**	
09:30	Welcome and Opening – *Prof. Robert MacIntosh (Deputy VC & PVC (R&I))*	
09:45	Research in the School of CEPS – *Prof. Gordon Morison (Dean of CEPS)*	
10:00	Housekeeping – *Dr Marco Gilardi*	
10:05	The AVCN Institute – *Prof Keshav Dahal*	
10:25	From Research to Real-World Impact – *Prof Naeem Ramzan*	
10:45	**Coffee (P121/123/125)**	
11:00	**Parallel Session 1 (Room P118)** *Chair: Dr Evi Viza*	**Parallel Session 2 (Room P114)** *Chair: Dr Shahid Awan*
11:00	**Marco Gilardi** *A Web-Based Agnostic Framework for Audio Generation from Interconnected 360 Images*	**Tahir Mahmood** *Circular Twin: A Digital Twin Framework for Lifecycle Prediction and Circular Economy in Built Environments*
11:15	**Julius Bernikas** *Inclusive WebXR for Blind and Low Vision Users in Cultural Heritage*	**Joanna Olszewska** *Trustworthy Autonomous Systems: Current Technical Challenges and Societal Impact*
11:30	**Lara McIntyre** *Deaf communication in virtual reality*	**Paul Keir** *ClangOz: Parallel constant evaluation of C++ map and reduce operations*
11:45	**Panagiota (Penny) Trevlopoulou** *Real-Time Cloth Simulations to Enhance Engagement and Education in Historic Fashion Exhibitions*	**Gabriel Okolo** *Bridging the Gap: An Experience Report on Deploying a Centralized Azure AI Gateway in an Engineering Enterprise*
12:00	**Dave Johnston** *Can game characters move beyond scripted responses to become truly reactive personalities?*	**Edward Jennings** *The case for AI-enabled monitoring in soft fruit production.*
12:15	**Networking Lunch and Demos (P121/123/125)**	
13:30	**Parallel Session 3 (Room P118)** *Chair: Prof Keshav Dahal*	**Parallel Session 4 (Room P114)** *Chair: Dr Tahir Mahmood*
13:30	**Thomas Hainey** *Staff Attitudes, Perceived Challenges, Concerns and Uses of Generative AI in Higher Education*	**Muhammad Tufail Khan** *mmWave radar-based assistive navigation system*

13:45	**Liam Mcphee** *Economic security risks in telco technology: A comparative study of Legacy, Hybrid and Cloud-Native architecture*	**Yingbo Zhu** *Design and Deployment of a Real-Time Monitoring Dashboard for Biomass Briquette Production: An Industry Case Study with Land Energy*
14:00	**Qi Chen** *XR-Based Visualisation for Networking Education within a Digital Twin Framework*	**Timo Lange** *Pitfalls in Multispectral In-Field Strawberry Detection: Challenges and First Results for Ripeness Classification in Robotic Harvesting*
14:15	**Wei Ning** *Multi-Point Thermal Haptics for Immersive VR: Design and Dissipation Optimisation of a Ring-Based Modular System for Perceptual Fidelity*	**Sujan Sharma** *An Agentic AI Framework for Enhancing Data Trustworthiness in Blockchain Systems*
14:30	**Osanyingbe Adebowale Teslim** *Application of Artificial Intelligence/ Machine Learning Techniques to Utility System Under Uncertainty for AI-Assisted Decarbonisation*	**Fahad Ayaz** *AI and IoT-Enabled Real-Time Early Warning System for Extreme Weather Events*
14:45	**Coffee Break (P121/123/125)**	
15:00	**Parallel Session 5 (Room P118)** *Chair: Dr Edward Jennings*	**Parallel Session 6 (Room P114)** *Chair: Dr Joanna Olszewska*
15:00	**Ahren Hart** *IoT-Enabled Digital Twins for Robotics over Private 5G Networks: Security, Fault Detection, and Environmental Monitoring*	**Md Abdul Kalam** *Transforming Project Management Through AI, IoT, and 5G and Beyond: A Framework for Intelligent, Real-Time Decision-Making in Complex Environments*
15:15	**Adam Ashford** *Predicting extreme heat using environmental parameters and machine learning: a global scoping review*	**Shehrzad** *A Digital Twin Framework for Missing Diagnosis Prediction*
15:30	**Alexander Dow** *Drone Systems Laboratory Research Overview*	**Samson Adetutu-Amao** *SQL-Native Medallion Architecture: Design Patterns and a Case Study for Analytics Engineering at Small and Medium Enterprises*
15:45	**Michal Oszczudlowski** *A Lightweight Deep Learning Architecture for Crack Segmentation in Structural Health Monitoring*	**Ogochukwu Ejike** *Regime-Aware Short-Range Rain Occurrence Forecasting*
16:00	**Tamas Ilcsik** *Federated Self-Supervised Learning for Aerial Environmental Monitoring*	**Jonathan Conn** *Digital Dairy Chain Product Predictions - Improving Manufacturing Efficiency with Machine Learning*
16:15	**Conference closing – Prof. John F. Smith (P118)**	

3 Opening Speakers

Prof. Robert MacIntosh

Deputy VC & PVC (R&I)

Opening and Welcome

Prof. Gordon Morison

Dean of the School of CEPS

Research in the School of CEPS

Prof. Keshav Dahal

AVCN Institute Co-Lead & UoA 11 CKU Lead

The Artificial intelligence Virtual Communications & Networks Institute

The Artificial Intelligence, Virtual Communications & Networks (AVCN) Research Institute is one of UWS's leading centres for advanced digital technology research and innovation. Over the past decade, AVCN has established a strong international reputation in areas including artificial intelligence, extended reality, 5G and beyond networks, IoT, cybersecurity, autonomous systems, blockchain, and data analytics. The institute has successfully delivered numerous national and international research projects funded by organisations such as the European Commission, Innovate UK, EPSRC, and industry partners. This talk highlights AVCN's research achievements, collaborative ecosystem, impact-driven activities, knowledge exchange initiatives, and its vision for shaping sustainable and intelligent digital futures.

Prof. Naeem Ramzan

AVCN Institute Co-Lead & UoA 11 Lead

From Research to Real-World Impact: Latest AVCN Use Cases and REF Alignment

This talk will showcase the latest research and innovation activities within AVCN, highlighting high-impact use cases across artificial intelligence, healthcare, engineering, and digital transformation. Through real-world examples, the presentation will demonstrate how interdisciplinary research is being translated into practical solutions that address societal and industrial challenges. A central theme of the talk is how AVCN research aligns with the Research Excellence Framework (REF), particularly Unit of Assessment (UoA) 11, by delivering research that demonstrates originality, significance, and rigour while generating measurable impact beyond academia.

Prof. John Smith

ADRI School of CEPS

Closing Remarks

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4 Sessions Abstracts

Parallel Session 1

Dr Marco Gilardi

UWS Creative Computing Technologies (UWS CCT)

A Web-Based Agnostic Framework for Audio Generation from Interconnected 360 Images

Virtual tourism enables users to visit real places digitally using technologies such as extended realities (XR) and 360 imagery, such as street-view. However, the user experience of virtual travel using 360 imagery can be a silent one, or augmented by generic soundtracks that do not take into account the context represented in the image.
This talk presents the work in progress of a novel, web-based agnostic framework to procedurally generate contextually appropriate ambient and object sounds from single equirectangular images. By treating AI models as pluggable strategies, the framework ensures that navigation logic remains independent of specific model schemas, allowing the system to define "intents" that maintain auditory continuity across interconnected panoramas. To show that the framework is functional, a specialized implementation of the system strategies was created, leveraging an open visual language model and a latent diffusion audio model to generate sounds as the user travels the 360 imagery of the world.

Mr Julius Bernikas

UWS Creative Computing Technologies (UWS CCT)

Inclusive WebXR for Blind and Low Vision Users in Cultural Heritage

This talk explores accessibility challenges in immersive WebXR environments for blind and low vision (BLV) users in digital cultural heritage. While 3D web technologies are expanding, accessibility guidance and practical solutions remain limited. The research adopts a human-centred design approach, drawing on insights from interviews with BLV participants to identify barriers in navigation, interaction, and understanding 3D content. It proposes an AI-driven assistive framework that generates audio and text descriptions for 3D environments, improving usability and compatibility with existing assistive tools. The work highlights practical steps toward making immersive cultural heritage experiences more inclusive.

Ms Lara McIntyre

UWS Creative Computing Technologies (UWS CCT)

Deaf communication in virtual reality

VR offers significant opportunities to support sign language. However, existing systems are designed around other communication modalities. My research critically examines how communication for deaf users is represented and supported in VR. This talk presents a scoping literature review and a categorisation of current communication methods in VR, evaluating the linguistic and cultural requirements of VR software for deaf users. The analysis reveals persistent assumptions in current HCI research, where deaf communication is reduced to simplified or substitute modalities. A gap existing in designing VR software with sign language as a primary communication modality.

Ms Panagiota (Penny) Trevlopoulou

UWS Creative Computing Technologies (UWS CCT)

Real-Time Cloth Simulations to Enhance Engagement and Education in Historic Fashion Exhibitions

Historic Garment (HG) exhibitions are of significant importance to museums, attracting a substantial amount of visitors and income. Despite being objects that were created to be in motion, HG are presented as static objects, and exhibiting them as dynamic artefacts has historically been a challenge.
With my research, I am examining how Augmented Reality and Real-time 3D Simulations can be utilised to enhance HG exhibitions, thus promoting visitor engagement and accelerating education on HGs. Museum visitors can experience the HG in movement, while learning about sewing and construction techniques used, safeguarding this way our Historic Heritage.

Mr Dave Johnston

UWS Creative Computing Technologies (UWS CCT)

Can game characters move beyond scripted responses to become truly reactive personalities?

Traditional NPCs rely on predictable dialogue trees that limit player agency and immersion. This research explores how large language models can enable free-text, natural language interactions while remaining viable on consumer hardware. Building on a comparative benchmark of LLM families, parameter tiers, and 4-bit quantised versus native designs, we first identify efficient deployment pathways for VRAM-limited systems. These findings inform a bespoke web application for a user study comparing multiple-choice dialogue with natural language input, evaluating how adaptive NPCs can support more immersive, interactive, and inclusive digital experiences.

Parallel Session 2

Dr Tahir Mahmood

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Circular Twin: A Digital Twin Framework for Lifecycle Prediction and Circular Economy in Built Environments

This talk will be about Circular Twin, a sensor-free digital twin framework developed to support circular economy decision-making in built environments. The approach eliminates reliance on physical sensors by integrating material degradation models, environmental data, and usage patterns to estimate the Remaining Useful Life (RUL) of components such as steel, aluminium, and wood. The framework combines data-driven and physics-informed methods to enable predictive maintenance, lifecycle optimisation, and sustainable material selection. A prototype single-room house dashboard demonstrates real-time simulation and scenario analysis. Circular Twin supports stakeholders in reducing waste, extending asset lifespan, and improving resource efficiency for sustainable infrastructure systems.

Dr Joanna Olszewska

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Trustworthy Autonomous Systems: Current Technical Challenges and Societal Impact

Nowadays, autonomous systems (AS) are a fast-growing and buzzing area of research and development - from robotic systems to AI agents. Therefore, their trustworthiness is crucial for all AS key stakeholders, i.e. developers, manufacturers, regulators, governments, operators and users.
In this talk, I will outline my current EU project I am Principal Investigator of. I will also present some current projects I have led and supervised as well as my ongoing research in the area of TAS along with my contributions to TAS international standardization efforts.

Dr Paul Keir

UWS Creative Computing Technologies (UWS CCT)

ClangOz: Parallel constant evaluation of C++ map and reduce operations

Interest in metaprogramming, reflection, and compile-time evaluation continues to inspire and foster innovation among the users and designers of the C++ programming language. Regrettably, the impact on compile-times of such features can be significant; and outside of build systems, multi-core parallelism is unable to bring down compilation times of individual translation units. We present ClangOz, a novel Clang-based research compiler that addresses this issue by evaluating annotated constant expressions in parallel, thereby reducing compilation times. Prior benchmarks analyzed parallel map operations, but were unable to consider reduction operations. Thus we also introduce parallel reduction functionality, alongside two additional benchmark programs.

Dr Gabriel Okolo

Digital Connectivity & Innovation Centre (DCIC)

Bridging the Gap: An Experience Report on Deploying a Centralized Azure AI Gateway in an Engineering Enterprise

The rapid and uncoordinated adoption of Large Language Models (LLMs) in enterprise settings frequently leads to “shadow AI” employees utilising third-party, public-facing AI services without organisational IT oversight. This practice introduces significant risks concerning data privacy, intellectual property leakage, and regulatory compliance. This paper presents an experience report on the design, incremental deployment, and multi-dimensional evaluation of a centralised Enterprise AI Gateway (the “bw AI” platform) within an engineering firm. The platform, built on React, FastAPI, and Microsoft Azure AI Foundry, provides secure Single Sign-On access to custom configured, department specific AI agents. We describe the principal architectural decisions, report on observed adoption dynamics, and present the evaluation measures used to assess compliance, usability, and organisational impact.

Mr Edward Jennings

Digital Connectivity & Innovation Centre (DCIC)

The case for AI-enabled monitoring in soft fruit production

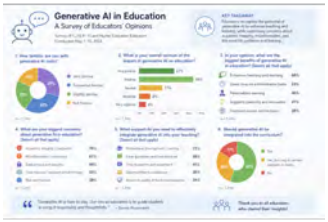
Climate change is making crop production increasingly difficult as rising temperatures drive pest resistance and alter disease behaviour. Our research addresses the need for improved food security by developing systems to monitor and control crop environments. Using the new precision agriculture lab, the project integrates multi-spectral imagery and sensor data with a view to full automation of crop production. Recently presented at SUSTECH 2026 in California, the SPADE device has shown that acting on AI driven insights can reduce the time from planting to flowering by a week. Future research will further automate the process, removing the need for human intervention and building a dataset for custom AI model development.

Parallel Session 3

Dr Thomas Hainey

UWS Creative Computing Technologies (UWS CCT)

Staff Attitudes, Perceived Challenges, Concerns and Uses of Generative AI in Higher Education



Generative AI has fundamentally changed the Higher Educational environment. Patel (2024) states that "it uses machine learning models to produce outputs, such as text, images, or music, that are new and unique. It essentially allows computers to generate creative content that appears as though it could have been made by a human." This study will present the results of a survey of academic and professional services staff attitudes, uses and perceptions of the use of Generative AI at UWS. This will describe tool use, benefits, challenges, concerns, and inform pedagogical and governance strategy at UWS and HE in general.

Mr Liam Mcphee

UWS Creative Computing Technologies (UWS CCT)

Economic security risks in telco technology: A comparative study of Legacy, Hybrid and Cloud-Native architecture

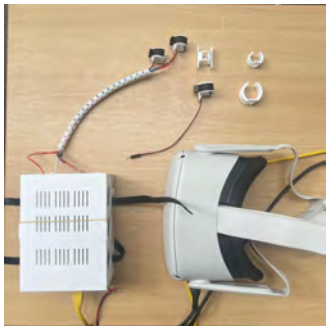
Telecommunications providers have shown cyclical phases of technological adoption which are characterised by periods of infrastructure growth and reduction. These phases are caused by more than just economical market fluctuations but also regulatory and security constraints. This tension between competitive advantage or cost efficiency vs compliance and risk mitigation showcases the constant balance organisations must strike between innovation and governance obligations. This study uses a combination of institutional theory and anonymized questionnaires to examine the interplay of regulations and organisational decision making within telcos. Comparative case studies and collected data will identify how economic drivers allow rapid deployment of emergency technology while also examining how regulatory interventions slow that same deployment.

Ms Qi Chen

Beyond5G (B5GHub)

XR-Based Visualisation for Networking Education within a Digital Twin Framework

This talk presents ongoing PhD research exploring XR-based visualisation for networking education within a Digital Twin framework. Over the past months, progress has advanced along two parallel strands. On the technical side, structured training in Unity has established a strong foundation in XR development, including VR fundamentals and ongoing Mobile AR development, in preparation for future prototype implementation. In parallel, a research paper on XR-based visualisation for complex networking systems is under development, including cross-institutional data collection and ongoing manuscript refinement in preparation for submission to IEEE Transactions on Learning Technologies. Current work focuses on strengthening the system's technical framing and preparing for prototype design and evaluation.



Mr Wei Ning

UWS Creative Computing Technologies (UWS CCT)

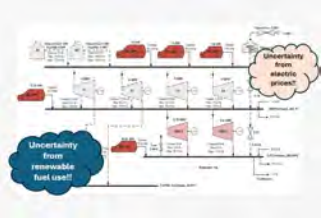
Multi-Point Thermal Haptics for Immersive VR: Design and Dissipation Optimisation of a Ring-Based Modular System for Perceptual Fidelity

This talk presents the design and evaluation of wearable thermal haptic rings for immersive virtual reality. The system integrates a compact Peltier module, temperature sensing, and real-time control to provide dynamic thermal feedback during object interaction. A controlled user study compares VR experiences with and without thermal feedback, examining perceived realism, immersion, and user comfort. The results show that thermal feedback enriches the sensory experience, but challenges remain regarding the device's ergonomics and temperature stability.

Mr Adebowale Osanyingbe

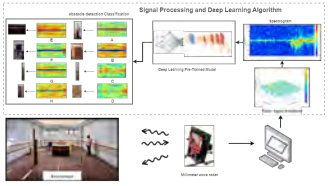
Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Application of Artificial Intelligence/ Machine Learning Techniques to Utility System Under Uncertainty for AI-Assisted Decarbonisation



This research investigates how artificial intelligence and machine learning can support the decarbonisation and operational optimisation of industrial utility systems under uncertainty. Focusing on combined heat and power plants, multi-pressure steam networks, and electric boiler integration, the study develops an uncertainty-aware decision-support framework for reducing cost, emissions, and energy losses while maintaining reliable steam supply. The work combines techno-economic analysis, mixed-integer optimisation, and data-driven uncertainty modelling to assess operational strategies under variable demand, electricity prices, renewable availability, and equipment performance. The research aims to provide practical, robust pathways for low-carbon, flexible, and intelligent industrial energy systems.

Parallel Session 4



Mr Muhammad Tufail Khan

Affective and Human Computing for Smart Environments (AHCSE)

Integration of Millimeter-Wave Radar and Deep Learning for Assistive Obstacle Detection Systems for Visually Impaired Individuals

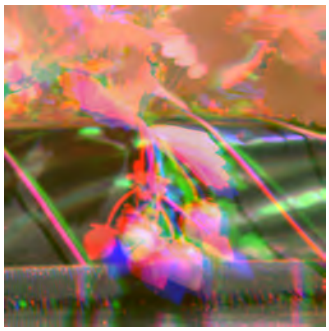
My work presents a millimeter-wave (mmWave) radar-based assistive navigation system that integrates advanced deep learning models for obstacle detection and classification. The system addresses limitations of traditional assistive technologies in providing environmental awareness for visually impaired individuals, particularly in dynamic scenarios.

Dr Yingbo Zhu

Digital Connectivity & Innovation Centre (DCIC)

Design and Deployment of a Real-Time Monitoring Dashboard for Biomass Briquette Production: An Industry Case Study with Land Energy

Developed by the Digital Connectivity & Innovation Centre (DCIC) in collaboration with our industry partner Land Energy, this project presents a real-time monitoring dashboard for the company's briquette production line, providing live visibility such as mill current, energy consumption, and process temperature across the plant. The system is underpinned by a custom data pipeline that streams SCADA exports into a centralised database, establishing the data foundation required for AI-driven predictive maintenance. Future development will apply machine learning to the accumulated operational data to forecast equipment faults, anticipate unplanned downtime, and identify drivers of Overall Equipment Effectiveness (OEE), enabling a shift from reactive maintenance towards a proactive, data-led approach to plant reliability and efficiency.



Mr Timo Lange

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Pitfalls in Multispectral In-Field Strawberry Detection: Challenges and First Results for Ripeness Classification in Robotic Harvesting

In agriculture, autonomous robotic harvesting of strawberries in unstructured outdoor fields faces significant challenges from variable lighting, occlusions, and fruit clustering. While RGB-based detection is common, multispectral imaging (MSI) promises enhanced ripeness classification, yet in-field applications remain underexplored. We present a novel MSI dataset from a commercial strawberry farm, with strawberries, annotated as unripe, ripe, or overripe. We adapt YOLOv8 for MSI and compare baselines against RGB counterparts, revealing key challenges like imperfect image registration and HDR artifacts, resulting in MSI underperformance . Our findings highlight deployment pitfalls for robotic systems and provide a foundation for future in-field MSI advancements.

Mr Sujan Sharma

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

An Agentic AI Framework for Enhancing Data Trustworthiness in Blockchain Systems

Blockchain ensures immutability but not the trustfulness of input data, limiting its reliability in real-world applications. This research proposes an agentic AI–driven framework integrated with large language models (LLMs) to enhance end-to-end trust across the blockchain lifecycle. The framework incorporates intelligent input validation, interaction with the blockchain system, continuous monitoring, and generation of actionable insights from transactions. Autonomous agents perform semantic verification and multi-source cross-checking before data is recorded on-chain. A proof-of-concept demonstrates improved data integrity, anomaly detection, and transparency. Results suggest that embedding agentic AI layers can significantly strengthen trust and usability in blockchain-based systems.

Dr Fahad Ayaz

Digital Connectivity & Innovation Centre (DCIC)

AI and IoT-Enabled Real-Time Early Warning System for Extreme Weather Events

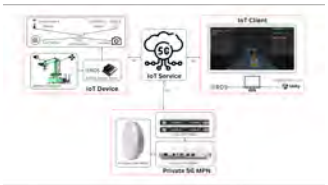
Extreme weather events, including heavy rainfall and heatwaves, are increasing in both frequency and severity, placing significant health burdens on vulnerable communities and overwhelming existing response systems. This work presents an AI-driven early warning system for predicting these events and their associated health risks using real-time and historical environmental data. The system integrates low-cost environmental sensors, machine learning models, and a real-time dashboard to enable continuous monitoring and timely decision-making. Built on over 667,000 sensor records from KwaZulu-Natal, South Africa, it employs evidence-based machine learning approaches to generate localised predictions and support early warning alerts.

Parallel Session 5

Dr Ahren Hart

Digital Connectivity & Innovation Centre (DCIC)

IoT-Enabled Digital Twins for Robotics over Private 5G Networks: Security, Fault Detection, and Environmental Monitoring



An IoT digital twin framework for real-time robotic monitoring in Industry 4.0, using a robotic arm as a case study. It combines 5G connectivity with SATCOM backhaul to address latency, security, and efficiency in physical-virtual synchronisation. Built on a Jetson Nano, ROS, and Unity, the system targets three objectives: real-time synchronisation, threshold-based fault detection, and facial recognition security. Vodafone's 5G private network and Starlink SATCOM ensure reliable data transfer across environments. Testing across 5G standalone, non-standalone, and SATCOM configurations yielded average latencies of 130–270 ms over 10 iterations per setup.

Mr Adam Ashford

Digital Connectivity & Innovation Centre (DCIC)

Predicting extreme heat using environmental parameters and machine learning: a global scoping review

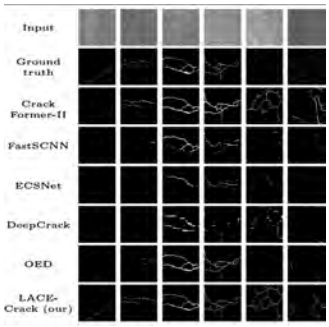
As extreme heat events become increasingly frequent, accurate forecasting has become critical for protecting public health, particularly in high-risk regions. This review synthesises existing literature on the application of machine learning techniques for heatwave prediction using environmental parameters. The findings indicate that models such as neural networks and random forests consistently achieve strong predictive performance, with temperature-related variables emerging as the most influential predictors. However, current research is geographically concentrated in Europe and North America, highlighting significant underrepresentation in some regions. This will contribute to the development of a data-driven early warning system for heatwaves in Durban, South Africa.

Dr Alexander Dow

Drone Systems Laboratory (DSL)

Drone Systems Laboratory Research Overview

This talk presents a summary of the Drone Systems Laboratory's current research work in drone-based environmental solutions. Our work seeks to improve efficiency, latency, and accuracy, whilst reducing manual involvement and data relocation. We present an overview of recent research, including novel approaches to convolutions to reduce energy consumption during training of A.I. networks, the design of new deformable image registration networks to account for wind motion in aerial photogrammetry, and federated self-supervised learning for tree canopy and vegetation segmentation. We also present how this state-of-the-art research now directly underpins the teaching for the MSc Advanced Drone Technology course.



Mr Michal Oszczudlowski

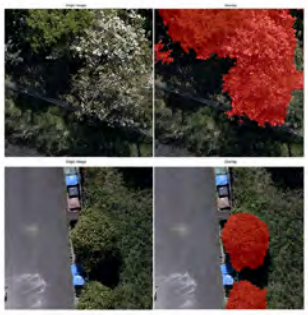
Drone Systems Laboratory (DSL)

A Lightweight Deep Learning Architecture for Crack Segmentation in Structural Health Monitoring

Crack detection is important for structural health monitoring. Many deep learning models are too slow and too heavy for real-world deployment. In our research, we focus on building models that are lighter and faster. We want them to run on edge devices and still give strong results. The goal is to keep performance close to state of the art while reducing computational cost. We also test the models on a wide range of images, covering different materials, textures, and lighting conditions. The results show that lightweight models can still deliver accurate and reliable crack detection in practical scenarios.

Mr Tamas Ilcsik

Drone Systems Laboratory (DSL)



Federated Self-Supervised Learning for Aerial Environmental Monitoring

This talk presents ongoing PhD research on AI-driven biodiversity monitoring using high-resolution aerial imagery. The work investigates federated self-supervised learning for adapting large Vision Transformer models, such as DINOv2, without centralising raw image data. Fully Sharded Data Parallelism is used to support the adaptation of large models across available GPUs. The adapted backbone is evaluated with a Mask2Former segmentation head for tree canopy and vegetation segmentation from UAV and aerial datasets, including contexts linked to Network Rail and Glasgow City Council. The research explores how privacy-preserving, label-efficient learning can support scalable environmental monitoring, reduce manual annotation requirements, and improve computer vision methods for ecological applications.

Parallel Session 6

Mr Md Abdul Kalam

Digital Connectivity & Innovation Centre (DCIC)

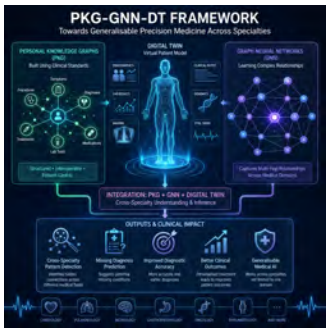
Transforming Project Management Through AI, IoT, and 5G and Beyond: A Framework for Intelligent, Real-Time Decision-Making in Complex Environments

This research explores how present project management methodologies are shifting in response to technological innovation. Specifically, it analyses the integration of artificial intelligence (AI), IoT sensors, 5G connectivity, and Digital twin technology into a single but comprehensive framework.
This research explores the deployment of these technologies into farming, construction, and business through an analysis of previous literature and modern system architectures. The results show that most of the present tools operate in isolation with little interaction across systems. This has led to the absence of a comprehensive platform that enables project managers to make data-driven decisions on the go.
The contribution of the study is to identify the existing status of technology adoption and major gaps in integration. It also provides guidance for future research.

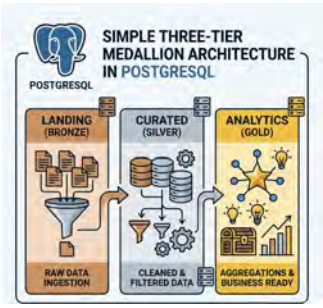
Ms Shehrzad

Digital Connectivity & Innovation Centre (DCIC)

A Digital Twin Framework for Missing Diagnosis Prediction



Precision medicine aims to provide treatments tailored to each patient using detailed health data. However, current approaches face key limitations. Many digital twin systems, or virtual patient models, remain underdeveloped and do not fully utilise artificial intelligence. Traditional machine learning often oversimplifies patient data, losing important medical relationships. Moreover, existing technologies cannot efficiently detect patterns across multiple medical specialities. This research proposes the PKG-GNN-DT Framework, which integrates Personal Knowledge Graphs (PKG), built on clinical standards, with Graph Neural Networks (GNN). This approach enables cross-disciplinary pattern detection and prediction of missing diagnoses. Initial results indicate improved diagnostic accuracy and clinical outcomes. Overall, the framework provides a pathway towards generalisable medical AI.



Mr Samson Adetutu-Amao

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

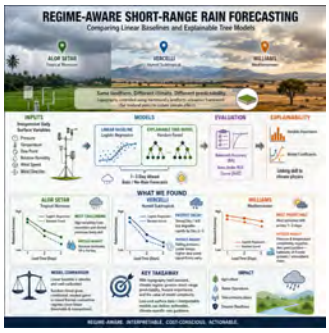
SQL-Native Medallion Architecture: Design Patterns and a Case Study for Analytics Engineering at Small and Medium Enterprises

Modern data engineering tooling, including cloud warehouses, dbt, Spark, and orchestration platforms, assumes budgets and skills that exclude most small and medium enterprises. I present a case study of a three-tier medallion architecture (landing, curated, analytics) implemented entirely within PostgreSQL at a specialty paper trading firm, integrating six heterogeneous data sources spanning external APIs and internal ERP systems. From the deployment I derive five reusable design patterns covering schema-agnostic JSONB landing, regex-guarded type coercion, idempotent transformation, two-scheduler separation, and structural lineage. I evaluate the architecture against standard platform requirements and identify the volume, heterogeneity, and team-size thresholds at which the approach fails.

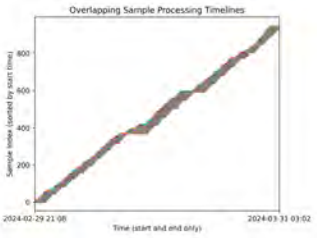
Ms Ogochukwu Ejike

Digital Connectivity & Innovation Centre (DCIC)

Regime-Aware Short-Range Rain Occurrence Forecasting



Regime-aware short-range rain occurrence forecasting is evaluated across terrain-controlled flat lowland plains in tropical monsoon (Alor Setar), humid subtropical (Vercelli), and Mediterranean (Williams) climates. Using inexpensive daily surface variables, a linear baseline, logistic regression, is compared with explainable random forest models for one- to three-day forecasts under forward-chaining validation. Balanced Accuracy and AUC show a clear climate hierarchy: Williams is most skilful, Vercelli degrades rapidly after Day 1, and Alor Setar is hardest. Coefficients and variable importance link performance to regime physics. Tree gains are conditional, while linear baselines often provide steadier, actionable, and low-cost guidance.



Dr Jonathan Conn

Data anaLyTics for Intelligent and Autonomous Systems (DeLTA)

Digital Dairy Chain Product Predictions - Improving Manufacturing Efficiency with Machine Learning

This study presents a machine learning framework for the simultaneous prediction of salt, moisture, fat, and protein content in cheese curd products. Models are trained on data extracted from a bespoke industrial SCADA system, processed through a comprehensive cleaning pipeline that aggregates raw sensory outputs into normalised statistical features. Given that sensor timestamps are unavailable, data is treated as a pseudo-time series, ordered sequentially across three reaction chambers along the production line. Initial results are promising; however, the presence of outliers poses significant predictive challenges and raises important strategic considerations regarding real-world model deployment.

Organizing Committee & Volunteers

General Chairs: Prof. Keshav Dahal
Dr Marco Gilardi

Programme Chair: Dr Marco Gilardi

Local Arrangements: Dr Marco Gilardi
Ms Emma McMillan
Ms Alison McIntosh

Volunteers: Dr Jonathan Conn
Dr Ravi Koirala
Dr Tahir Mahmood
Ms Hannah Abasiekong
Mr Samuel Oluwatosin Adejuyitan
Mr MD Abdul Kalam
Mr Huzaifa Ramzan
Mr Sujan Sharma

Participating Groups

UNIVERSITY OF THE WEST of SCOTLAND UWS | DeLTA: Data anaLyTics for intelligent and Autonomous systems

UNIVERSITY OF THE WEST of SCOTLAND UWS | CCT CREATIVE COMPUTING TECHNOLOGIES

UNIVERSITY OF THE WEST of SCOTLAND UWS | AHCSE Affective and Human Computing for Smart Environments

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DRONE SYSTEMS LAB

Thank you for attending the 2nd AVCN Institute Conference (AVCN 2026).

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