UTS

Leading AI health innovation

From local partnerships to global impact

Introduction

Watch Professor Debra Anderson's 2024 Alumni Forum introduction

I'm delighted to introduce the focus of our 2024 UTS Alumni Forum, which will centre on making health care safer, better, more affordable, and more equitable through AI – and empowering this change on a global scale.

While attending a recent conference in Silicon Valley, I learned about the development of AI which can help ID patients at higher risk of stroke by predicting atrial fibrillation and identifying patients with a bigger chance of cognitive decline. It was just one of many evidence-based examples of advancements in technology and artificial intelligence I have seen that accelerated my enthusiasm for the exciting healthcare innovations being discovered through the latest breakthroughs in AI.

I returned to UTS with a renewed mission to implement AI innovations into our research right now. UTS boasts global experts in artificial intelligence and we have a leading faculty of healthcare in Australia – and AI won't wait for us to catch up. I am confident that the connections we are currently developing between artificial intelligence, robotics, business, healthcare and beyond, will allow us to embrace the benefits of AI's full potential to make healthcare safer, more affordable, and more equitable for our patients in Australia and across the world.

In this booklet you will be introduced to some of our UTS researchers working in this space.

This year's Alumni Forum is just the beginning of what we hope to be an inspiring future of collaboration, discovery, innovation, and healthier lives.

Professor Debra Anderson
Dean, Faculty of Health

Translating the language of AI to treat speech disabilities

Dr Lucy Bryant

Senior Lecturer in Speech Pathology, Faculty of Health

Dr Bryant, a certified practising speech pathologist, is working with technology teams at UTS to investigate how developments in AI—particularly in the areas of Virtual Reality and Augmented Reality—can lead to innovative new applications to support language learning, recovery, and access for people with a communication disability across their lifespan. Lucy's passion for communication grew from a belief that everyone should have access to the basic human right of communication, and all that comes with it in terms of social, educational, and workplace opportunities.

Her current work is split between teaching, research and running the speech pathology clinic at UTS that gives free treatment to the public and provides students with clinical experience. Dr Bryant's intersecting roles across these domains give her the unique opportunity to conduct clinically meaningful research and educate the next generation of speech pathologists to use technology in ways that will improve access to communication.

In her past clinical practice and research, Dr Bryant has focused on how we understand and formulate messages and meaning in the brain, especially after brain injury, stroke or other disability. Dr Bryant see AI empowered technology, through virtual and augmented tools, as the exciting next step in progressing this research and treatment in these areas.

Urgent action is <u>necessary</u>. It will take time, leadership, will, effort, and investment to achieve and sustain benefits from AI in health.

AI in Health: Huge Potential, Huge Risks © OECD 2024

Unearthing new medical solutions through AI data mining and analysis
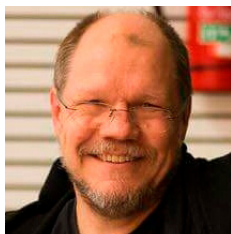
Professor Daniel Catchpoole
School of Computer Science
Biomedical Data Science Lab, Australian Artificial Intelligence Institute

Professor Daniel Catchpoole's current focus includes research in digital and virtual health—bringing computer science into the medical world to find new solutions for complex medical challenges.

Prof Catchpoole has over 20 years of lab-based experience in childhood cancer research, tissue pathology, genomics and cell biology. He has worked with UTS School of Computer Science since the early 2000s, collaborating within FEIT to develop improved mapping of cancer treatment pathways by combining data analytics, artificial intelligence, and software development together with his own expertise in the molecular basis of childhood cancers and genomics.

Prof Catchpoole is currently studying data sets—that represent the expression/activity of thousands of genes derived from a range of paediatric tumours—to mine them for complex profiles that define an individual patient's disease. These data sets are then compared across a cohort of patients to learn the common features in the data that not only describe the disease but also characterises of the individual qualities of each patient. AI can be used to provide high-end computational analysis of this data to draw out actionable knowledge to assist clinicians in their therapeutic decisions.

Watch interview with
Professor Daniel Catchpoole

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Revealing AI's ability to help diagnose and care for cancer patients

Associate Professor Nic Hart

School of Sport, Exercise and Rehabilitation, Faculty of Health

Associate Professor Nic Hart is utilising deep machine learning and AI to automatically detect clinical pathologies in his research to improve care and outcomes for people living with advanced or metastatic cancer.

Nic has received more than AUD$17.5m in research income as chief investigator to improve outcomes for people with advanced cancer and bone metastases, to investigate approaches to delay disease progression and extend overall survival in advanced cancer patients through exercise medicine.

Nic led the development of international survivorship care standards, practice recommendations, and research priorities for people affected by advanced or metastatic cancer. He is a member of International Bone Metastases and Exercise Working Group (IBMEWG) that developed the worlds' first clinical exercise guidelines for people with bone metastases, and he is a member of the World Health Organisation (WHO) Cancer Development Group, who created a Package of Interventions for Rehabilitation in cancer survivors worldwide.

Associate Professor Nic Hart views new breakthroughs in AI, especially in areas of diagnosis and long-term outcome analysis, as game changers in how we can support cancer patients.

# Seeing AI's potential for ocular healthcare

Associate Professor Mojtaba Golzan

Deputy Head of School, Research, Graduate School of Health
Associate Professor of Vision Science

Associate Professor Mojtaba "MJ" Golzan and his cross-disciplinary team at UTS are utilising AI in conjunction with a diverse array of tools—including machine learning, image analysis, photonics, and laboratory-based in-vitro assays—to research new biomarkers that can aid in early identification of ocular and neurological diseases, particularly glaucoma.

MJ led his team in the development of "A-Eye," an all-in-one technology that leverages the power of artificial intelligence to analyse images obtained from the back of the eye. A natural window to both the eye and the brain, having "A-Eye" analyse these images for abnormal intra-cranial pressure can eliminate the need for an invasive diagnostic surgical procedure

When I was researching my masters, I witnessed patients having a hole drilled into their skull and a catheter put into their brain. It was confronting. Fast track to now, and we're developing an affordable, safe, and non-invasive alternative.

Associate Professor Golzan aims for his translational research to make significant progress in connecting vision science, technology, and digital health. AI is proving to be a breakthrough tool to empower that mission.

Watch interview with Associate Professor Mojtaba Golzan

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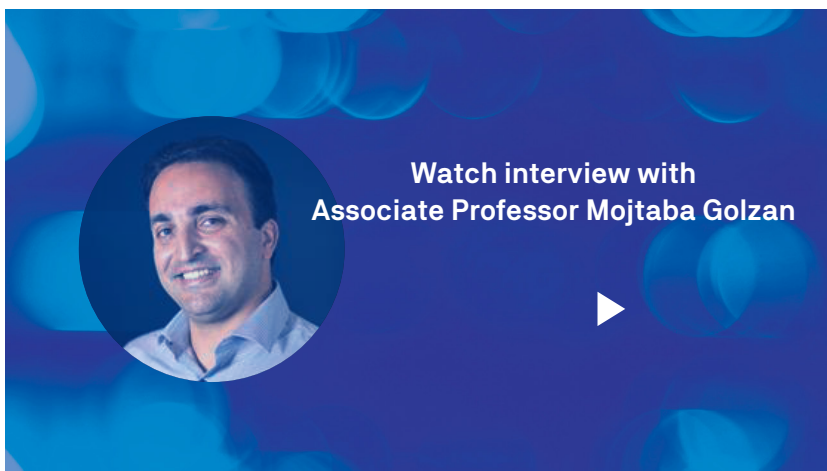
Shaping AI's role in healthcare

Distinguished Professor Jie Lu AO

Laureate Fellow, Faculty of Engineering and IT
Director, Australian Artificial Intelligence Institute (AAII)

As Director of the AAII, Professor Jie Lu oversees the largest AI centre in Australia with 35 researchers and 230 PhD students. Especially in the areas of fuzzy transfer learning, concept drift, data-driven decision support systems, and recommender systems, Jie's research is helping shape the way organisations use data to make decisions in complex and uncertain situations.

Jie has applied her expertise in AI to facilitate effective prediction and decision making to deliver direct benefits to industry and the community by increasing economic activity and helping organisations to manage risk. Having collaborated across a wide range of sectors, including transportation, telecommunications, and education, Jie's research in health care has shown the vast potential of AI technology in the field, such as the use of AI-generated avatars to role play clinical situations for healthcare trainees.

Jie's projects have included partnerships with Optus, Sydney Trains, Domain Holdings, Australia Ltd, Workforce Health Assessors and 23Strands, developing and implementing intelligent recommender systems and data-driven decision support systems. Since 2010 Jie has also served as Editor-in-chief of *Knowledge-based Systems*, a leading international and interdisciplinary journal in the field of artificial intelligence.

# Extending AI learning, to support longer, healthier lives

Associate Professor Guodong Long

Australian artificial Intelligence Institute

Associate Professor Guodong Long is currently researching how machine learning and AI can be applied to chronic healthcare conditions and Aged Care support.

Dr Long's research has recently focused on using federated learning to develop a trustworthy AI with privacy-preserving and personalised intelligence, and developing new on-device intelligence to cooperate with pre-trained foundation models at the server level. His research interest extends to several application domains, such as natural language processing, Internet of Things, education, social media, and healthcare.

He has received more than AUD$4m in external industry investment, and he and his collaborators have created a small research ecosystem to pave the knowledge transition among theoretical research, applied research, and real applications. Always actively engaging with research communities, Dr Long will serve as the general co-chair to organise the WebConf to be hosted in Sydney in May 2025, and the Australasian Joint Conference on AI to be hosted in Canberra in December 2025.

Watch interview with Associate Professor Guodong Long
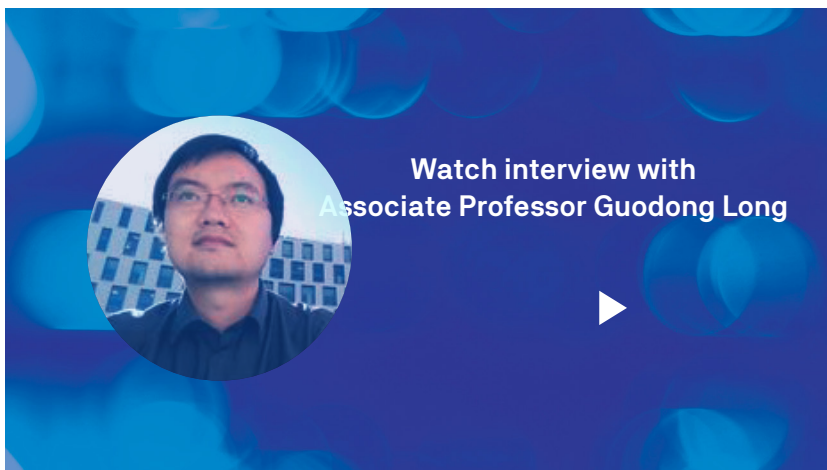
Interacting with AI to assist communication and the ability to swallow

Professor Bronwyn Hemsley
Head of Speech Pathology at UTS
Co-lead of the UTS Disability Research Network

As a Certified Practicing Speech Pathologist, Fellow of Speech Pathology Australia, and Fellow of the International Society for Augmentative and Alternative Communication, Professor Bronwyn Hemsley is using AI in her research relating to communication—part of a comprehensive program that includes swallowing, social media, and other advanced assistive technologies, such as VR/AR, communication apps, and 3D food printing.

Bronwyn was the lead investigator and project lead for the 'UTS Co-Creating Safe and Enjoyable Meals' project funded by the NDIS Quality & Safeguards Commission and the Victorian Department of Families, Fairness, and Housing (2020-2022). She is credited as the lead investigator on an ARC Discovery project 'An Appetite for the Future: 3D Printed Food for People with Swallowing Disability' (2020-2023).

Professor Hemsley's research is demonstrating how AI and specifically generative AI can reveal new opportunities to assist those with disabilities in communication and swallowing.

The worldwide AI health care market is projected to grow by 16x by 2030 from USD 11 billion (in 2021) to USD 188 billion.

Conor Stewart 2023, *AI in healthcare market size worldwide* 2021-30, STATISTA

Developing AI and telehealth models to improve access to cardiovascular care

Professor Sally Inglis

Professor, Improving Palliative, Aged and Chronic Care through Clinical Research and Translation (IMPACCT)

Professor Sally Inglis is a Heart Foundation Future Leader Fellow and an internationally recognised research leader and expert in nurse-led and remotely delivered models of cardiovascular care, especially telehealth, telemonitoring and digital patient education.

Supported by the Heart Foundation, Prof Inglis leads a cardiovascular research program at UTS focused on digital health, especially telehealth models of care to improve access to cardiovascular care. Prof Inglis is the first/senior author of six Cochrane Reviews/Protocols with international author teams examining cardiovascular digital health. She has received UK National Institute of Health Research funding for this research and her research is cited in multiple international and national clinical guidelines.

Prof Inglis' research has informed telehealth in Australia and internationally and influenced healthcare policy and clinical practice, especially with the rapid implementation of telehealth during the COVID-19 pandemic.

Improving healthcare decisions with the precision of AI

Distinguished Professor Tuan V Nguyen AM
School of Biomedical Engineering, Faculty of Engineering and IT

Distinguished Professor Tuan V Nguyen is currently conducting research into how AI can assist individuals in making informed healthcare decisions.

Dr Nguyen is a Leadership Fellow of the National Health and Medical Research Council and Distinguished Professor of Predictive Medicine at the School of Biomedical Engineering, and Director of the Centre for Health Technologies. He is a Theme Lead of UTS Ageing Research Collaborative (UARC) and holds an appointment as an Adjunct Professor of Epidemiology at UNSW Medicine. A focus of his research has been the discovery and translation of genetic and etiologic factors that determine individual risk of osteoporosis.

Tuan's research group consists of clinicians, postdoc fellows and PhD students in both Australia and Vietnam. Outcomes have included the creation of a digital tool called BONEcheck™ for personalised osteoporosis risk assessment; the creation of a genomic signature called 'Osteogenomic Profile' for predicting fracture risk and bone loss; and the advancement of a new metric called 'Skeletal Age' for personalised assessment of skeletal fragility.

Dr Nguyen is implementing new developments in AI and data science in his research, particularly the area of digital health for precision medicine.

Interacting with generative AI to create new healthcare solutions

Dr Mukesh Prasad

Senior Lecturer, School of Computer Science, Faculty of Engineering and IT

Through his research in the fields of machine learning and artificial intelligence, Dr Prasad's work is making substantial contributions to healthcare. His research interests have included big data, computer vision, brain computer interface, and evolutionary computation. He has served as a postdoctoral researcher leading a Big Data and computer vision team at National Chiao Tung University, Taiwan.

In addition, Mukesh works in the field of image processing, data analytics, and edge computing— a domain which promises to pave the way for new applications in agriculture, smart cities, education, marketing, finance, biomedical and health care. During his tenure as the principal engineer at the Taiwan Semiconductor Manufacturing Company, Mukesh developed new algorithms for image processing and pattern recognition using machine learning techniques.

Mukesh started his academic career as a lecturer with UTS in 2017 and became a core member of the University's world-leading Australian Artificial Intelligence Institute (AAII), which has a vision to develop theoretical foundations and advanced technologies for AI and to drive progress in related areas. As part of the AAII Dr Prasad is currently focusing on the benefits of generative AI research in healthcare.

When future generations look back at the 2020's, they may wonder why society was not more rapidly and broadly leveraging a massively abundan asset – health data – to save and improve lives.

AI in Health: Huge Potential, Huge Risks © OECD 2024

Connecting through AI to heal speech impacted brain injuries

Dr Emma Power

UTS Professor, Speech Pathology

Currently incorporating new AI tools into her research, Professor Emma Power has worked in the area of communication impairments following acquired brain injury (ABI) for over 25 years, in a variety of clinical and academic positions.

Emma started her clinical career working with people with neurological conditions, before becoming involved in acquired brain injury research. Her particular interest is in implementation research.

Emma has led research on the development of post-stroke aphasia best practice guidelines and the development of the Australian Aphasia Rehabilitation pathway. She has also developed effective face to face and online training programs for communication partners of people with TBI, (TBI Express, TBI Connect, Social Brain Toolkit), dementia (Dementia Connect) as well as aphasia. She is recognised internationally and nationally for her research in acquired communication disorders and implementation science.

Sufficient international consensus on AI principles has already been reached to guide the development of policies for responsible AI in health… The time to operationalise principles and… practice for AI is now.

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UTS Ambassadors

UTS is honoured to have the support and involvement of our distinguished Ambassadors, who contribute their time and expertise to thought leadership and advancing knowledge.

Nicole Alley

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AI has significant potential to save lives, improve health professionals' work, and make health systems more people-centred.

UTS Alumni Forum

Saturday 3 August 2024
10am – 4.00pm

Enquiries: Tracey Beck

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