



THE UNIVERSITY
of ADELAIDE



Partnership
profile

AUSTRALIAN INSTITUTE FOR MACHINE LEARNING

adelaide.edu.au/aiml

WELCOME.



ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ALIGN TO THE UNIVERSITY'S STRATEGIC RESEARCH PLAN, ENSURING THAT WE CAN SUCCESSFULLY MAINTAIN OUR POSITION AS WORLD-LEADING EXPERTS IN THESE FIELDS.

The University of Adelaide's institutes are globally recognised for their research quality and extensive connections with industry, government and the wider community. This was reflected in the federal government's 2016 National Survey of Research Commercialisation, which showed we are ranked number 5 Australian university in total value of contracts, consultancies and collaborations in Australia.

Although a new Institute by name, the Australian Institute for Machine Learning was formed from the Australian Centre for Visual Technologies (ACVT), a group with a long history of delivering high-impact fundamental and applied research. ACVT's many years of success and experience has formed the core of what is now known as AIML.

The Institute has grown exponentially to become the largest machine learning and computer vision group in the country, with over 120 members, boasting outstanding research expertise, state of the art facilities, high achieving students and recognised on a global scale.

Machine learning underpins the business models of the largest corporations and has the potential to deliver massive, social, economic and environmental benefits. Our world-class research strengths lie in machine learning and the methods that support this; artificial intelligence, computer vision and deep learning. Partnering with AIML will give you access to world class expertise and state of the art facilities.



Professor Peter Rathjen
*Vice-Chancellor and President
The University of Adelaide*

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ABOUT THE INSTITUTE

Australia's top-ranking computer-vision research group.

The Australian Institute for Machine Learning (AIML) is one of the world's best research groups in artificial intelligence, computer vision, and machine learning.

In the last decade, rapid advances in machine learning have enabled its parent discipline, artificial intelligence (AI), to make a decisive move out of the computer lab and into the real world. AI now touches and enhances almost every aspect of our daily lives.

It connects us with the nearest Uber driver. It curates our Facebook feeds according to our interests. It keeps our Google search results relevant.

Here at the AIML, we're working at the movement's cutting edge; collaborating with Australian and international corporations, industry and government to ensure we're able to thrive and prosper—individually and collectively—in an AI-powered global economy.

Mission

The Australian Institute for Machine Learning is transforming the way we live for the better through research excellence in machine learning, artificial intelligence and computer vision.

Vision

To be global leaders in machine learning research, and high-impact research translation.

AIML AT A GLANCE



1ST
in Visual
Question
Answering
Challenge 2.0*



The largest
Machine
Learning
group in
the country



1ST
in retinal image
segmentation



120+
Researchers
and students



Multiple technology
licences and
commercialised
patents



1ST
IN CITYSCAPES,
a key driverless
car benchmark**



Multiple
start-up
companies



2ND
IN xVIEW
overhead
image analysis



3RD
IN WORLD
by high quality
papers



\$8M+
of funding
in 2018

* Global competition requiring AI-generated natural language answers to an image-based problem.

** The Cityscapes Datasets scene-parsing benchmark suite independently tests effectiveness of driverless-car technology.

RESEARCH WITH IMPACT

AIML's world-class, interdisciplinary research provides South Australia and the nation with significant social, economic, educational and environmental benefit.

We regularly collaborate with Australian industry to: develop exclusive AI-based products and services; boost their efficiency and reliability; and enhance their ability to compete in an increasingly automated world. This work frequently involves:

- identifying patterns in large, complex data sources
- developing deeper insights into customer and system behaviour, and predicting future behaviour
- coaching staff or students on how to improve their performance
- optimising complex systems
- automating video imagery interpretation
- developing computer vision and robotics applications
- creating natural language processing
- building machines that can answer questions they've never seen before.

With automation and robotics surging, AIML is dedicated to realising machine learning's potential.



Our areas of strength

With automation and robotics surging, AIML is dedicated to realising machine learning's potential. Our research is focused within these themes: Machine Learning Theory, Robotic Vision, Medical Machine Learning, Trusted Autonomous Systems, Surveillance and Tracking and Photogrammetry.

Particular strengths include:

- 3D modelling
- SLAM
- machine-based reasoning
- augmented reality
- image segmentation and captioning
- medical imaging
- object recognition and tracking
- parameter estimation
- visual question answering
- computer vision
- scene understanding
- recommender systems
- intelligence, surveillance (including large-scale video) and reconnaissance.



A close-up portrait of Professor Anton van den Hengel, a man with short brown hair and blue eyes, wearing a light blue patterned polo shirt. He is smiling slightly and looking directly at the camera. The background is dark and out of focus.

I'm proud to be leading Australia's premier research group in artificial intelligence, computer vision and machine learning. The quality of our work is elite, and with state of the art facilities complemented by our world renowned researchers, there is no limit to what we can achieve.

Professor Anton van den Hengel,
Australian Institute for Machine Learning

MEET OUR DIRECTOR

Professor Anton van den Hengel

Anton is a highly respected and influential figure in machine learning, both nationally and internationally. Also a Chief Investigator with the Australian Centre for Robotic Vision (an Australian Research Council Centre of Excellence), he's led over \$60M worth of research funded by such organisations as Google, Canon, BHP Billiton and the Australian Research Council.

Anton is a former winner of the Pearcey Foundation Entrepreneur Award; the SA Science Excellence Award for Research Collaboration; and the Computer Vision and Pattern Recognition Conference Best Paper prize (2010). He's authored over 300 publications, commercialised eight patents and formed two start-ups. And medical technology incorporating AI of his design was recently given first-in-class approval by the US Food and Drug Administration. Current research interests include deep learning, vision and language problems, interactive image-based modelling, large-scale video surveillance, and medical machine learning.

Professor van den Hengel and his team have developed world leading methods in a range of areas within Computer Vision and Machine learning, including methods which have placed first on a variety of international leaderboards such as: PASCAL VOC (2015 & 2016), CityScapes (2016 & 2017), Virginia Tech VQA (2016 & 2017), and the Microsoft COCO Captioning Challenge (2016). Professor van den Hengel's team placed 4th in the ImageNet detection challenge in 2015 ahead of Google, Intel, Oxford, CMU and Baidu, and 2nd in ImageNet Scene Parsing in 2016. ImageNet is one of the most hotly contested challenges in Computer Vision.

EXPERTISE IN ACTION

The Australian Centre for Robotic Vision (ACRV): leading the world

The AIML plays a key role in the ACRV, a national research centre at the forefront of global efforts to apply computer vision to robotics and create machines capable of understanding the world around them. This revolutionary technology has the potential to fundamentally change the way live and work, enhancing everything from environmental protection and health care delivery, to sustainable food production and mining.

Funded by the Australian Research Council as a Centre of Excellence, the ACRV houses a vibrant robotic-vision community, with partners including: Queensland University of Technology; Australian National University; Monash University; and the CSIRO. It also regularly collaborates with leading international institutions, such as Oxford University.

The AIML contributes specialist expertise in visual scene understanding and combined language and vision understanding, for tasks like navigation. The Institute also play a part in educating the public on robotics, vision and coding.





International robotics challenge champions

AIML computer scientists were instrumental in the Australian Centre for Robotic Vision's 2017 Amazon Robotics Challenge victory.

Held by online retail giant Amazon, the annual event is an open global competition for industry and universities. Entrants are required to develop robotic technology capable of correctly identifying and retrieving a large variety of items from storage boxes, and re-stowing them—a surprisingly complex task that's critical to future delivery-system automation.

AIML representatives developed the deep-learning segmentation algorithms that guided their team's robot—designed and built by collaborators Queensland University of Technology—to its Grand Championship triumph.

The ACRV team overcame strong competition from the University of Bonn (Germany), Nanyang Technological University (Singapore), and a joint US entry from Princeton University and MIT (Massachusetts Institute of Technology).



INNOVATIONS IN PLAY

Speeding disease diagnosis

The AIML's collaborative research has resulted in the world's first AI microbiology screening technology for use in pathology laboratories. Developed in partnership with Adelaide-based LBT Innovations, the Automated Plate Assessment System (APAS) went into production in 2017 and is attracting huge international interest.

The system automates the traditionally time-consuming functions performed by microbiologists in screening culture plates after incubation. It takes high-quality images of the plates, then analyses and interprets any microbial growth, matches this against key patient data, presents a diagnosis, and continually updates its own knowledge base.

Speeding up the diagnosis process enables doctors to order more tests, giving them more information, sooner. The technology could even allow country or developing-world hospitals to run their own tests without having to ship samples to a central lab, saving a huge amount of time and potentially many lives.





Accelerating crop farmers' adaptation to climate change

AIML image-analysis technology has been tailored to accurately estimate potential new cereal varieties' yields after only very short periods of growth.

Using multiple images taken from numerous angles, the technology—being commercialised by industry partner Bayer CropScience—rapidly identifies and automatically measures attributes associated with high yields. Significantly, it has been incorporated into the University of Adelaide's state-of-the-art Plant Accelerator facility, which enables thousands of test breeds to be grown simultaneously under unique and fully controllable conditions.

The potential global impact is significant. With nearly 33 per cent of the planet's arable land already estimated to have been lost over the past 40 years through erosion and pollution, further increases in global average temperatures through climate change could place enormous strain on traditional crop production.



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Measuring biomass status by photography

Combining computer vision with environmental science, the AIML has played a leading role in developing technology that automatically determines biomass—the total amount of plant material in an ecosystem—through analysis of 360-degree panoramic photographs.

Created in collaboration with researchers from Australia’s Terrestrial Ecosystem Research Network (TERN), the technology is quick, simple, accurate and requires minimal training. This makes it significantly more efficient than: the standard labour-intensive direct measurement method; the accurate, but highly expensive laser-reading method; and other rapid measures that provide only crude biomass estimates.

Collecting data on Australia’s vegetation density is crucial for measuring environmental change in order to better manage and protect our natural habitats.

Automated medical imaging analysis to detect breast tumours

The AIML has developed a remarkable, fully-automated medical image program that independently detects breast tumours and delivers precise prognoses 1.78 times faster than existing methods.

As the program analyses a magnetic resonance imaging scan of the patient’s breast, it shows a small green square moving across the image on-screen. When the square moves over a suspected lesion it turns red to indicate detection.

The system uses AI deep-reinforcement learning methods, or goal-orientated algorithms, which learn how to attain a complex objective by being rewarded for correct decisions. Our ultimate aim is for this technology to be used by radiologists all over the world to complement, support and assist their important work.





HOW WE CAN HELP

At the AIML, we're highly experienced in working with government and industry to improve their offerings' effectiveness, efficiency and global competitiveness, through world-leading machine learning and AI technology.

Whatever field you operate in, we can do the same for you. So if you're ready to take that step, don't hesitate.

CONTACT US

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