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*of* ADELAIDE



**Excellence in AI  
research and innovation**

# HOW TO PARTNER WITH THE AUSTRALIAN INSTITUTE FOR MACHINE LEARNING

[adelaide.edu.au/aiml](http://adelaide.edu.au/aiml)

# ABOUT US

**The Australian Institute for Machine Learning (AIML) is one of six Research Institutes at the University of Adelaide.**

We are financially supported by the University of Adelaide and the State Government of South Australia.

AIML is the largest University-based research group in machine learning in Australia with over 100 staff. In recent years we have won numerous international competitions in machine learning capabilities, and are ranked in the top three in the world for many international benchmarks.





**THE LARGEST  
MACHINE LEARNING  
GROUP IN  
AUSTRALIA**



**100+  
RESEARCHERS  
AND STUDENTS**



**\$8M+  
OF FUNDING  
IN 2018**



**1ST  
IN VISUAL  
QUESTION ANSWERING  
CHALLENGE 2.0**

# OUR CAPABILITY

Our research group apply their world-leading expertise in machine learning applications to the following areas.

## Computer Vision

Our researchers have been pioneers in the development of new techniques for computer vision and we are ranked third in the world on [csrcrankings.org](http://csrcrankings.org) for computer vision research.

We have applied our expertise in a number of application areas:

- **Robotic Vision:** Robotic vision is a technology that gives machines the ability to see and operate in the physical world. Robotic vision combines deep learning techniques with other computer vision methods and engineering systems. AIML is a Node Leader in the Australian Centre for Robotic Vision and together we recently won the Amazon Robotic Picking Challenge in Nagoya, Japan. AIML researchers are also global leaders in vision technologies for driverless cars – an exciting and fast moving application area for this emerging technology.
- **Surveillance:** Computer vision enables machines to constantly scan an environment for pre-learned patterns. In urban environments, computer vision can identify maintenance needs for local councils, or identify illegal developments. In mining, computer vision surveillance can track assets and monitor mine spoil changes over time. In defence, the ongoing

surveillance of potential threats can be automated using a variety of computer vision-enabled platforms.

- **Medical Imaging:** The costs of providing medical care in many countries is rising much faster than the rate of inflation. Computer vision can automate the process of assessing medical images such as x-rays, video, MRI and CAT scans, microscope slides and agar plates. AIML has a strong track record in creating world class medical imaging solutions. We have come first in global competitions to automate the process of image classification. We helped Australian company, LBT Innovations, to achieve the world's first FDA-approved, machine learning medical device in 2013. With our industry partners, we are currently involved in the development of two new products that will be the first of their types in the world.

## Visual Question Answering (VQA)

AIML researchers have led the world in the development of VQA, a technology that gives machines the ability to see and understand their environment. VQA gives natural language answers to natural language questions about the content of visual images. The system trains to answer general questions about images, rather than look

for a specific image type (e.g. a dog or a plane). This makes it fundamentally different to traditional computer vision technology.

AIML have won numerous global competitions in VQA and have made major contributions to the development of the methodology. The group recently published a paper on how to use VQA across multiple data types and streams, giving humans the ability to interact with their data using natural language.

## Natural Language Processing (NLP)

NLP is a technology that gives machines the ability to interact with humans in both text and spoken language. It is the technology that underpins technology such as Siri on an iPhone. NLP is being used to extract data from written documents into databases, to automate the process of writing reports and to develop machines that can interact with a human by spoken word only.

## Deep Learning Theory

Deep Learning is the technology that underpins much of the transformational improvement in Artificial Intelligence that has happened over the last ten years. Deep Learning gives machines the ability to find patterns in data by learning from training data sets. Our research team have made major contributions to advancing the mathematical tools that underpin Deep Learning Theory. We can and do use this world class expertise to help organisations better understand their data.

## APPLICATIONS

AIML has successfully helped companies commercialise products in artificial intelligence. We also work with government, defence and NGOs in developing new AI-solutions. We work across all sectors of the economy, and are currently working with organisations in:

Defence and security	Agriculture and food	Manufacturing
Social and policy	Transport	Infrastructure
Health and medical	Environment	Sports science
Mining and resources	ICT	Energy
Entertainment	Finance and commerce	Space

# WHAT DO YOU NEED NOW TO BE READY TO PARTNER?

**TO PARTNER WITH AIML FOR THE DEVELOPMENT OF AN AI PRODUCT, YOU NEED TO BE ABLE TO DRAW UPON THE FOLLOWING RESOURCES:**

## 1 DATA

You need access to a large enough dataset to train a system. To train a system, we need ‘annotated’ data – which means that the bits of the data you are interested in are identified within the data set.

For example, if you want to be able to identify fraudulent and non-fraudulent activity within your historic financial data – you need to be able to show examples of fraudulent patterns in your training data. Usually, machine learning needs 10,000s to 10 millions of data points, although depending on the problem, sometimes meaningful results can be achieved with 10s of data points.

Furthermore, the data must be de-identified before we receive it so that there are no potential privacy breaches.

## 2 FINANCIAL RESOURCES

You will need to have sufficient financial resources. Refer to page 5 for further details.

## 3 HUMAN RESOURCES

While we have software engineers in our team who have developed products for a range of clients, ideally you will have the human resources needed (internally or contracted in) to take the AI component we develop for you and add it into your systems or products.

# HOW YOU CAN ENGAGE WITH AIML

We understand that each organisation may be at a different stage in their journey of developing and integrating AI into their business.



To tackle this, AIML has a range of entry points and co-funding opportunities that means that most people who meet the criteria on page 3 can begin to work with us.

## Consultancy

To get started on your AI journey, you may need some advice about how to design a technical program to develop a product. You may need an independent review of a proposal for the development or supply of an AI product. AIML can supply you with world-leading expertise in areas that include computer vision, robotic vision, machine learning and visual question answering.

For example, we recently helped a company save \$100,000s in data acquisition costs, by redesigning their product development methodology at a cost to them of \$5,000.

Typically, a consultancy contract will be within the range of \$5,000 to \$50,000.

## Student Scholarships

Providing student scholarships can help support local or international students in gaining a PhD in Machine Learning at AIML. It provides an opportunity to engage with the student during their PhD, and potentially to build a relationship with possible future

employee. Note that the primary goal of the student will be to achieve the PhD, and thus that the sponsor will have little control over content. Funding a student scholarship may cost between \$20,000 to \$80,000 per annum for three years depending on whether they already have some funding to contribute to their scholarship and the competition and demand for the student.

## Contract Research

If you are an organisation looking to outsource the development of new and innovative technology, a commercial research program with AIML can lead to cutting-edge products. AIML can work at commercial timeframes and deliver commercial-grade products. For this type of engagement, we are required under Australia Competition Policy to charge commercially equitable rates.

Examples of our commercial projects include:

- We worked with LBT Innovations to develop a 'first-in-class' medical device, all the way through to FDA approval over a five year period.
- Development of 3D content creation tools for a simulation company leading to significant productivity gains.

- Developed a prototype trainer for a mining company to expand the scale of their safety in the workplace program.
- Assisted a major Australian Defence company to optimise video detection and tracking algorithms prior to an international product launch.
- Applied machine learning techniques to enhance the performance of medical ultrasound devices.
- Applied machine learning to develop tools for intelligence analysts to search through millions of images in seconds using images as queries.
- Applied machine learning to create enhanced tracking and recognition algorithms for a sports statistics company.
- Developed 3D modelling tools to help an international agritech company predict plant yield.

Our commercial research contracts range from \$50,000 to \$5m.



### Co-funded research

AIML has a long history of partnering with industry to attract funding from government funding programs. We can work with you to prepare a highly competitive funding application to leverage your funds and expertise with government funding. Depending on your circumstances, your investment may be eligible for the R&D Tax Incentive.

AIML have a strong track record at attracting funds from programs such as ARC Linkage and Defence industry funding programs. The rates and co-investment rules vary from program to program. Some examples of the more commonly accessed programs are listed below, but there is a long list of alternative co-investment programs that may be suitable.

## FUNDING AVAILABLE FOR RESEARCH WITH AIML

Funding Source	Funding available	Comments
AusIndustry Innovation Connect	\$50k matched 1:1	For proof-of-concepts with industry. You must have a minimum of \$1.5M turnover and been in business for three years.
AusIndustry Accelerating Commercialisation	Up to \$1m matched 1:1	Commercialising research already done. Cash payments of 50% of agreed costs are paid in arrears.
ARC Linkage	Up to \$900k matched 1:1	For research that leads to commercialisation. You need to invest ~\$75,000 per year in cash, unless you are a start-up in which case you should be able to invest ~\$25,000 per annum.
CRC Project Program	Up to \$3M matched 1:1	For research that leads to commercialisation. Must have at least two commercial partners. To be competitive, cash and in-kind contributions from the partners should be worth more than double what is being sought from the Commonwealth Government.
CRC Program	~\$30M to ~\$50M	For research that leads to commercialisation.
Defence Industry Hub	Varies depending on stage of technology readiness but ranges from \$100,000s to \$millions	Needs to meet the objectives and priorities of the program. There are four different stages of technology development ranging from proof of concept to full implementation within defence systems.
Defence Innovation Partnerships	Up to \$150,000	South Australian Government's support program for Defence innovation.
Medical Research Future Fund (MRFF)	Rules vary	The MRFF invests in clinical trials, translational research and fellowships. \$1.4 billion will be spent in the first 5 years.
NHMRC Partnership Projects	Up to \$1.5M over five years	This funding scheme provides funding and support to create new opportunities for researchers and policy makers to work together to define research questions, undertake research, interpret the findings and implement the findings into policy and practice.
Australian Institute for Machine Learning	Matched 1:4	For research that leads to commercialisation and jobs in SA.

# FOUNDATION PARTNERS

For a limited time, AIML is offering Foundation Partnerships to co-develop world-leading applications based on machine learning.



Only one Foundation Partner will be selected in any particular industry sector, offering a level of priority and exclusivity to the collaboration.

Foundation Partners will be required to invest a minimum of \$500,000 per annum for a minimum of three years into research, innovation and product development.

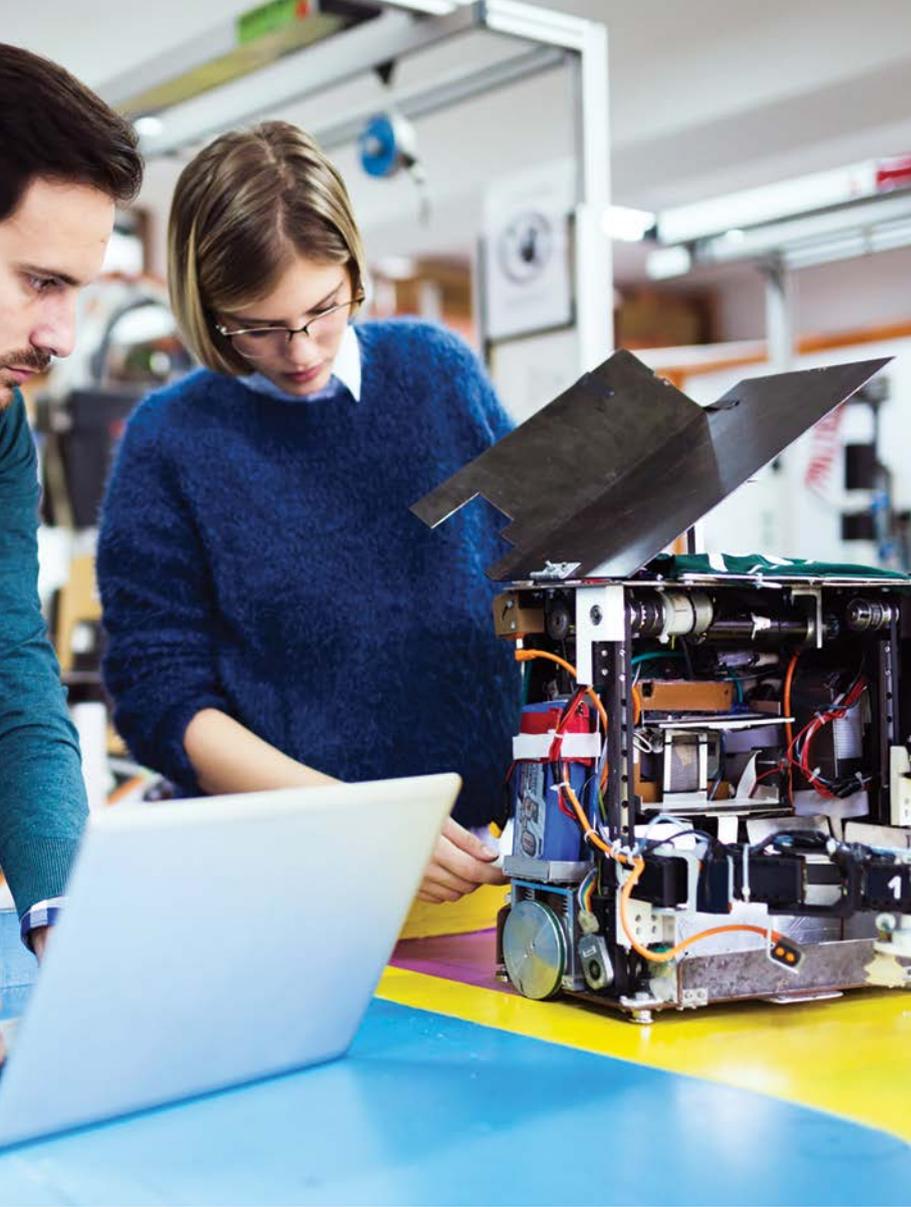
There are many opportunities to leverage this investment:

- We have a funded partnership with the State Government of South Australia to develop AI-driven solutions for government, which Foundation Partners have first rights to co-build with us. These new solutions will potentially have a broad market appeal nationally and internationally as well as for South Australia.
- We are highly successful at attracting innovation grants such as ARC Linkage and AusIndustry grants which require industry cash funds to leverage, providing Foundation Partners with a minimum of 1:1 leverage. You may be eligible to claim the R&D tax credit for your investment into the Institute.

Companies who have a globally recognised brand in automation, defence systems, high-level data analysis, leading-edge computer applications, automated machinery and innovative health systems are particularly encouraged to become Foundation Partners.

In addition to world-class research outputs, Foundation Partners will also receive the following benefits:

- Priority access to some of the world's best machine learning practitioners.
- Priority access to the Institute 'ecosystem' of global researchers, government contacts and industry partners.
- Opportunities for branded Machine Learning / AI workshops and conferences co-hosted by AIML for Foundation Partner staff and clients.
- Priority access to PhD students as potential employees.
- Priority access to development opportunities for emerging opportunities in their sector.
- Opportunity to co-brand on Institute communications materials including website, brochures, banners.
- Foundation Partners-only events, including an annual dinner with the Advisory Board and key researchers of AIML, and other Foundation Partners.
- Access to the network of organisations already engaged with the Australian Institute for Machine Learning.
- Receive the quarterly in-house AIML newsletter with information on the latest research, case studies and issues relating to Artificial Intelligence and Machine Learning.
- Access to up to four in-house training sessions on AI for professional development of executives and in-house AI staff and managers.



# WHAT HAPPENS WITH INTELLECTUAL PROPERTY?



We are flexible and happy to consider alternate models of IP ownership and rights of use. As a matter of principle:

- If you pay for the full costs of the research and provide the data, you can own all of the new IP
- If the University brings background IP to the table, it will retain ownership of that IP but will be open to negotiating a license agreement for you to use it in your product.
- It is important to note that the field of machine learning is moving quickly, and the commercial value of IP developed today can decline rapidly over time without constant upgrades. If you do not have in house resources to maintain the currency of the IP, you may wish to form a longer term relationship with the University or a third party provider to work with you to do so.
- If you and the University collaborate to bring in additional resources to your project, the intention will be to give you rights for commercialisation, and there will be some negotiation around shared ownership of the IP or royalty payments.
- We can also look at licensing IP for specific fields of use, where partners only require use in their specific area of business.

**THE OWNERSHIP OF INTELLECTUAL PROPERTY (IP) IS DEPENDENT ON THE EXISTING OWNERSHIP OF BACKGROUND IP, AND THE CONTRIBUTION OF RESOURCES TO THE DEVELOPMENT OF NEW IP.**

## What are the first steps to work with AIML?

To work with AIML, we suggest that you:

1. Meet with us to discuss in general terms what we could do together
2. Sign a mutual confidentiality agreement
3. Transfer a sub-set of your data to us for us to review
4. Meet again to explore what could be done with your data for what cost, and explore co-investment opportunities
5. Agree on a scope of works and whether to apply for co-investment
6. Apply for co-investment or contract work directly.





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## OUR TEAM

Our research leaders are:

**Professor Anton van den Hengel**  
Computer Vision, Visual Question Answering, Deep Learning, Knowledge Representation.

**Professor Ian Reid**  
Computer Vision, Robotic Vision and Automation, Deep Learning, Knowledge Representation.

**Professor Chunhua Shen**  
Deep Learning Theory, Computer Vision.

**Professor Gustavo Carneiro**  
Application of Machine Learning and Computer Vision to Medical Image Analysis.

**Associate Professor Anthony Dick**  
Computer Vision, Deep Learning, Image Analysis.

**Associate Professor Javen Shi**  
Deep Learning Theory, Probabilistic Graphical Models.

**Associate Professor Tat-Jun Chin**  
Application of Machine Learning and Computer Vision to 3D mapping, augmented reality, space, autonomous robots and self-driving cars.

**Dr Johan Verjans**  
Medical Machine Learning.

**Dr Lingqiao Liu**  
Deep Learning, Computer Vision, Natural Language Processing, Machine Learning Applications in Music.

**Dr Qi Wu**  
Visual Question Answering, Deep Learning, Natural Language Processing.



## FOR FURTHER ENQUIRIES

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