Annual Report 2023

Excellence in AI research and innovation

Australian Institute for Machine Learning

THE UNIVERSITY *of* ADELAIDE

150 YEARS

make history.

Contents

Excellence in AI research and innovation

Our vision

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

Our mission

Research excellence in machine learning (ML), artificial intelligence (AI) and computer vision (CV).

AIML in 2023

Over 190 members in total making AIML the largest university ML group in Australia

50+
new members welcomed in 2023

21%
of AIML members are female

Research resulting in 278 publication outputs in 2023

300+
local and international visitors

Winner
of the 2023 Open Catalyst Challenge hosted by Meta AI Research

Welcome

From the Deputy Vice-Chancellor (Research) and the Pro Vice-Chancellor (Research Excellence)

The University of Adelaide's Australian Institute for Machine Learning (AIML) continues to exemplify the profound impact that universities can have in driving technological advancements and fostering economic growth. Through a commitment to research excellence, AIML is not only shaping the future of artificial intelligence (AI) but is also helping to build the industries and jobs of tomorrow.

Since its start in late 2017, AIML has gone from strength to strength, improving upon its status as the largest and most influential university-based, machine learning research group in Australia.

Upholding its reputation on the global stage, in 2023 AIML continued its significant and impactful contributions to the field of AI and machine learning, while sounding the call on the importance of Australian sovereign AI capability. AIML's members continue to lead the charge at the forefront of innovation, and it is with pride that we recognise this brilliant community of diverse talents.

Please enjoy the AIML 2023 annual report.

Professor Anton Middelberg

Deputy Vice-Chancellor and Vice-President (Research)

Professor Laura Parry

Pro Vice-Chancellor (Research Excellence)

Director's overview

The University of Adelaide's Australian Institute for Machine Learning (AIML) is dedicated to supporting the next generation of AI and ML research talent.

Since its inception in late 2017, AIML has grown rapidly from 80 to 192 members in 2023 making it the largest university-based machine learning research group in Australia. Our cohort continues to outperform other international research institutes of larger size and scale and our local and international impact in the AI sphere continues to grow.

National impact

2023 was a breathtaking year for AI globally and we've had some great achievements here at AIML. 54 new members joined the AIML family as academics, post-doctoral researchers, PhD students, and professional staff, along with several others who joined as short-term interns and summer research scholars. We welcome all of AIML's new members and can't wait to see their contributions to the field.

Throughout the year, AIML members and staff continued to distinguish themselves across a variety of areas. The Institute continues to develop and maintain industry, government, and academic partners at the state, federal, and international levels to not only ensure a diverse range of opportunities for our researchers, but to play a pivotal role in shaping Australia's AI environment.

We've continued our important AI education and advocacy work with the Kingston AI Group and will continue working to build the AI pipeline from schools to industry across SA and the nation, an issue of great importance to me. AIML has also been busy working with government, here in South Australia and federally, delivering the message that investment in AI is essential for Australia's economic future. Our team has met with dozens of MPs and senior policymakers as well as international delegations to relay this message.

> "
> **The work [AIML] is doing and the innovative activities in this space otherwise conducted at Lot Fourteen are truly remarkable. They are beacons for and ornaments to our state and will show the way in terms of innovation over the years ahead."**
>
> **Josh Teague,** Member of the South Australian House of Assembly

The Hon. Ed Husic, Minister for Industry and Science, visited AIML and met with several of our researchers, engineers, and students. In September, four senior AIML members appeared before the SA Parliament's Select Committee on AI where we covered a range of topics including the need to invest in AI research and development nationally and how best to facilitate government regulation of AI.

It was also rewarding to join the National Robotics Strategy Advisory, working with other robotics leaders to help grow our domestic robotics and automation industry and ensure Australians benefit from the technology. We also had a great year in national news and media, with AIML members really leading many of the public conversations about AI in Australia. We had more than 400 news articles written about us in 2023 -- seen by about 13 million Australians – as well as almost 70 radio and tv interviews.

Local engagement

Engaging with the local community is an important part of AIML's role in building AI literacy across Australian industry, government, and the broader public. That it's also great fun makes it even more enjoyable.

AIML members participated in many community engagement events in 2023 including presenting at the Lot Fourteen Student Showcase, speaking to over 100 undergraduate students at the first *PhD @ AIML Information Session*, and hosting cohorts from local schools including Sunrise Christian School, the Australian Science & Mathematics School (ASMS), and The University of Adelaide's Wirltu Yarlu Aboriginal Education unit.

In August, more than 150 people from across government, business, and industry came together to explore the latest in AI research at the AIML Research Showcase 2023. The showcase's focus was responsible AI: what it means, how it works, and how AIML is supporting its growth in Adelaide. This annual event is a great opportunity for AIML members to share their work with a broader audience and for AI practitioners across South Australia to get together and have a great time while discussing AI trends and developments.

In November, AIML partnered with the Australian Academy of Technological Sciences and Engineering (ATSE) in a new report titled *Responsible AI: Your questions answered*, a short collection of papers exploring responsible AI and the benefits it offers Australia. Authors featured in the 38-page report include Centre for Augmented Reasoning (CAR) Director Professor Anton van den Hengel; CSIRO Data61 Director Professor Jon Whittle; National Artificial Intelligence Centre Director Stela Solar; Australian Academy of Technological Sciences and Engineering (ATSE) Chief Executive Kylie Walker; and myself.

Cover of 'Responsible AI: Your questions answered' by AIML and ATSE

Our leaders and high achievers

This year we've had great success with fellowships, awards, and countless industry collaborations.

The Genomic Data, Modelling and Access Interactive Program (SynBioGen) is an initiative, under the leadership of Associate Professor Johan Verjans, to develop an algorithm that can predict human traits from genomic data, including height, hair and eye colour, ethnicity, sex, and facial features. The project commenced in 2023 with Dr Charlotte Na employed to undertake the data synthesis.

Professor Javen Shi continued to serve as a panellist for the CSIRO Responsible AI Think Tank; Senior Lecturer Ehsan Abbasnejad was appointed an Area Chair for both the Conference on Computer Vision and Pattern Recognition (CVPR) and the Conference on Neural Information Processing Systems (NeurIPS); and researcher Dr Wei Zhang served as AI 2023 Industry Day Co-chair.

Dr. Ehsan Abbasnejad and Professor Javen Shi were also awarded an ARC Discovery grant for the project, *Learning to Reason in Reinforcement Learning*. This project aims to equip reinforcement learning (RL) with counterfactual reasoning and outcome anticipation to narrow the gap between AI and human capabilities and broaden the adoption of RL in real-world applications.

AIML researchers Dr Xinyu Li, Dr Zhen Zhang, Professor van den Hengel, and Professor Shi won the Open Catalyst Challenge hosted by Meta AI Research (formerly known as Facebook AI Research) on the NeurIPS Competition Track. The Open Catalyst Challenge uses machine learning to accelerate the calculation of adsorption energy and the discovery of new catalysts. The Causal AI Group from AIML won the challenge with a success rate of 46%.

And AIML researchers Dr Yanyuan Qiao, Zerui Li, Jingxing Cao, Gengze Zhou, and Associate Professor Qi Wu won 3rd prize at the Large Robotics Model and Embodied AI Challenge at the CCF Chinasoft Conference in Shanghai in December. Well done to both teams!

Academic excellence

We are incredibly proud of the AIML members who presented 20 papers accepted at the 2023 Institute of Electrical and Electronics Engineers (IEEE) Conference on Computer Vision and Pattern Recognition

conference in Vancouver. CVPR is ranked by Google Scholar at number 4 among all journals (by h5-index).

In June, AIML hosted a Defence Science and Technology Group (DSTG) employee for a work placement under the NAVIGATE program. The NAVIGATE Program gives participants the opportunity to work with our partners in industry and academia, both in Australia and around the world. Dr Gretel Png was placed with Professor Tat-Jun Chin for six months to research ML for space and Space Domain Awareness (SDA).

Professor Chin also secured grant funding from the Asian Office of Aerospace Research & Development (AOARD) to undertake a research project on physical adversarial attacks against ML models for satellite imagery. The project commenced in 2023 and will continue until 2025, with a portion of the funding used to offer a master's degree scholarship.

Dr Wei Zhang and Dr Weitong Chen were successful in securing funding from the Sustainability Fame Strategy internal grant scheme with their project on 'greenwashing,' or when companies misrepresent their level of environmental friendliness which can undermine consumer trust. The project, undertaken in collaboration with the University's Faculty

of Arts, Business, Law and Economics, will create an AI-driven benchmark predictor to detect greenwashing from companies' public disclosures, combating greenwashing and promoting transparency in sustainability practices.

And AIML delivered a summer research scholarship program to nurture domestic top talent by providing undergraduate students with an opportunity to work directly with senior AIML researchers, gain experience in ML and AI research, and insight into future ML research and career opportunities. The research projects commenced November 2023 and 18 students were selected.

2024 and beyond

2024 will see AIML continue our research excellence in AI, ML, and computer vision, including using these tools to solve some of the big challenges in science and industry. We will continue our advocacy for increased Australian Government support and investment in these invaluable tools, more government collaboration with universities and industry to drive the field of ML forward, and Australian AI sovereignty.

I greatly appreciate the continued and enthusiastic support of the Government of South Australia and the valuable support and collaboration of our federal stakeholders. I thank our advisory board members, academic leaders, early and mid-career researchers committee, and all our hard-working members for their valuable contribution to ML science and innovation. Lastly, I thank the University of Adelaide for its continued and unwavering support of AIML's mission and objectives.

Professor Simon Lucey
AIML Director

Diversity, gender equity, and inclusion

21%

of AIML members are female

74%

of AIML members come from non-English speaking backgrounds

Established a Gender, Equity, Diversity, and Inclusivity (GEDI) charter

Joined Women in AI (WAI) as a major sponsor of the WAI Awards

There are longstanding societal challenges arising from gender inequality, a lack of diversity, and the exclusion of marginalised individuals.

These challenges include the gender pay gap, underrepresentation of marginalised groups, perpetuation of stereotypes and bias, harassment and discrimination, and unequal access to opportunity.

Gender Equity, Diversity, and Inclusivity (GEDI) charter

AIML is and remains committed to addressing these challenges. By the end of 2023, 21% of AIML's members were female, aligning with industry standards. AIML is also proud to be a truly global institution, with 74% of our members coming from non-English speaking backgrounds across Asia, the Pacific, Europe, and North and South America.

In 2023, the Institute created a Gender Equity, Diversity, and Inclusivity (GEDI) charter working to end all forms of systemic discrimination across gender, ethnicity, age, disability, sexual orientation, neurodiversity, and other factors. The charter is part of a larger AIML initiative to foster an inclusive working environment where everyone feels respected, heard, valued, and supported.

AIML believes that creating policies and initiatives that promote diversity and inclusion, educate about bias and discrimination, and provide support to marginalised groups will lead our members to actively build inclusive technologies that benefit everyone.

The Institute is committed to having an inclusive culture where diversity is championed and represented at all leadership levels.

Events and sponsorship

AIML regularly works with community groups to promote diversity in science, mathematics, and technology.

In 2023, AIML joined Women in AI (WAI) as a major sponsor of the WAI Awards gala and ceremony, recognising incredible women working in the AI space. AIML also hosted several Ada Lovelace lunches, which provide an opportunity for women and gender diverse members at AIML to share their experiences, achievements, and concerns in a confidential and friendly forum.

And one of our most popular events, the AIML Community Day, was hosted at a local farm that included a bonfire and lots of marshmallows. This annual event is an incredible opportunity to have fun away from the office and for our international members to learn more about Aussie culture.

Dr Kathy Nicholson
AIML, Operations Manager

AIML research fellows

Dr Ehsan Abbasnejad

Future Making Fellow 2022 - 2025

Dr Ehsan Abbasnejad is a senior lecturer at the University and a team leader with the Centre for Augmented Reasoning (CAR).. He obtained his PhD from the Australian National University in 2015.

His research interests include responsible ML and out-of-distribution generalisation with applications to various vision and language tasks.

Dr Dhani Dharmaprani

Future Making Fellow 2023 – 2027

Dr. Dhani Dharmaprani is a biomedical engineer whose research employs ML techniques to address cardiology challenges. She obtained her PhD from Flinders University in 2020.

Additionally, she is exploring using ML to improve the prediction of patient trajectories and enhance clinical decision-making processes in collaboration with cardiologists at Flinders Medical Centre.

Dr Ravi Garg

Future Making Fellow 2023 - 2026

Dr Ravi Garg is a researcher working in the domain of Computer Vision and ML. He obtained his PhD in 3D Vision from The University of London in 2014 with a dissertation on dense monocular capture of deformable surfaces.

His current research interests includes static and dynamic 3D Reconstruction, Visual Reasoning, and Generative AI for Robotics and Automation.

Dr Melissa McCradden

Hospital Research Foundation Fellowship awarded 2023, to commence 2024-2029

Dr Melissa McCradden is a researcher with The Hospital for Sick Children (SickKids) in Toronto, Canada. She was appointed a five-year Hospital Research Foundation Fellowship in Paediatric AI Ethics through the University of Adelaide, alongside a joint appointment as AI Director at the Women's & Children's Hospital Network (WCHN).

She received her PhD in Neuroscience from McMaster University in 2017. Her past work has focused on sport ethics, and she is particularly interested in how to integrate research ethics and evidence-based medicine.

Dr Jack Valmadre

Australian Research Council Discovery Early Career Research Award scheme (DECRA) 2023-2026

Dr Jack Valmadre is a researcher working in computer vision and deep learning. He obtained his PhD in 2016 at the Queensland University of Technology before taking a postdoctoral research position at the University of Oxford from 2015-2018. His DECRA will be used to investigate how object tracking in computer vision can be improved by new paradigms for algorithm design.

Dr Wei Zhang

Early Career Industry Fellow awarded in 2023, to commence 2024 - 2029

Dr Wei Zhang is an AIML researcher and an Honorary Lecturer at the School of Computing, Macquarie University. She received her PhD from the University of Adelaide in Computer Science in 2017.

Her research focuses mainly on big data analytics, text mining, ML, and Internet of Things (IoT), including IoT-enabled automated mushroom cultivation that provides access to new agricultural techniques.

AI phone app transforms bushwalks into tools for high-tech bushfire prevention

Researchers from the University of the Sunshine Coast (UniSC) and AIML launched the NOBURN (National Bushfire Resilience Network) app in August.

Users are encouraged to take photos of fire-prone areas showing tree canopies, bark, and ground level plant and shrub cover. The app uses computer vision to analyse the photos and assess the potential bushfire fuel loads. The system can also estimate the severity of a potential bushfire and how far it's likely to spread.

AIML's Director of Advanced Reasoning and Learning, Professor Javen Shi, said the AI models have been developed to mimic the eyes of human experts who would ordinarily be scouring bushland for bushfire hazards.

Identifying those potential fire hazards using AI involves training a model to detect segments within an image, which based on previous training, allows them to distinguish which segment is which type of fuel load.

"Once we train the model and get a good model, we don't really need experts to go to the forest because we don't have that many experts, we don't have thousands of experts," Professor Shi said.

"We can easily have thousands of citizens right, kids who do camping or on a family trip and they can just take photos and AI would actually make a prediction."

Professor Shi calls this the "easy part." The more challenging aspect is ensuring the data collected is balanced. While some forests are popular for hikers and campers, others are rarely visited -- and that risks an imbalance in the data being collected.

To avoid skewing the algorithm, Professor Shi said an advanced causal AI model can be used to stitch together thousands of types of forest environments—with differing tree species, lighting, and climate—as one dataset. This helps researchers make more accurate predictions for forests with tiny datasets.

Collecting quality data from users of the app could take up to 12 months, and another year for the app's AI model to be trained on the images uploaded from rural areas. However, as Professor Shi explains, the point of the NOBURN app is about raising awareness of the ways investment in AI can help prevent devastating losses during bushfires.

"The app alone is small, but we hope this is a catalyst to ignite people's excitement because we lose millions of dollars every year to fires," Professor Shi said.

"We hope to expand this to situational awareness like a command centre for the bushfire commanders, and they can see in real time their resource deployment, how a bushfire spreads, and we can build AI for them to interact with."

The idea for the app was sparked after the Black Summer bushfire season in 2019-2020, which burned more than 46 million acres. The fires destroyed more than 9,000 properties, claimed 34 lives and cost farmers up to $7 billion in damages.

Professor Shi worked alongside UniSC forestry experts, Dr Sam Van Holsbeeck and Professor Mark Brown, as well as the director of the Centre for Human Factors and Sociotechnical Systems, Professor Paul Salmon, to develop the NOBURN app. UniSC was able to secure an almost $500,000 Australian Government Citizen Science grant to help them develop and build the app, which can be used on phones and tablets.

Dr Van Holsbeeck said the app could interpret images to give locations an overall fuel hazard rating, a simplified approach which would save time for researchers. He encouraged everyday people to use the app and upload photos from across Australia's vast rural areas.

"There's a huge potential for AI to be leading that game in overall fuel hazard assessment and again even further into bushfire prediction and simulation modelling as we've been attempting with AIML," Dr Van Holsbeeck said. "It's not just a bushfire research project. It is really like a combination of different fields of discipline coming together and doing this is in a way that makes bushfire research accessible to the general public in a sense."

This isn't the first time AIML and UniSC researchers have teamed up to use AI to predict and prevent bushfires. The two institutions worked together to develop a winning project at the Data Quest showcase in 2020. As part of the challenge, the team developed an AI algorithm that could accurately predict the spread and fire scar from a bushfire.

Researchers trained a deep learning model on satellite imagery of more than 120 burn sites ranging in sizes from 100sqm to 5,000sqm. They were also able to use predictors such as temperature and humidity to determine where the fire would travel and how far it would spread. The team's success at the Data Quest showcase allowed them to access federal government funding, which in turn helped get the NOBURN app off the ground.

Professor Shi said the NOBURN app is only the beginning when it comes to deploying AI to fight bushfires and hopes to one day expand the technology into situational awareness for firefighters and emergency responders.

"We can build an AI assistant for them, like how Iron Man has AI talking to Tony Stark saying what's the best odds and what he should do," Professor Shi said.

"We want to build an AI that can have a conversation with the commander and also the firefighters and give them real-time advice and also make them aware of their surroundings because bushfire fighters have tiny visibility when they are on the ground."

By Kurtis Eichler

International Engagement

The Hon. Ed Husic, Minister for Industry and Science (2nd from left), with AIML staff and Kadli, AIML's robot dog, during the minister's visit.

AIML's global engagement brings world-class opportunities

AIML has established strong relationships with government at both the state and federal level, and recognises its important role in advocating Australia's research in AI and ML to international governments and industry bodies. In 2023, AIML hosted delegations from NASA, the UK Space Industry and Government, Japan (JAXA) space agency, India Aerospace and Defence, and ambassadors of NATO countries leading to a wealth of research and industry opportunities for students and researchers.

AIML hosted a tour for Dame Angela McLean, Chief Scientific Adviser to the UK Ministry of Defence, as part of an interactive showcase of University of Adelaide student projects exploring real-life applications of architecture, engineering, science, technology, computer and mathematical sciences. The Institute also hosted a visit from His Excellency Mr Ryuta Ibaragi, Governor of Okayama, Japan and the Vietnamese Ambassador to Australia, Mr Nguyễn Tất Thành. AIML is actively pursuing opportunities to increase its links with academia and industry in Vietnam and Southeast Asia more broadly.

This world class engagement has allowed AIML to create one-of-a-kind opportunities for researchers and students, and provided the framework for AIML students and staff to create unparalleled connections and learning experiences of their own.

International partnerships

Master research agreements (MRAs) were signed with MITRE, a U.S.-based, non-for-profit research and development organisation, in late 2022. AIML has recruited a domestic PhD student for the first scholarship, Adam Bethell, who commenced his studies in early 2023. Supervised by Professor Ian Reid, Adam's research is on simultaneous visual tracking and object modelling using an autonomous drone for surveillance and pursuit, which has significant alignment with MITRE's research objectives and pertinence to national security.

In September, Certis Group, a Singapore-based company that designs, builds, and operates multi-disciplinary smart security and integrated services, engaged AIML for a six-month research project to explore the ability of security technology to detect anomalies in public spaces and identify a wide range of threats. AIML Associate Professor Qi Wu, Dr Ehsan Abbasnejad, and Dr Yuankai Qi led this research, including training AI software to detect the different types of items that passengers typically carry in public transport hubs.

AIML students abroad

By the end of 2023, AIML had worked with or was working with numerous organisations to adopt or develop ML technology.

During this period, AIML engineers and researchers transitioned to roles at Amazon, Rising Sun Pictures, Amplified Intelligence, Canva, Mighty Kingdom, and other established companies.

Other AIML students were also afforded opportunities to visit some of the most prestigious universities and companies in the world, expanding their networks as well as their AI knowledge. Here are a few of their stories.

Lana at Carnegie Mellon University

Lana Tikhomirov, PhD Student

My primary supervisor was taking a well-earned research sabbatical to the U.S. and invited me to come along. I was extremely lucky to learn from respected academics during our visits to Carnegie Mellon and Harvard universities, as well as attend a machine learning conference at The Massachusetts Institute of Technology (MIT).

Our meeting with the Carnegie Mellon human computer integration (HCI) group was an amazing experience where we got to meet with many different PhD students and researchers who took an interest in our work. I also was able to visit some HCI students at Harvard who are researching fascinating topics such as large language models (LLMs) and generative models for artists and writers.

Academia can feel isolating when your field is new or small such as mine, but meeting like-minded people makes me feel like I'm on the right track. I learned what role my research could play in the broad spectrum of AI and how I can best maximise the value of AI safety as a field. I now have a good idea of where my work needs to reach to be implemented, and I hope to work further on creating AI that is safe from a cognitive and ethical perspective.

Harrison with the UAVs he used to test his team's learning-based visual odometry model at Carnegie Mellon University

Harrison Taylor Bagley, PhD student

I found out about the 2023 Robotics Institute Summer Scholars (RISS) program at Carnegie Mellon University and I knew it would be a great experience to collaborate with some great minds. Whilst there, I worked on a project involving robotics and AI that involved integrating a learning-based visual odometry model with the flight stack of an unmanned aerial vehicle (UAV).

There were definitely plenty of challenges, including sensor issues, a lot of hardware debugging for the robot operating system (ROS) and evaluating model performance. However, I really enjoyed the ability to work with some great people from all over the world and make great friendships while working on some exciting technology. I hope to grow my knowledge in the field of AI whilst developing the skills to be a proficient researcher.

Cameron at the Golden Gate Bridge in San Francisco during his Apple internship

Cameron Gordon, PhD student

In 2023 I completed a four-month research internship with Apple in Cupertino, California as part of an existing engagement with the Institute. The project focused on applying recent ML techniques to problems in computer graphics and geometry.

By far the highlight of the internship was the people. Other interns came from around the world and everyone was a deep expert in at least one area (ML, cryptography, compilers, front-end design, materials science, user-oriented psychology). This leads to a highly energised melting pot of ideas and innovation, cross-cultural connection, and cross-disciplinary technical perspectives. Companies in Silicon Valley are hungry for people with AI, ML, and computer science skills. I highly recommend taking advantage of these industry internships to other students at AIML.

Centre for Augmented Reasoning (CAR)

Headquartered within AIML and building on its existing research strengths, the Centre for Augmented Reasoning (CAR) is helping to create the next generation of AI experts and solidifying the University as a key strategic research institution for ML in Australia.

CAR is led by Professor Anton van den Hengel and maintains a number of programs and initiatives, including providing grants and funding opportunities for students and researchers. In 2023, CAR hosted 25 advanced reasoning research grants, awarded 10 PhD scholarships, and provided support to 8 High Performance Researchers.

Kingston AI Group

The Kingston AI Group, an initiative of the directors of AIML and CAR, includes 14 top professors of ML from eight Australian universities. The group was formed by CAR Director Professor van den Hengel in 2022 to coordinate Australia's AI leadership and be a trusted source of expert advice to the government.

The group gathered in Canberra in May for a Parliamentary Friends of Science panel discussion on how AI is used in Australia currently and its future potential. The panel, entitled 'Australia's ChatGPT Moment,' was held at Parliament House and gave MPs and parliamentary staffers a chance to ask panellists about hot-button issues including data gathering, automation, cybersecurity, and AI regulation. The event was co-hosted by Science & Technology Australia (STA) and the Academy of Technological Sciences and Engineering (ATSE).

Kingston AI Group members and AIML staff in Kingston, Canberra 2023

Submissions and publications

Kingston AI Group continued to contribute to the AI discussion in Australia with a series of important government submissions and articles analysing AI's growth in-country. In May, it submitted a response to the Australian government's National Robotics Strategy discussion paper seeking input on the future vision for Australia's robotics sector. The group's submission noted Australia's strength in both robotics and computer vision research which represents an opportunity for the nation, but that Australia risks relinquishing control to foreign commercial and national interests if it doesn't develop its own domestic robot capability.

In August, Kingston AI Group submitted a response to an Australian Government discussion paper on Supporting Responsible AI stating that it was critical for Australia to invest in research and development to build the country's domestic AI capability if it wants to create, understand, and control the technology.

Throughout the year, Kingston AI Group published pieces touting the need for increased investment in Australian AI. In November, the group published an article that asked the critical question, 'If Australia invested $1 billion in AI research and development, where should the money be spent and what impact would we see?' In the piece, group members identified funding a national AI initiative, creating ecosystems between universities, startups, and industry that allow for AI innovation, strong and robust government investment, and partnering those investments with core research technology as critical to growing AI in Australia.

Right: In 2023, Kingston AI Group members were afforded several opportunities to engage with the Australian federal government

Centre for Augmented Reasoning (CAR)

ARTofficial art exhibit

A CAR-led application was awarded the City of Adelaide's CreaTech Challenge Grant in September 2022 to build an AI-powered, interactive, artwork vending machine that was exhibited in Rundle Place in Adelaide's CBD from 20 March to June 2023.

Instead of trading snacks for cash, the ARTofficial Truth Machine ATM-001 art exhibition – presented by multidisciplinary artists Dave Court and James Brown, and supported by CAR's Special Projects Officer Luke Heffernan – generated unique artwork based on the 'opinion' the machine formed after users had a conversation with its AI personality.

It also rewarded users with products designed by local artists, including Australian native plant seeds wrapped in art posters, custom AI-made digital art, and personalised feedback written as poetry.

The artwork was displayed on the screen and available to download via QR code. The exhibit was incredibly popular and drew well over 5,000 visitors. The ARTofficial Truth Machine ATM-001 was also displayed at the inaugural SXSW festival in Sydney in October 2023 where almost 500 attendees engaged with it.

Left: A user prepares to engage with the ARTofficial Truth Machine ATM-001 at Rundle Mall in Adelaide

Top AIML publications 2023

In 2023, AIML members authored 278 papers in leading international journals and conferences, making notable contributions to global conversations around AI and ML.

AIML's research leaders have nominated the following short selection of papers as the most impactful in their respective fields.

Names in bold are AIML members.

Lana Tikhomirov, Simon Lucey, Anton van den Hengel, Elanor Huntington, Jon Whittle, Stela Solar, Michael Milford, Carolyn Semmler, Katrina Falkner, Rocky Chen, Andrew Dettmer, Kylie Walker, Mary-Anne Williams, **Kingston AI Group**, Ian Opperman. *Responsible AI: Your questions answered*. The Australian Academy of Technological Sciences and Engineering (ATSE) and the Australian Institute for Machine Learning (AIML). November 2023

Ziqin Zhou, Yinjie Lei, **Bowen Zhang, Lingqiao Liu, Yifan Liu**. Zegclip: *Towards adapting clip for zero-shot semantic segmentation*. Published in the Conference on Computer Vision and Pattern Recognition (CVPR) 2023

Liang Chen, Yong Zhang, Yibing Song, Ying Shan, **Lingqiao Liu**. *Improved test-time adaptation for domain generalization*. Published in CVPR 2023

Yanyuan Qiao, Yuankai Qi, Yicong Hong, Zheng Yu, Peng Wang, Qi Wu. *History-enhanced and Order-aware Pre-training for Vision-and-Language Navigation*. Published in IEEE Transactions on Pattern Analysis and Machine Intelligence (Volume: 45, Issue: 7, 01 July 2023)

Yanyuan Qiao, Zheng Yu, Qi Wu. *Parameter-Efficient Transfer Learning for Vision-and-Language Navigation*. Published in the International Conference on Computer Vision (ICCV) 2023.

Melissa McCradden, Oluwadara Odusi, Shalmali Joshi. Ismail Akrout, Kagiso Ndlovu, Ben Glocker, **Gabriel Maicas**, Xiaoxuan Liu, Mjaye Mazwi, Tee Garnett, **Lauren Oakden-Rayner**, Myrtede Alfred, Irvine Sihlahla, Oswa Shafei, Anna Goldenberg. *What's fair is... fair? Presenting JustEFAB, an ethical framework for operationalizing medical ethics and social justice in the integration of clinical machine learning: JustEFAB*. Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency

Damien Teney, Yong Lin, Seong Joon Oh, **Ehsan Abbasnejad**. *ID and OOD Performance Are Sometimes Inversely Correlated on Real-world Datasets*. 37th Conference on Neural Information Processing Systems (NeurIPS 2023).

Mark D. McDonnell, Dong Gong, Amin Parveneh, Ehsan Abbasnejad, and **Anton van den Hengel**. *anPAC: Random Projections and Pre-trained Models for Continual Learning*. NeurIPS 2023

Luke A Smith, Lauren Oakden-Rayner, Alix Bird, Minyan Zeng, Minh-Son To, Sutapa Mukherjee, **Lyle J Palmer**. *Machine learning and deep learning predictive models for long-term prognosis in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis*. The Lancet Digital Health

Top Research Grants for 2023

In 2023, AIML researchers, academics, and students were awarded a number of prestigious grants and fellowships, further cementing AIML's position as a top AI research institute in Australia.

Analytics for the Australian Grains Industry

Analytics for the Australian Grains Industry (AAGI) is a five-year strategic partnership aimed at harnessing analytics to drive the sector's profitability and global competitiveness. AAGI awarded The University of Adelaide $12 million, including $1.93 million for AIML to provide ML research and engineering capability.

The Hospital Research Foundation

In July, Dr Zhibin Liao was awarded $125,000 from the Hospital Research Foundation to undertake research on advancing the imaging diagnosis of juvenile idiopathic arthritis with deep learning. And Dr Melissa McCradden was awarded the Hospital Research Foundation Fellowship, valued at $750,000, for the period 2023-2029. Dr McCradden's research focuses on sport ethics, specifically concerning youth athletes and sport violence, and the integration of paediatric bioethics concepts into youth sport.

ARC Discovery Project

Associate Professor Ehsan Abbasnejad and Professor Javen Qinfeng Shi were awarded an ARC Discovery Project, *Learning to Reason in Reinforcement Learning.* This project, valued at $544,551, aims to narrow the gap between AI and human capabilities and broaden the adoption of reinforcement learning in real-world applications.

ARC Discovery Project

Dr Yifan Liu, who sadly passed away in September, was named as a chief investigator on a successful Discovery Project led by Professor Andrei Kotooussov from the School of Electrical and Mechanical Engineering. The team was awarded $527,934 to develop a new methodology for the assessment of fatigue life of structures subjected to realistic loading conditions.

ARC Early Career Industry Research Fellow

Dr Wei Zhang was awarded an Early Career Industry Research Fellow, valued at $501,000 over three years. Dr Zhang's research focuses mainly on big data analytics, text mining, machine learning and Internet of Things (IoT), including the development of a portable, automated system for the cultivation of mushrooms.

ARC Discovery Early Career Research Award scheme (DECRA)
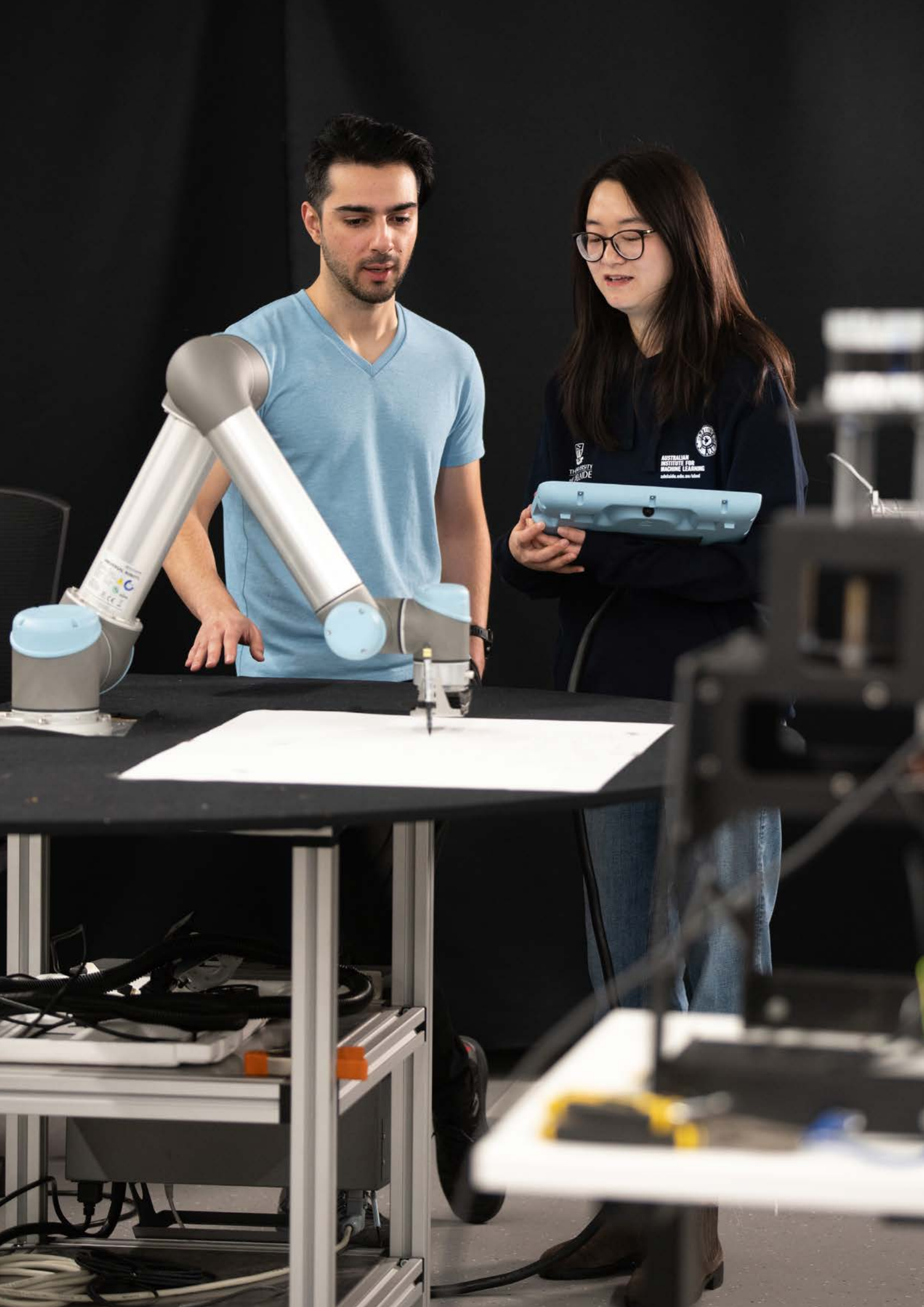
AIML researcher Dr Jack Valmadre was awarded a DECRA, valued at A$366,000 in September 2023. The award will be used to investigate how object tracking in computer vision can be improved by new paradigms for algorithm design.

Asian Office of Aerospace Research and Development (AOARD)

Professor Tat-Jun Chin has secured grant funding from the Asian Office of Aerospace Research & Development (AOARD) to undertake a research project on physical adversarial attacks against ML models for satellite imagery. The project, valued at $330,000, will continue until 2025, and a portion of the funding will be used to offer a master's degree scholarship valued at $33,000 per annum.

ARC Discovery Project

Dr Wei Zhang was awarded $292,330 to develop data analytics techniques that can extract accurate information in complex structures from imperfect/incomplete data that changes over time. The project will likely improve data tools relevant to critical sectors such as cybersecurity, healthcare, and defence.

◣ Further enquiries