

AUTHORS



Professor Mike Miller AO FTSE*
Telecommunications researcher



Dr Oliver Mayo FAA FTSE
Evolutionary geneticist



Distinguished Prof Mary-Anne
Williams FTSE
Data scientist



Professor Shazia Sadiq FTSE
Computer scientist



Professor Anton van den Hengel FTSE
Australian Institute for Machine Learning



Professor Svetha Venkatesh FTSE
Computer scientist



Professor Glenn Wightwick FTSE
Systems engineer



Distinguished Professor Fang Chen
Data scientist



Dr Jackie Craig FTSE
Defence researcher



Dr Paul Dalby
Australian Institute for Machine Learning

EDITING Edwyn Shiell

*Mike Miller AO FTSE sadly passed away on 30 November 2021. You can read Professor Miller's obituary on page 63.

How AI is powering us

Innovative new Artificial Intelligence technologies have extraordinary potential to improve our lives – and Australian researchers are leading the charge.

Artificial Intelligence (AI) refers to the collection of technologies and techniques used to solve problems that would otherwise require human input.

Human uses for AI have grown across every aspect of our society, from identifying bruising on fruit to coordinating batteries to store energy more efficiently. The potential of AI to transform society is massive, and its impact is only projected to increase.

Because AI is not always easy to see, it can be difficult to imagine how it is already having such a revolutionary impact.

The dramatic and rapid emergence of AI as one of the key drivers of the modern global economy is difficult to overstate. Before 2030, \$13 trillion worth of global activity will be underpinned by AI technologies.

Projections point to a potential windfall for Australia of around \$300 billion. But this growth and economic opportunity will only be realised if our AI sector is sufficiently supported, coordinated and industry-focused.

Building on an impressive research foundation, Australia has the capability to become a genuine leader in the global AI space and deliver profound economic and social benefit.

This series is a snapshot of the innovative work in AI research happening across Australia.

The examples were selected by an expert ATSE project team to assist businesses or organisations understand how Australia's AI expertise can be leveraged in real world applications to deliver economic and social outcomes.

AI nation

Snapshots of Australian innovation



Western Australia

RailSmart Wanneroo Planning Support System

Australian cities are growing and rapidly expanding at their edges. This is challenging for city planners to model and plan infrastructure to ensure people have access to essential amenities and a strong sense of place.

The Systems for Knowledge Discovery from Data research cluster at the University of Western Australia brings together experts in data mining, cybersecurity and sensor network systems.

They contributed to the Planning and Transport Research Centre's partnership with the City of Wanneroo to create a predictive urban development tool that is visual, interactive, and easy to use.

The tool can be used to plan public transport growth and create jobs.



South Australia

Better grapes, better wine

The University of Adelaide is working with Riverland Wine and Wine Australia to develop tools for Australian wine grape growers that monitor, predict and advise on managing aspects of viticulture such as irrigation, pruning and application of pesticides.

The digital platform, called VitiVisor, collects information with new sensors that use computer vision to measure vineyard growth.

Collecting so much data for analysis allows growers to track performance and make more informed management decisions for more efficient yields. The project will assist growers to produce better grapes and empower them to better manage contracts with wine makers.



Queensland

The future of self-driving cars

The Queensland University of Technology (QUT) Centre for Robotics took an electric car fitted with high-tech sensors on a 1200km, three month-long road trip to test drive the future of autonomous driving in Australia.

The car used robotic vision and machine learning to see and interpret everyday road signs and markings essential for safe road use. Taking the car on the open road highlighted several considerations for Australia's driving infrastructure that we need to consider before autonomous driving can become widespread:

- Ensuring camera-vision systems can correctly identify and interpret signs, traffic lights and lines on the roads are a priority
- Improving technology to deal with inclement weather and driving at night
- Improving roadside infrastructure to clear obstructions.



Victoria

Supporting fast and accurate trauma care

Over 1000 patients go to the Alfred Trauma Service each year with major injuries that can cause death or disability. For these patients, the care they receive in the first 30 minutes is critical to their survival. For the staff, the first 30 minutes' procedures and process are carried out under extreme pressure.

The Applied Artificial Intelligence Institute (A²I²) at Deakin University collaborated with Alfred Health to create the Trauma Reception and Resuscitation System (TR&R). It monitors patient data, such as vital signs and diagnosis information, and provides advice and treatment options based on hospital procedures and guidelines.

A large screen visible to all staff displays these recommendations in real time to support decision-making. The TR&R system has slashed missed steps by 21 per cent, reduced the need for blood transfusions by 30 per cent, and cut the time required for treatment in the Intensive Care Unit by a life-saving 26 hours.



New South Wales

Stop the leaks!

Australia has more than 140,000 kilometres of water pipes. A major pipe failure can disrupt everyone's lives – from utility workers to consumers.

Collaborating with more than 30 utilities in Australia and internationally, AI researchers working with the University of Technology Sydney (UTS) Data Science Institute examined one million pipe failure records for 10 million pipes over the past decade.

Sydney Water provided access to 20 years of digital data from their five million customers so UTS could develop the world's-first pipe failure prediction tool.

As a result, Sydney Water can now complete intelligent condition assessments, repairs and renewals to improve the performance of water assets. Eighty per cent of failures predicted so far by the UTS team were within 200m of where the fault actually occurred, dramatically narrowing areas to direct maintenance efforts.



Australian Capital Territory / Tasmania

The CONSORT Bruny Island Battery Trial

The Australian National University (ANU) led the CONSORT Bruny Island Battery Trial in collaboration with Reposit Power (an energy software small and medium enterprise), and TasNetworks (a distribution network service provider).

The trial uses innovative Network Aware Coordination (NAC) software to coordinate consumer-owned distributed rooftop solar and batteries with network demands.

The AI software was able to plan ahead to automatically provide coordinated battery discharges, at the exact times when the undersea cable supplying power to Bruny Island was in danger of overloading. For the first time, TasNetworks avoided using their backup diesel generator during a major network peak.