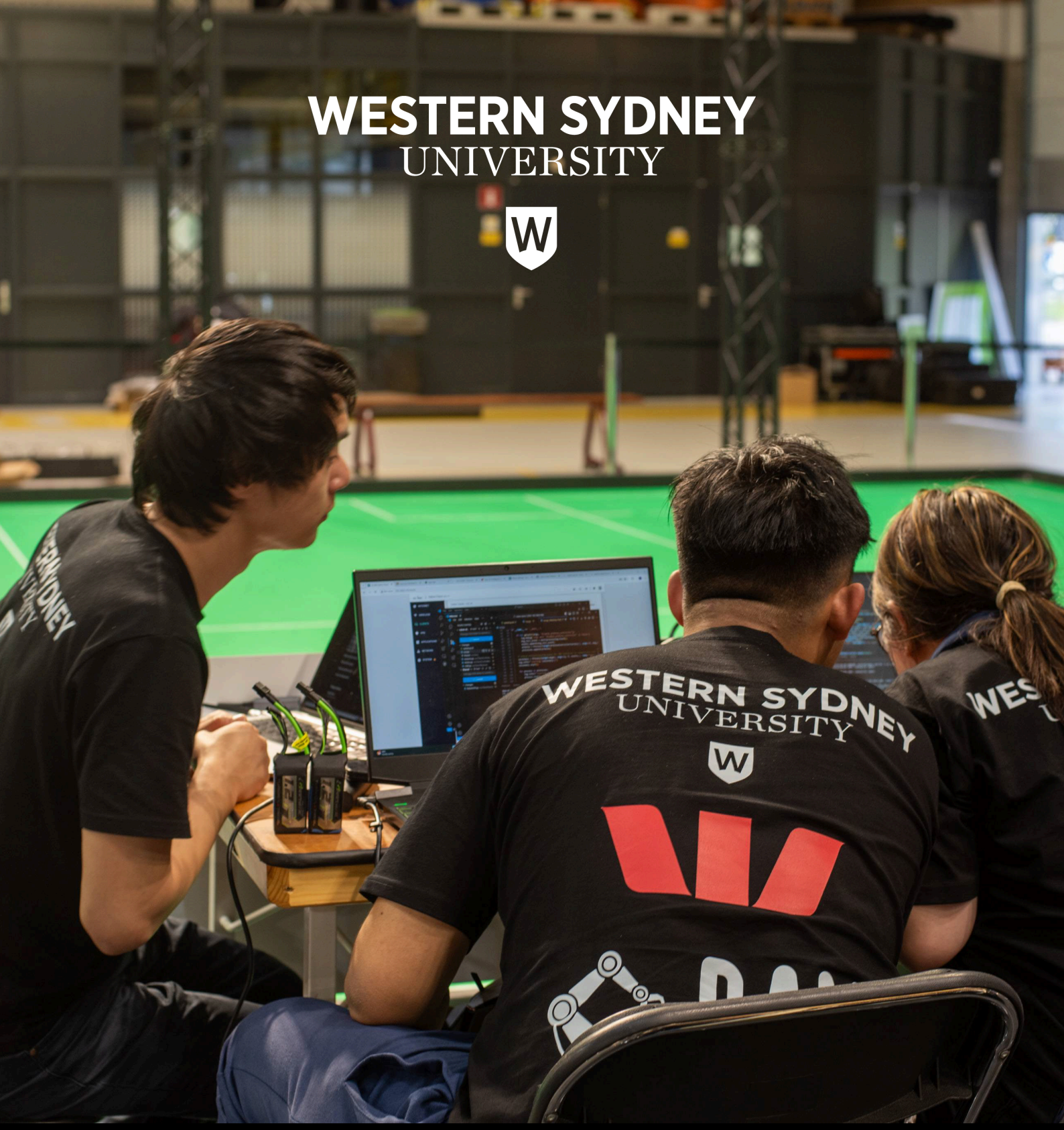


Innovation in Computer, Data and Mathematical Sciences

Welcome / Warami

We acknowledge the Dharug Nation, the Traditional Custodians of the land on which Western Sydney University stands. For tens of thousands of years, this region has nurtured continuous learning, innovation, and community. Today, we honour that legacy by cultivating the next generation of innovators in Computer, Data, and Mathematical Sciences. Together, we build on the rich heritage of our First Peoples to shape digital futures that are inclusive, ethical, and transformative.

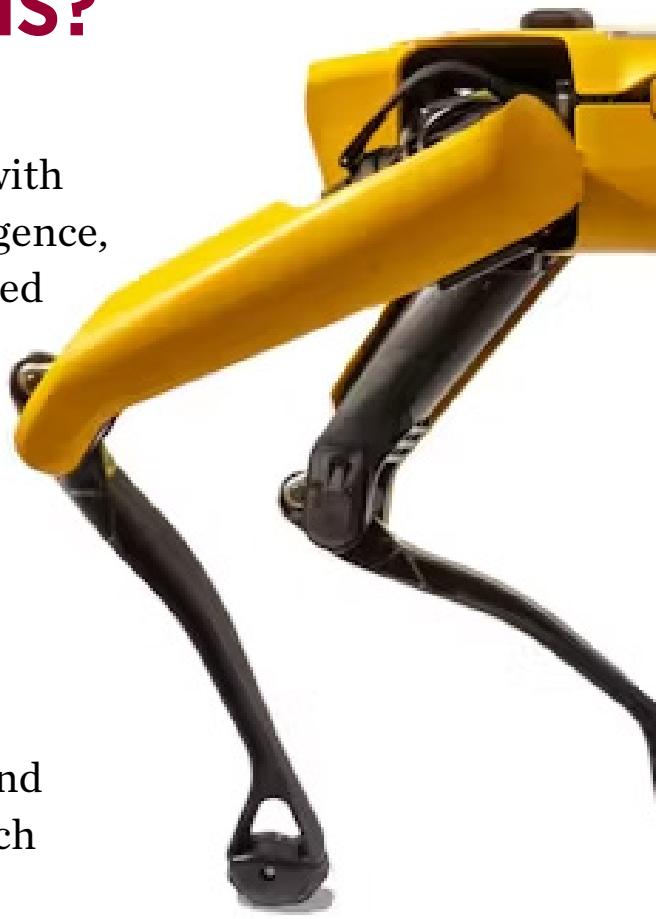
Professor Kurt Langfeld, Dean
School of Computer, Data and Mathematical Sciences

We bridge research, education, and industry so that technology serves people and planet.

At the School of Computer, Data, and Mathematical Sciences, our mission is clear: to bridge research, education, and industry so that technology serves people and planet. We prepare students and partners to succeed in a world defined by AI, data-driven decision-making and connected systems. Our vision is to be the catalyst for breakthroughs that enhance lives, in Western Sydney and globally.

Assoc Prof Anupama Ginige
Deputy Dean of CDMS

Why partner with CDMS?



Access pioneering research: Collaborate with experts whose work spans artificial intelligence, machine learning, cybersecurity, distributed systems, mathematics, and advanced data analytics.

Innovate faster: Leverage state-of-the-art facilities and interdisciplinary teams to accelerate R&D, reduce time-to-market, and validate new ideas through applied research projects.

Talent Pipeline: Engage with a diverse cohort of students and graduates who are industry-ready, technologically skilled, and driven to solve real-world problems.

Social impact: Partner with us on initiatives that prioritise sustainability, fairness, and community outcomes.

Research Themes & Capabilities

Asssoc Professor Yi Guo
Associate Dean, Research

Our research themes highlight the breadth of expertise, the depth of our collaborations, and the dedicated research that drives impactful outcomes. Each theme opens opportunities for industry to co-create new solutions.

AI, Data & Secure Computing

Artificial Intelligence & Machine Learning

Deep learning, reinforcement learning, generative models

Ethical AI, explainability, and bias mitigation

Natural language processing, computer vision, logistics and environmental monitoring

Cybersecurity & Trusted AI

Advanced threat detection, privacy-preserving analytics

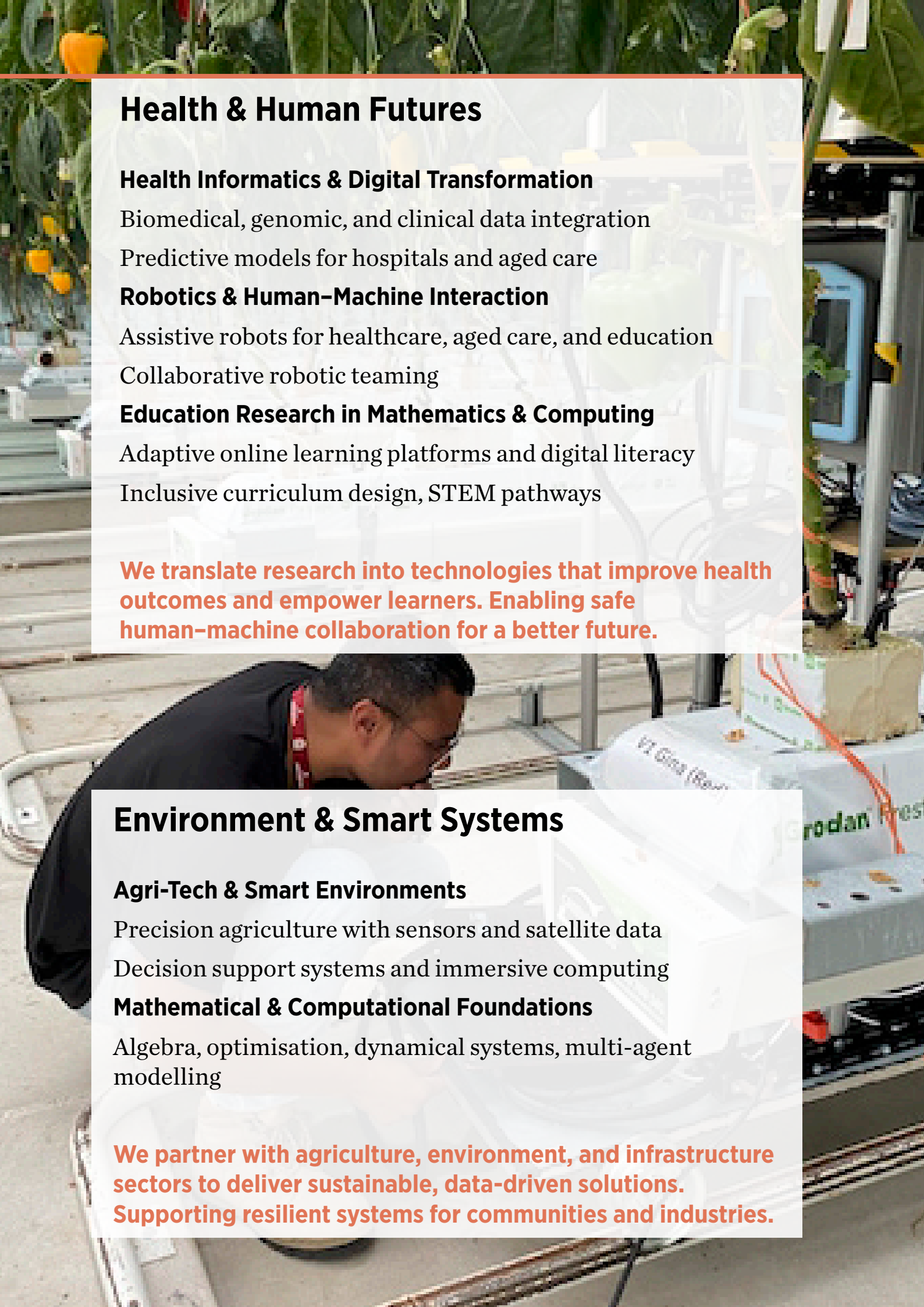
Federated learning, differential privacy, regulatory compliance

Distributed, Cloud & Edge Computing

High-performance computing, digital twins, smart infrastructure

IoT for logistics and environmental monitoring

We help our partners harness AI and data securely, at scale. Accelerating innovation while protecting trust.



Health & Human Futures

Health Informatics & Digital Transformation

Biomedical, genomic, and clinical data integration

Predictive models for hospitals and aged care

Robotics & Human–Machine Interaction

Assistive robots for healthcare, aged care, and education

Collaborative robotic teaming

Education Research in Mathematics & Computing

Adaptive online learning platforms and digital literacy

Inclusive curriculum design, STEM pathways

We translate research into technologies that improve health outcomes and empower learners. Enabling safe human–machine collaboration for a better future.

Environment & Smart Systems

Agri-Tech & Smart Environments

Precision agriculture with sensors and satellite data

Decision support systems and immersive computing

Mathematical & Computational Foundations

Algebra, optimisation, dynamical systems, multi-agent modelling

We partner with agriculture, environment, and infrastructure sectors to deliver sustainable, data-driven solutions. Supporting resilient systems for communities and industries.

Our Disciplines

Computer Science & IT

Our Computer Science & IT Department leads research and education across high-performance computing, distributed systems, social robotics and smart agriculture. We collaborate with industry to create technologies that drive next-generation networking, autonomous systems, and digital infrastructure.

Assoc Professor
Rodrigo Neves
Calheiros

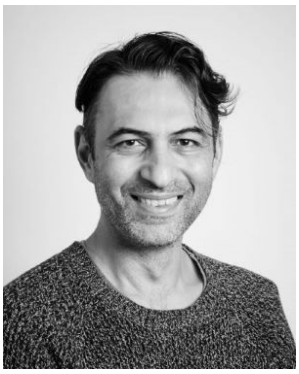
Artificial Intelligence & Data Science

The AI & Data Science Department advances machine learning, generative models, natural language processing, robotics, and optimisation. With partners, we build explainable AI, immersive technologies (VR/AR/XR), and data solutions that deliver insights while ensuring fairness and transparency.

Assoc Professor
Oliver Obst

Mathematics & Statistics

Our Mathematics & Statistics Department advances algebra, control theory, networked systems, and statistical modelling. From cryptography to financial risk management, we offer expertise that underpins secure technologies and data-driven business decisions.



Professor
Roozbeh Hazrat

Computer, Data and Mathematical Sciences Education

The Department of CDMS Education improves teaching and learning in mathematics and computing. We research quantitative literacy, digital adoption, and inclusive pedagogies that empower diverse learners. Our work provides organisations with evidence-based strategies for staff upskilling and curriculum development.

Assoc Professor
Leanne Rylands

Meet the researcher

Immersive Technology Unlocks Genomic Insights

Dr Zhonglin Qu
Immersive Technology
Associate Lecturer
(early-career researcher)

Collaborating Institutions:

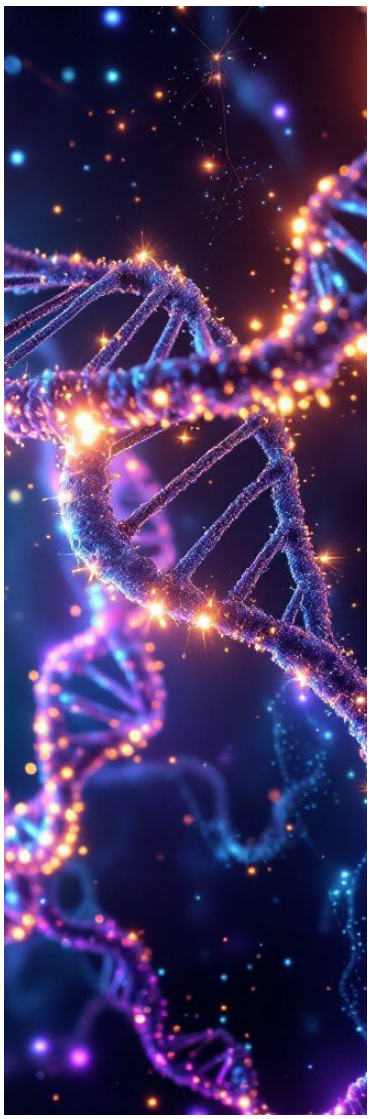
UTS (Sydney)
Children's Hospital Westmead
Western Sydney University

The challenge

Genomic data contains vast amounts of biological information that are difficult to interpret using traditional methods. Healthcare professionals often struggle to uncover meaningful insights, making diagnosis and treatment planning complex. There is a need for more intuitive ways to analyse and visualise these intricate datasets.

The solution

Immersive technologies such as virtual, augmented, and mixed reality allow users to interact with data in three dimensions. This creates a more natural and engaging way to explore large datasets. When combined with machine learning, these tools not only enhance visualisation but also improve the accuracy and speed of genomic analysis.



Why it matters

Immersive approaches open the door to more personalised medicine. By seeing and interacting with genomic data in 3D, clinicians can design treatment plans tailored to a patient's unique genetic profile. This has the potential to improve diagnostic accuracy, reduce errors, and lead to better patient outcomes.

Research contribution

Dr Zhonglin Qu has explored how immersive technologies and machine learning can be integrated to improve genomic data visualisation. Her work demonstrates how clinicians and researchers can use these tools to uncover patterns and relationships hidden in complex datasets.

The impact

By enabling real-time, interactive genomic data analysis, Zhonglin's research shows how immersive technology can transform healthcare. It supports more accurate, personalised treatment and represents a step toward redefining medical practice.

Meet the researcher

Turning Student Feedback into Data Insights for Mathematics Education

Dr Gizem Intepe
Education Research Lecturer
(early-career researcher)

Collaborating Institutions:

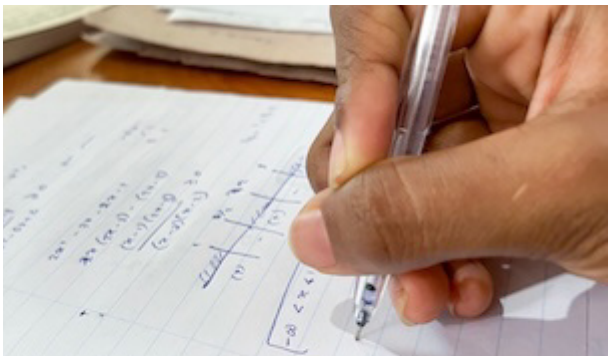
Dublin (Ireland)
Western Sydney University
Sheffield (UK)

The challenge

University students around the world often struggle with similar mathematical concepts. From solving equations to understanding calculus and statistics, many students face difficulties that hinder their progress. Traditional feedback systems collect large amounts of comments, but the data is unstructured and difficult to interpret at scale.

The solution

An international study analysed thousands of pieces of student feedback from mathematics support centres in Ireland, the UK, and Australia. Instead of reading each comment manually, the researchers applied natural language processing to uncover patterns and group related topics.



Why it matters

Universal challenges The findings showed that students across countries share strikingly similar difficulties.

Actionable insights Identifying the most common stumbling blocks helps support centres focus their teaching where it is needed most.

Scalable approach Text-mining allows institutions to process years of feedback efficiently and continuously improve student support.

Research contribution

Dr Gizem Intepe played a central role in processing and analysing the Australian dataset. Using the R programming language, she developed text-mining methods to identify recurring themes in student feedback, cluster similar comments, and present key problem areas through visualisations from word clouds to dendrograms.

The impact

Gizem's approach transformed thousands of unstructured comments into clear insights. It demonstrates how advanced data analysis can strengthen mathematics education, making learning support more targeted, efficient, and responsive to student needs worldwide.

Meet the researcher

A Breath Test for Malaria in Children

Dr X. Rosalind Wang
Data Scientist
Senior Lecturer
(mid-career researcher)

Collaborating Institutions:

Philadelphia (US)
Western Sydney University
Portland (US)
Blantyre (Malawi)
Boston (US)
Seattle (US)
Washington (US)
East Lansing (US)

The challenge

Blood tests are the standard for malaria but are invasive, slow, and often miss infections at low parasite levels. For children, they can be especially difficult.

The solution

This project trialled a non-invasive breath test. By analysing volatile organic compounds (VOCs) in exhaled breath, they found a unique "breathprint" of malaria. A child simply blows into a collection bag. This requires no needles, and no lab-bound process.

Why it matters

Child-friendly Quick and painless.

Accurate Detects malaria, even at low levels.

Responsive Breath markers fade after treatment.

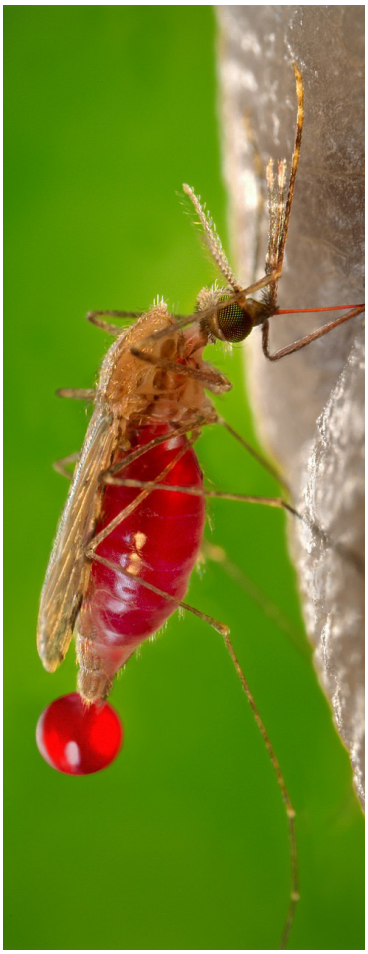
Scalable Simple enough for rural clinics.

Research contribution

Dr. Rosalind Wang, data scientist, led the statistical analysis to identify the key breath markers. Using machine learning (Boruta with Random Forests), Rosalind built predictive models that learned the chemical "signature" of malaria. Her expertise confirmed that while no single molecule was enough, a panel of markers could reliably detect infection.

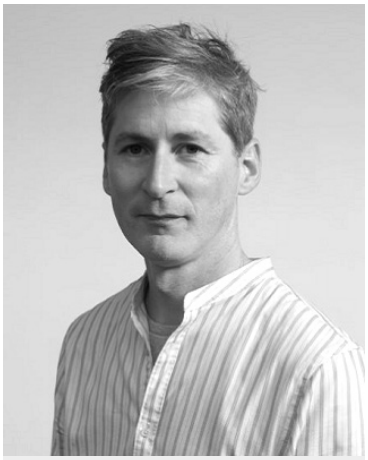
The impact

This approach proved that malaria leaves a chemical fingerprint in breath that disappears with treatment. This offers a safe, scalable way to diagnose children early and reduce the disease's spread.



Meet the researcher

High-Speed Imaging for Radio Astronomy



Professor Paul Hurley
Mathematician
Full Professor
(senior researcher)

Collaborating Institutions:

EPFL (Switzerland)
Western Sydney University
Versoix (Switzerland)
Swiss National
Supercomputing Centre

The challenge

Next-generation telescopes such as the Square Kilometre Array will generate one terabyte of data every second. Traditional imaging tools can not keep pace: they are too slow and miss faint signals.

The solution

Professor Paul Hurley and collaborators helped develop the Bluebild algorithm, which turns raw telescope data into clear, high-resolution images faster and more accurately than existing methods.

Why it matters

Faster insights Handles massive data streams in real time.

Sharper results Reveals faint signals and hidden structures other methods miss.

Scalable computing Optimised for high-performance computing platforms.

Research contribution

Paul applied his expertise in radio signal modelling and beam-forming to shape the algorithm, ensuring it accurately captures sky signals while reducing noise. His work helped design the mathematical core that makes Bluebild both efficient and precise.

Meet the researcher

AI Augmented Edge and Fog Computing

Professor Bahman Javadi
Computer Science
Full Professor
(senior researcher)
highly cited publication

Collaborating Institutions

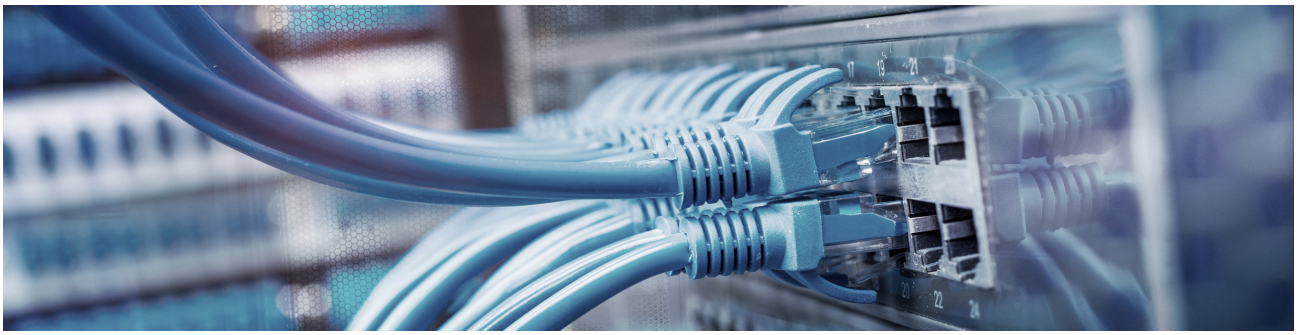
Imperial College (UK)
Western Sydney University
Melbourne (Australia)
Nevada (US)
Loughborough (UK)

The challenge

Edge and fog systems are complex because they involve many types of devices. Critical tasks like health monitoring demand fast responses, but this is difficult with remote or low-power devices. Sudden changes in demand and ongoing security risks make it hard to keep these systems reliable.

The solution

Artificial intelligence can manage tasks more efficiently across edge and cloud devices. Smart algorithms adapt to changing conditions, while simplified models and cloud support allow AI to run even on small devices. This enables systems to deliver faster and more reliable services automatically.



Why it matters

With billions of connected devices generating data, edge AI is essential for tasks such as health monitoring and autonomous driving. Local processing improves reliability, safeguards privacy, and reduces internet traffic by keeping sensitive data closer to its source. AI-powered edge and fog computing is seen as a foundation for future technology.

Research contribution

Professor Bahman Javadi contributed his expertise in networking and cloud computing to guide the study. He identified how AI can enhance edge and fog systems and helped shape the paper's focus on challenges and opportunities. The research provides valuable insights for both academia and industry, offering practical solutions and a roadmap for innovation in faster, smarter, and more reliable edge technologies.

Contact us

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Erin Pattison – Executive Assistant & Project Officer

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Western Sydney University

www.westernsydney.edu.au/schools/socdms
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School of Computing, Data and Mathematical Sciences
Parramatta South Campus
September 2025

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