Kingston AI Group
Australian Professors of Artificial Intelligence

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# A national vision and strategy for Australia to be a world leader in AI by 2030

## Statement by the ***Kingston AI Group:*** *Australian Professors of Artificial Intelligence*

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**Australia must develop a national vision and strategy for artificial intelligence that includes a substantial new investment in building core sovereign capability. This is essential for our prosperity, economic diversity, and sovereignty.**

Artificial intelligence (AI) is a disruptive technology that is transforming the global economy. It will impact every sector of Australian industry, challenge our national security, and test our democracy. The first movers in AI gain a disproportionate advantage because of the importance of capturing and controlling the data that drives AI technology. Countries and companies that have invested in high-level AI capability, data and computing infrastructure have reaped enormous rewards, and have set the agenda for the quality and performance of the technology that we all now use.

*Australia's AI Action Plan* set a vision to "establish Australia as a global leader in developing and adopting trusted, secure and responsible AI"[1]. If Australia is to achieve this outcome, and control its destiny through the ongoing AI-driven societal revolution, we must proactively engage with the technology and build a sovereign capability—that is, AI developed and owned here in Australia, which is inclusive, safe, secure and reliable.

The alternative is to relinquish control of our technology to foreign commercial and national interests.

A group of Australia's top researchers and innovators in artificial intelligence met in the Canberra suburb of Kingston in late September 2022 to discuss how to better coordinate and accelerate our national research and education effort so that Australia benefits from the AI revolution. The Kingston AI Group now includes 14 leading professors from eight universities, and the Chair of Robotics Australia Group. Eight are members of the learned academies and five are existing or previous laureate fellows. As well as driving Australia's AI research, these individuals are working with companies to develop transformative commercial AI solutions.

At the Kingston meeting we agreed that the development of sovereign AI is of critical importance to Australia's future security and prosperity. We identified the need for Australia to invest in the development of our own AI to:

[1] (2021) *Australia's AI Action Plan* (June 2021). Department of Industry, Science and Resources. Available archived at: http://industry.gov.au/ai-action-plan

- improve Australian economic prosperity in the face of the unique challenges of living in a big, diverse country with a low population density
- protect Australia's national security from an increasing online threat and dynamic geopolitical circumstances
- maintain control over Australia's data and information flow to enable Australian business opportunities and protect Australian democracy, security and privacy
- ensure Australian businesses and governments understand the value and performance of the AI products they buy, and the impact of the purchasing decisions they make
- use AI as a productivity enhancer to support the creation of a diverse range of high-paying jobs
- ensure Australia's adoption of AI is inclusive, safe, secure and reliable, and make responsible AI and digital trust a competitive advantage of Australia's industry.

These sentiments are echoed by the Australian Academy of Technological Sciences & Engineering in its statement, *Strategic Investment in Australia's Artificial Intelligence Capability* (July 2022).

A major investment in building our own AI capability will help meet the skills gap that the country faces as we adapt to an AI-enabled world. The Australian Government understands the country will require as many as 161,000 AI jobs by 2030[2], and at the moment, there is no mechanism to achieve this.

A failure to deliver the AI workforce Australia needs will harm our future economic growth, shrink our economic complexity, and weaken our sovereign control in key industry sectors. If done strategically, a major investment would result in Australia becoming one of the leading countries in AI, and that would:

- stimulate productivity across the economy, and support wage growth
- improve Australia's economic complexity
- address the skills shortage facing some of our key industries and sectors
- transform how we manage our energy systems for the 21st century
- assist in faster and cheaper adaptation to the effects of climate change
- bring improvement in food security, and dramatic improvements in public health
- ensure greater sovereign security and protection.

The Kingston AI Group identified that the core research challenge for Australia to solve is how to train AI faster and more accurately with smaller amounts of data and in close collaboration with humans. We need this 'small data' capability to give us a competitive edge against much larger economies and companies that rely more on vast datasets, computing infrastructure, and a larger engineering workforce to build their AI capability.

We can be early adopters by being able to build high quality AI without the need to invest first in creating huge datasets. This can help us solve uniquely Australian challenges where global datasets don't exist.

In addition, as the world becomes more unstable geopolitically, the group agreed with multiple reviews[3] identifying that to make Australia safe and secure, AI is absolutely critical for protecting us from

[2] *Artificial Intelligence Roadmap* (April 2019) CSIRO Data61. Available at: https://data61.csiro.au/en/Our-Research/Our-Work/AI-Roadmap

[3] Moy, G. et al. (2020) *Recent advances in artificial intelligence and their impact on Defence*, Defence Science and Technology Group. Department of Defence. Available at: https://www.dst.defence.gov.au/publication/recent-advances-artificial-intelligence-and-their-impact-defence

cybersecurity attacks, biosecurity risks, technology supply chain disruptions and asymmetric conflict wherein Australia will be the weaker combatant. AI is one of the initial capabilities to be developed under the AUKUS alliance.

## An integrated strategy for AI in Australia

Engaging piecemeal with the AI revolution will not work. We instead require an integrated strategy to grow the entire education-to-industry pipeline. If we stimulate interest in AI, but do not deliver the skilled workforce and technological advantage, all we will create is frustration. If we build the skills but not our own industry, those skilled workers will go overseas—accelerating the tech brain drain. If we create the world's best regulation, but not an industry or expert skills of our own, our economic future lies in the hands of other nations and corporations.

To have an influence in what future AI technology is deployed in Australia, and the impact it will have, we must take a leadership position today.

Australia currently performs well in some of the key areas of AI innovation, but we are slipping behind other countries that have invested more proactively. We are not operating at the scale required to support the needs of current industries, let alone new ones. What we need is an integrated strategy that:

- creates our own AI that services Australia's unique needs
- builds the skilled workers and entrepreneurs required to build an AI-enabled industry
- enables Australian businesses to be the early adopters and developers of AI, and gain a global trade advantage
- protects important national datasets of sovereign importance to create Australian value
- creates sovereign AI capability for Australia's national security needs
- adopts the Australian principle of a 'fair go' for everyone, and does not become exploitative.

## An Australian AI research strategy must deliver Australian AI for Australia's unique needs

All countries, including Australia, have unique needs for AI technology that are best developed in-house. This means each country must develop its own AI capability in some key areas, and cannot simply rely on a few international technology giants to meet all their requirements. In addition, countries like Australia may not wish to release nationally sensitive data to overseas companies. Some of Australia's unique AI needs include:

### Solving the challenge of living in a big country with a dispersed population

Australia has one of the lowest population densities in the world. We have an ageing population, highly concentrated in cities and then sparsely populated over enormous areas, with a relatively high rate of immigration. We are custodians of unique, megadiverse and fragile ecosystems; and we have a highly variable climate compared to other countries. These elements all create uniquely Australian challenges to consider. The promise of Australian AI is that it can:

- deliver health and other services to regional areas cost-effectively and to the same standards as the services received in the cities

- transport minerals and goods over vast distances safely and cheaply via smarter supply chains and increased automation
- optimise and maintain domestic control of Australia's food production in a fragile and unpredictable environment to achieve social, economic and environmental outcomes
- manage a highly distributed and complex energy supply system
- deliver housing services to fast growing cities and regional centres cost effectively and fairly
- provide an ageing population with safety, dignity and purpose
- monitor for biosecurity threats to better protect our unique natural environment
- measure carbon at huge scale and low cost
- save billions of dollars of infrastructure losses due to climate change
- safeguard Australian lives, homes, businesses, plants and animals from bushfire, flood and other natural disasters
- protect the public from information warfare, our businesses from cybersecurity threats, and our defence forces from AI-enabled weapons systems
- deliver higher quality public services at reduced costs
- maintain sovereignty of Australia's large land mass and extensive coastline.

### Maintaining control over Australia's sovereign data to protect Australians and Australian businesses

The performance of AI depends on the quality of the data on which it is trained. Google's search engine, for instance, is trained on billions of search queries and website clicks—it uses our search behaviour to train its algorithms. Companies that control AI systems end up learning a lot about the people that use them. Imagine if foreign AI companies knew more about Australians and Australian businesses than we did ourselves. Imagine if we lost control of our agricultural and mining industries to foreign controlled software systems. Imagine if foreign software companies knew more about our health than our own doctors and health system.

In areas where national interests need to be protected, we must insist on Australian owned AI for the core functioning of related digital systems and datasets. For these sectors, we need to be the early developers and adopters, with government support and protection (e.g. health care built off public health data).

### Knowing that AI meets Australia standards

Without our own homegrown expertise in the design and delivery of some high-quality AI systems, it will be very difficult for Australia to assess AI products that are purchased from international vendors, or develop technically informed guidelines and standards for AI technology. We need to have our own domestic technical expertise to draw upon to inform our understanding of the AI we are buying, its sovereign risks, and how we should regulate it and further adapt it.

### Using AI as a productivity enhancer to support economic growth and job creation

Globally, AI is supporting workers to become more productive. It has shifted human work effort from more repetitive, dangerous and low-paid tasks, to more creative, safe, interesting and higher paying work that is more suited to a highly diverse workforce.

The increased contribution to the global economy by 2030 from AI is estimated by PwC at USD$16 trillion[4] and McKinsey & Company at USD$13 trillion[5]. No other new technology shows this level of promise, but the benefits will be gained disproportionately by the early adopters.

Automation increases the size of the workforce, rather than decreasing it, as human creativity and productivity is unleashed within organisations[6]. This is the opportunity for Australia to develop and promote AI as a tool to kick-start productivity increases across all sectors of the economy, and create more and better jobs for all Australians.

## Enhancing Australia's national security and safety

AI is now a critical tool in managing national security, and it is important that, wherever possible, we retain sovereign control over the systems that protect Australia. Such systems will include:

### *Cybersecurity*

AI is essential to the vigilant monitoring of the information systems that run every aspect of our modern lives. Recent high-profile cyberattacks have illustrated the immense costs of not effectively defending our digital assets and information. The potential impact of future cybersecurity attacks is still far worse than what we've seen so far.

### *Biosecurity*

The challenge of managing biosecurity risks is that rare, small incursions of invasive plants, animals or diseases can wreak billions of dollars of damage to the Australian economy. AI is again ideally suited to be a persistent, round the clock guardian of Australia's borders against biosecurity threats.

### *Work safety*

AI is being increasingly used to monitor worksites to identify dangerous situations and provide early warnings before accidents happen. The potential is to substantially reduce workplace death and injury.

### *Democracy*

The result of abdicating control of a nation's news media and election campaign information is visible in the impact Cambridge Analytica had using the data of millions Facebook users to influence the 2016 US presidential election and more than 100 other elections across 30 countries[7]. Ethical AI systems must be built to quickly detect and prevent future attacks on the integrity of democratic systems.

### *National defence*

AI is the key technology required to succeed in information warfare and asymmetric warfare. Australia can and should develop its own sovereign AI capabilities to support its national defence

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[4] PricewaterhouseCoopers, *PWC's Global Artificial Intelligence Study: Sizing the prize*, PwC. Available at: https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html

[5] Bughin, J. et al. (2018) *Notes from the AI Frontier: Modeling the Impact of AI on the World Economy*, McKinsey & Company. McKinsey Global Institute. Available at: https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy

[6] Taylor, C. et al. (2019) *Australia's automation opportunity: Reigniting productivity and inclusive income growth*, McKinsey & Company. Available at: https://www.mckinsey.com/featured-insights/future-of-work/australias-automation-opportunity-reigniting-productivity-and-inclusive-income-growth

[7] Ghoshal, D. (2018) *Mapped: The breathtaking global reach of Cambridge Analytica's parent company*, *Quartz*. Quartz. Available at: https://qz.com/1239762/cambridge-analytica-scandal-all-the-countries-where-scl-elections-claims-to-have-worked

efforts and keep people safe. Such technology also gives us something to trade with our allies as we all seek to contribute to the maintenance of international peace.

### Ensuring Australia's AI adoption is inclusive, safe, secure and reliable

For Australia to gain the full benefits of AI, it's important to ensure that the AI systems developed by businesses, governments, and academia are safe and trusted by the citizens and communities who are expected to rely on them. To achieve this, the development and adoption of AI systems must be responsible and aligned with ethical and human values. Australia was one of the first countries to propose an AI ethics framework. Since then, a vibrant, responsible AI ecosystem is emerging in Australia, not only proactively reducing risks in AI, but also turning responsible AI and related digital trust into a competitive advantage for Australian business.

## What core research expertise should Australia build?

Global AI giants like the United States and China are developing better AI by training it on enormous datasets, using huge supercomputers and employing thousands of machine learning engineers. The results are impressive and have led to the creation of multiple tech unicorns and multi-billion-dollar companies.

Australia does not have the human or financial resources to compete against this type of AI. But where we can compete is in designing AI systems from small datasets where large datasets cannot be collected, or where the resources to build 'big AI' are not available. This type of AI is highly suited to solving Australian challenges and in building Australian security systems, where large datasets and resources are often not available.

This requires research into the careful and clever use of mathematics and coding to achieve disproportionate performance with more limited resources. Some of the specific research areas include: efficient learning, lifelong learning, transfer learning, expert knowledge, common sense and reasoning.

These types of AI require greater responsible collaboration with humans to develop machines that learn faster, adapt faster and interact much better with humans in the 'real world' than those systems built solely on data learning. We want to build AI that needs fewer inefficient guardrails and cages to protect humans, and is more easily moulded and improved by human interaction to meet individual human needs. This is an area of development that has been recognised by the wider communities in collaborative intelligence companies such as Meta[8] and Salesforce[9]. Fortunately, Australia has leading talent in this research area, which is attracting the attention of the global tech community.

This 'nimble AI' is where Australia should focus its research effort.

## Building the AI workforce to be a global AI leader

Australia currently is at risk of experiencing a significant shortfall in skilled AI workers by 2030. Such a failure has concerning implications for Australia's ability to sustain a complex, prosperous economy, and sovereign control over key industry sectors, and its democracy.

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[8] Woodall, T. (2022) *Meta's AI chief publishes paper on creating 'autonomous' Artificial Intelligence*, VICE. Available at: https://www.vice.com/en/article/qjkwqb/meta-ai-chief-publishes-paper-on-creating-autonomous-artificial-intelligence

[9] Savarese, S. (2022) *If you can say it, you can do it: The age of conversational AI*, Salesforce AI Research. Available at: https://blog-salesforceairesearch-com.cdn.ampproject.org/c/s/blog.salesforceairesearch.com/age-of-conversational-ai/amp/

We are strongly of the view that we need a profound increase in skills development at all levels. Australia needs an increase in technicians trained in the VET sector and to improve AI literacy across government, business, and the community. But more than this, to sustain and build a thriving and innovative AI sector, we need our universities to produce a critical mass of AI experts at both graduate (bachelor degree) and postgraduate (master degree and PhD) levels. It's primarily these experts Australia will rely on to:

- provide the technology leaders required in government and industry
- support the development of unique Australian AI for all of the reasons listed above
- generate unique IP that can lead to a new class of business unicorns
- feed the startup community with technical experts and leaders.

It's no accident that industry clusters form around universities that have leading expertise in particular areas. Silicon Valley could not exist without Stanford University. Optics Valley in Tucson, Arizona—with 150 optics companies worth USD$4 billion to the local economy[10]—wouldn't exist without the optics research expertise developed at the University of Arizona. Food Valley in the Netherlands has developed out of the research expertise at the University of Wageningen.

Australia cannot hope to build a world-class AI sector that can solve Australian challenges and protect Australian sovereignty and jobs without a vibrant and productive research effort. It is the PhD students and postdoctoral fellows who lead the growth of advanced technology industries. The field of machine learning and artificial intelligence is advancing at a rate even the experts struggle to keep up with. It is only by building deep understanding in the core and emerging technology areas and leveraging its 'fair go' principles and trust-enhancing technologies that Australia can hope to maintain any sort of advantage in this rapidly growing and fast developing field. We need investment in core research and postgraduate skills development at between two and ten times the current rate to match the investment by global peers. And we need to invest in targeted areas where we can maintain global leadership, and which matches Australia's needs.

[10] *About optics valley* (2022) Arizona Technology Council. Available at: https://www.aztechcouncil.org/about-optics-valley/

## Kingston AI Group members

**Professor Joanna Batstone**
Director of the Monash Data Futures Institute, Monash University

**Professor Peter Corke** FAA FTSE FIEEE
Joint Director of the QUT Centre for Robotics, Queensland University of Technology

**Professor Stephen Gould**
Australian National University

**Emeritus Professor Richard Hartley** FAA
Australian National University

**Professor Anton van den Hengel** FTSE
Director of the Centre for Augmented Reasoning, The University of Adelaide

**Adjunct Professor Sue Keay** FTSE
Robotics Technology Lead, OZ Minerals; and Chair of the Robotics Australia Group

**Professor Dana Kulić**
Director of the Robotics Research Group, Monash University

**Professor Jie Lu** AO FIEEE
Director of the Australian Artificial Intelligence Institute (AAII), University of Technology Sydney (UTS)

**Professor Simon Lucey**
Director of the Australian Institute for Machine Learning (AIML), The University of Adelaide

**Professor Michael Milford** FTSE
Joint Director of the QUT Centre for Robotics, Queensland University of Technology

**Professor Ian Reid** FAA FTSE
Australian Institute for Machine Learning (AIML), The University of Adelaide

**Professor Ben Rubinstein**
Associate Dean (Research) Faculty of Engineering and Information Technology, The University of Melbourne

**Professor Svetha Venkatesh** FAA FTSE
Co-Director of the Applied Artificial Intelligence Institute (A2I2), Deakin University

**Professor Toby Walsh** FAA
Chief Scientist of the UNSW Artificial Intelligence Institute, The University of New South Wales