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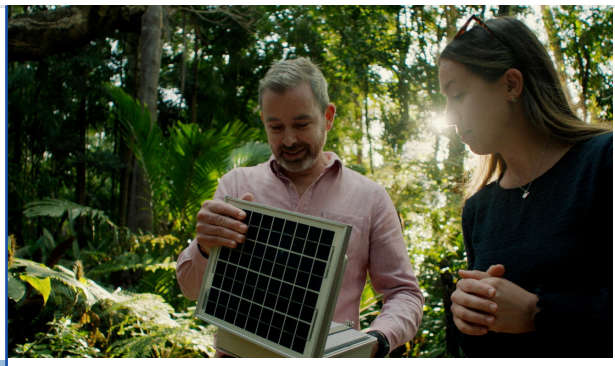
A Policy Framework for Building the Future of Science with AI in Australia



Executive Summary

Artificial intelligence (AI) is ushering in a new era of scientific discovery in Australia, revolutionising the way research is conducted and accelerating the pace of scientific breakthroughs. Australian science punches above its weight: the country's research accounts for 3.5% of the world's publications and is cited 42.2% higher than the world average. The pace of AI adoption will be a crucial determinant of the ongoing competitiveness of Australian science. With the ability to process vast datasets, identify patterns, and generate novel hypotheses, AI can help Australia's scientists to tackle complex challenges once thought impossible to solve within our lifetimes.

These are not distant promises, but tangible benefits already unfolding. AI is advancing science and improving lives in Australia today. A strong majority of Australians—over two-thirds—expect AI to have a positive impact on science. Machine learning and predictive technologies are supporting Australia's transition to a sustainable, greener economy; protecting and conserving Australia's precious biodiversity and natural ecosystems; and building healthier communities by enabling personalised care and speeding up drug discovery. AI is also contributing to scientific progress across a wide range of fields—from education and quantum computing to the natural sciences.

Building on today's successes, Australia's potential for tomorrow is even greater. With the right support, Australia can further harness AI to drive scientific breakthroughs: accelerating the shift towards clean energy, protecting the environment, advancing healthcare, and much more. Strategic investment and an enabling set of policies can empower Australia's scientific community to lead in this new frontier.

This paper outlines three specific policy pillars – the "three I's" – that the Australian Government can pursue to ensure AI positively impacts science and benefits all Australians:

- **Infrastructure** — Increase Access to AI Infrastructure:
  High-quality scientific data and computational resources can unlock AI-powered scientific solutions. To strengthen Australia's existing capabilities and foster international collaboration, the government should continue to support national and international pools of data, models, compute and software. This could include supporting AI for Science resource centres to provide researchers with shared access to data, computational, and educational resources for leveraging AI for scientific work.

- **Investment** — Invest in the Science of AI:
  Sustained government funding is crucial for ambitious, long-term scientific research in Australia, such as advancing quantum technologies and accelerating drug discovery. To get there, the Australian Government should refine its list of priority areas to strategically direct funding and further support AI programmes and initiatives that drive socially beneficial scientific innovations. Novel public-private partnerships and funding approaches can play an important role in maximising the impact of such initiatives and help cultivate Australia's next generation of scientific and AI talent.

- **Innovation** – Implement Pro-Science and Innovation Legal Frameworks:
  Science thrives on collaboration and the open exchange of information. To position Australia as a global leader in AI-driven science, the government should pursue harmonised, interoperable regulations that support continued AI adoption and scientific progress, especially in areas like privacy, cross-border data flows, and copyright. This includes identifying and addressing barriers to the adoption of AI in key scientific research settings, to accelerate discovery and improve research productivity. Clear, pro-innovation AI policies that enable responsible AI development, alongside immigration policies that attract and retain AI-skilled talent, will be essential to safeguarding and strengthening Australia's role in the marketplace of scientific ideas.

The recommendations in this paper are based on lessons learned from many years of scientific research across Google and Google DeepMind, and build on a recent essay, which explores how AI is transforming every scientific discipline. By taking decisive action along these "three I" policy pillars, the Australian Government can harness AI to drive scientific advancement and position the country as a global leader and key beneficiary of this progress. If Australia builds this enabling policy environment, it can fully realise AI's remarkable potential to deliver scientific breakthroughs that secure a better future for all Australians.

02 Introduction:
A New Era of AI-enabled Scientific Discovery

Science has been the cornerstone of human progress, from Galileo's telescope revealing the cosmos to the Large Hadron Collider's potential to revolutionise physics and our understanding of matter. It has empowered us to understand our world, whether at the subatomic level or its place in the vast expanse of the universe. In Australia, science has played a central role in everything from managing our unique biodiversity to developing life-saving medical treatments and supporting the transition to a greener future. It is not just a pursuit of knowledge; it is fundamental to improving everyday life, driving innovation, and shaping a better future for all Australians.

Today, many of science's most complex challenges are being tackled with advanced computational techniques enabled by artificial intelligence (AI), making AI a powerful tool in the hands of researchers. Notably, AI featured prominently in the breakthroughs recognised by all five winners of the 2024 Nobel Prize in Chemistry and Physics. Scientists around the world, including in Australia, are recognising AI not just as an enabler, but as a catalyst transforming how science is done. As one laureate remarked, AI's capacity to accelerate scientific discovery makes it "one of the most transformative technologies in human history".

> "We're constantly inspired by the ability of AI to help tackle grand challenges in science... Responsible use of broad, generative AI has the potential to not only accelerate, but transform scientific discovery."
>
> Dr Stefan Harrer,
> CSIRO's AI for Science Programme Director

The AI revolution will augment the capabilities of scientists in unprecedented ways, and can drastically accelerate Australia's scientific process — compressing years, or even centuries, of experimentation into months or days. It is enabling complex analyses of massive datasets, making advanced research more accessible to a wider range of scientists and institutions — from Australia's leading research universities and CSIRO to emerging centres of excellence across the country. In essence, AI is not just making science faster, it is making it broader, deeper, and more accessible, ushering in an era of discovery with the potential to address some of Australia's most pressing challenges.

This momentum is being met with growing public enthusiasm. A recent Google-IPSOS survey found that more Australians than ever are engaging with the technology — and optimism is growing. Australians are particularly excited about AI's potential to benefit society, especially in areas like scientific discovery and healthcare, with 68% expecting AI to positively impact science, just ahead of medicine at 67%.

This optimism is not misplaced. Across Australia, AI is already delivering tangible results – especially in areas aligned with the country's National Science and Research Priorities. Whether it is accelerating the transition to a net zero future, supporting healthy and thriving communities, or protecting and restoring our natural environment, AI is playing an increasingly important role in Australian science and making a measurable, positive impact.

Helping Australia lead the global transition to a sustainable future

AI is helping to accelerate the shift towards clean energy by enabling better use of data generated by new technologies. One example is the development of smart inverters, an essential part of the world's transition to clean energy that transforms renewable electricity into usable power. Historically, inverters have been underutilised due to their high cost, lower efficiency compared to traditional generators, and their role in contributing to blackouts and catastrophic bushfires. However, with Australia's position as the world leader in per-capita rooftop solar, the country is now trialling a new generation of "smart" inverters. A suite of AI tools developed by Tapestry is helping to interpret the data from these inverters, supporting a greener, more resilient energy grid.

In another notable advancement, CSIRO researchers have pioneered a research robot capable of autonomously testing flexible solar panel samples. Where researchers previously could test up to 20 solar cells per day manually, the new automated system can test 12,000 cells in just 24 hours — a 600-fold increase in productivity, underscoring the potential of AI to significantly accelerate Australia's transition to a more sustainable future.

Opening up new possibilities for environmental protection and conservation

Australia is also increasingly harnessing the power of AI to enhance environmental protection and conservation efforts. Scientists at James Cook University, for example, are using AI to protect the Great Barrier Reef by accurately forecasting the distribution of sediment, improving water quality management. AI is also supporting the restoration of Tasmania's giant kelp forests. Google, together with CSIRO, Institute for Marine and Antarctic Studies (IMAS), The Nature Conservancy, Great Southern Reef Foundation and Kelp Forest Alliance, is using AI tools like DeepConsensus and DeepVariant to identify genetic patterns that make certain kelp resistant to heat, enabling researchers to grow more of these kelp varieties to ultimately support the restoration of giant kelp forests severely impacted by climate change.

AI is also enhancing bushfire management through improved detection and risk monitoring, as demonstrated by the development of tools like FireSat by Google Research and applications in the Green Triangle by the South Australian Government forestry regions. Furthermore, AI is being deployed to detect invasive species such as the destructive crown-of-thorns starfish, and to monitor vulnerable wildlife across Australia, including but not limited to the threatened Glossy Black Cockatoo and humpback whales. These innovations are strengthening efforts to protect Australia's ecosystems, home to more than 10% of the world's biodiversity.

Building healthier communities

Australia faces growing public health challenges, including an ageing population and rising rates of chronic diseases. AI is creating new opportunities – enabling better prevention, earlier detection, and more personalised care.

Google, for instance, is partnering with five Australian organisations to customise healthcare for Australians, including using AI to personalise hearing models – improving the performance of hearing aids and supporting independent living. This is particularly important given that around 3.6 million people in Australia experience some degree of hearing loss, a condition linked to increased health risks such as dementia and Parkinson's disease. AI-based flood forecasting models are also helping vulnerable communities in Australia and globally take early action to stay safe. Meanwhile, Australian researchers are using AlphaFold, Google DeepMind's AI system, to accelerate drug discovery and understand the protein structure of honeybee silk – work that could lead to new bandages that provide early indication of wound infection. AI is also advancing other areas of healthcare, from the early detection of eye diseases, to identifying patients most at-risk of hospitalisation, and deepening understanding of the causes of early-onset Alzheimer's in Australia.

Driving more engaging and effective learning for students

Australia's education sector is being transformed by AI, which is opening up new possibilities for personalised learning, enhanced teaching, and streamlined administration. Drawing on principles of the learning sciences, AI-driven tools are being developed and implemented to adapt to diverse student needs across various subjects, shaping a more dynamic and effective educational experience.

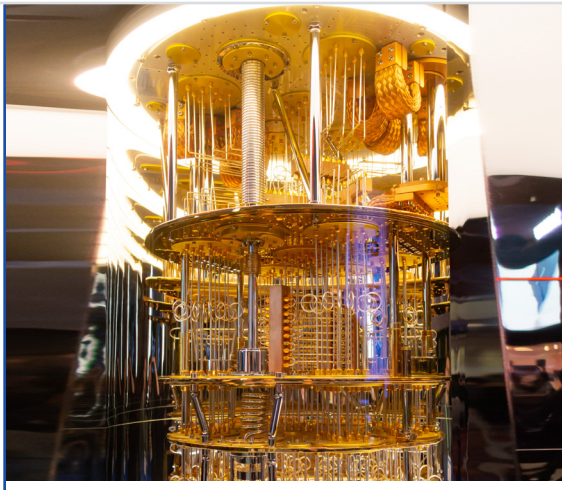
Researchers at Monash University, for instance, are developing an AI-powered system that analyses students' digital footprints to gain insights into their learning behaviours. By tracking factors such as time spent on tasks, engagement with materials, and interaction patterns, the system identifies students who may be struggling or at risk of dropping out, enabling more personalised support. Notably, a survey by Atomi, an Australian education technology company, found that 58% of teachers reported a jump in student engagement when AI was integrated into lessons, demonstrating how AI is advancing the application of learning science to improve educational outcomes.

Fuelling tangible progress in quantum and natural sciences in Australia

Australia is witnessing a significant acceleration of research and discovery in quantum and natural sciences, fuelled by the increasing integration of AI.

At CSIRO, researchers are using AI to address one of the biggest challenges in quantum computing: qubit noise. Unlike traditional bits, qubits can represent both 0 and 1 at the same time—unlocking massive computational potential. But they are highly sensitive to noise, which can cause errors. CSIRO's AI-powered neural network syndrome decoder can efficiently detect and correct these errors, bringing quantum computing one step closer to reality.

AI is also accelerating discoveries in natural sciences at an unprecedented pace. CSIRO researchers, for instance, are using AlphaFold, which predicts the 3D structure of proteins, for sustainable fabric production. AI is enabling new materials to be designed based on recombinant structural proteins with atomic level precision.



Remarkably, these breakthroughs—unprecedented in human history—represent only the beginning of AI's potential to advance science in Australia. Unlocking the full benefits of AI for scientific discovery will require close collaboration across the Australian Government, academia, and industry.

Australia's scientists cannot realise these opportunities alone—they rely on an enabling ecosystem supported by infrastructure investment, sustained funding, a strong talent pipeline, and education and training systems that equip Australians with the skills to thrive in an AI-enabled future. Beyond these foundations, the Australian Government plays a critical role in shaping pro-innovation policies that unlock scientific and technological breakthroughs to tackle the nation's most pressing challenges.

Without policies aimed at fostering AI-driven scientific progress, Australia risks being left behind as other nations drive innovation and economic growth – a concern raised by some academics and technology experts across the country. Because the underlying AI technology empowering scientific advancements evolves rapidly, regulatory frameworks need to be technology-agnostic and adaptable to keep pace and avoid becoming obsolete.

We share the Australian Government's commitment to managing AI's risks with appropriate safeguards and we emphasise the need for a balanced regulatory approach that prioritises research, innovation, science, and technology while implementing regulations to address potential risks. We also support the Australian Government's ambitions outlined in the National Science and Research Priorities, which rightly recognise the role of AI and other emerging technologies in advancing national interests and strengthening Australia's research and development ecosystem. These priorities lay an important foundation for future progress.

Google is committed to empowering more Australian scientists to solve problems with AI. With the right policy frameworks in place, we believe Australia is well-positioned to unlock the full potential of AI in science, delivering real, lasting benefits for the nation and the world.

*For additional examples of AI-driven scientific breakthroughs see Appendix

03 Pillar One: **Infrastructure** — Increase Access to AI Infrastructure

AI adoption in scientific contexts is particularly challenging due to several factors, such as access to high-quality, specialised data, constraints on access to computing power, and the need for interdisciplinary collaboration among AI and domain experts.

In the absence of an orchestrated infrastructure for AI-powered scientific research and development (R&D), scientists must spend significant time and effort to coordinate data and model access, secure computing power, and become proficient with AI tools, all of which detracts from their core research activities.

Lowering the entry barriers to developing, using, and deploying science-focused AI techniques is essential to ensure broader access to resources for scientists.

As Australia's National Science Statement rightly highlights, infrastructure is critical to shaping the country's scientific future: "The availability and extent of research infrastructure is a strong factor for companies selecting research and development (R&D) and manufacturing bases.

It is an important part of the fabric supporting a Future Made in Australia." Expanding access to compute capacity, data, AI models, software, and tools for a broader community of researchers is therefore key to accelerating collaborative, AI-driven scientific discovery in Australia.

In a competitive global landscape, Australia will benefit from assessing how other governments are working to create national resources and data repositories for AI research. Initiatives like India's INDIAai and the US's Data.gov serve as centralised repositories of datasets across key sectors, such as healthcare, finance, and education – democratising access to high-quality data and driving innovation. Private sector efforts, such as Google's Data Commons, further streamline access to publicly available data from diverse sources. Industry-academic collaborations have also proven valuable, exemplified by The Well, a large-scale scientific data repository containing 15TB of physics simulations across multiple domains.

Beyond access to data, high-performance computing resources are critical to scientific discovery, which often depends on simulating complex physical phenomena. For decades, building solutions to simulate such systems has been a core focus of the global science and engineering community. While Australian scientists are beginning to use AI to enhance simulations across various fields, its full potential to transform large-scale modelling in physics, biology, chemistry, and other domains remains largely untapped. To accelerate progress, platforms that enable the sharing of AI models are essential for fostering an open ecosystem that accelerates AI adoption and encourages collaboration across diverse fields. Platforms like Vertex AI, Kaggle, and HuggingFace already facilitate access to AI models and rapid prototyping. However, to fully harness AI for scientific advancement, Australia needs new, seamless, AI-ready platforms for scientific research and discovery. Below, we recommend policy options to establish and expand an infrastructure supportive of AI-powered scientific research across Australia.

1.1 National and International Pools of Data, Models, Compute, and Software

Continue to support national AI for science resource centres to make data, AI models, compute capacity, software and tools accessible for scientific research. These national resource centres could also coordinate with an international centre designed to facilitate the use of AI for global scientific collaboration and progress

Australia is making important strides in building the infrastructure needed to equip its scientists with the tools to tackle the nation's most pressing challenges. The government has committed $4 billion over 12 years (from 2018 to 2029) to support key elements of national research infrastructure – ranging from physical assets like supercomputers, to digital platforms for data and software – and is developing a 2026 National Research Infrastructure Roadmap to ensure its approach remains relevant to Australia's needs. It has also established a world-class National Computational Infrastructure (NCI), which provides high-end computing services to Australian researchers, particularly those in data-intensive fields such as climate and earth systems science. The NCI offers access to advanced computational and data-intensive methods, support, and high-performance infrastructure.

To fully unlock Australia's potential of AI in scientific discovery, the next step is to build on this momentum with **targeted efforts that broaden access to AI-enabled research tools and resources for more scientists nationwide.** Public-private partnerships will play a pivotal role in developing the infrastructure needed to support and scale this transformation.

Australia already has successful approaches to build on. Google, for example, is investing in and closely collaborating with CSIRO to develop advanced AI platforms and tools that will empower Australian scientists to tackle complex research questions with greater efficiency and accuracy. It has also invested in submarine cables connecting Australia to the rest of the world, including Southeast Asia and Oceania. In Perth, the Pawsey Supercomputing Centre's 2022 technology refresh — supported by a $70 million grant from the Western Australian Government — resulted in Setonix, the most powerful public research supercomputer in the Southern Hemisphere at the time of its launch. These efforts will go part of the way in addressing the infrastructure needs of Australian scientists. Other countries such as Japan are investing heavily in AI and microchips, recently allocating 10 trillion yen to reclaim its status as a global tech leader. Likewise, Singapore has invested $500 million into securing high-performance compute resources for AI innovation and capacity building. Continued focus will be necessary to ensure Australia's scientists stay ahead and have access to the resources they need.

Looking ahead, the Australian Government has an opportunity to build on its successes by identifying global approaches that have proven effective. One such approach is the US government's partnership with the private sector to pilot the National AI Research Resource (NAIRR), a research infrastructure designed to democratise access to AI R&D. By providing computational, data, and software resources, NAIRR aims to facilitate AI research and serves as a valuable example for Australia in establishing a robust infrastructure for AI-powered scientific research. Another positive example is the AI Trailblazers initiative between Google Cloud and the Singapore government, which set out to help 100 organisations develop 100 generative AI use cases in 100 days by providing participating organisations with seamless and free access to high-performance GPUs, pre-trained AI foundation models, and developer tools.

Infrastructure supportive of scientific research, however, requires resources beyond just compute to empower scientists from diverse backgrounds to effectively access data, conduct experiments, compare existing solutions, and build upon prior scientific work. Cooperative Research Centres (CRCs), supported by Cooperative Research Australia, already play a vital role by connecting industry and research, supporting knowledge exchange and promoting best practices in collaboration. Building on this foundation, there is an opportunity to develop dedicated **national science resource centres** in Australia that provide educational resources (such as courses and training programmes), shared scientific datasets, AI models (e.g., those used for climate modelling), tools for simulations and data generation, and utility software that enable seamless integration of AI solutions in scientific research. NAIRR, for instance, provides educational resources for trustworthy AI research. Meanwhile, Singapore has established several specialised resource centres that support various scientific domains, such as the National Centre for Engineering Biology, which aims to accelerate advancements in synthetic biology, alongside the National Supercomputing Centre. These centres offer an approach that Australia could consider adopting, to foster a more holistic and enabling scientific research environment.

Many scientific breakthroughs have also resulted from international collaboration, and Australia stands to gain significantly from such partnerships. A global shared resource pool for scientific research could enhance collaboration across various fields, enabling Australian scientists to access data, collaborate internationally, conduct AI-driven experiments more efficiently, and advance resource-intensive scientific discoveries to address both local and global challenges. An **international AI for science resource centre** could provide the infrastructure necessary for Australia's national centre to exchange best practices and coordinate resource needs in the pursuit of AI-powered scientific discovery.

These centres could undertake a range of activities, including:

- Issuing periodic requests for proposals in priority research areas that would allow scientists and organisations to apply for compute time
- Soliciting proposals focused on creating high quality scientific datasets where gaps exist
- Hosting public challenges that necessitate collaboration, creativity, and access to diverse data
- Providing educational resources to empower scientists who are novices in AI to leverage AI tools
- Pooling data from diverse geographies, economies, and cultures to create representative, high quality datasets for use in key disciplines e.g. healthcare.

1.2 Data Accessibility and Software Interoperability

Increase the accessibility and utility of government datasets and data from government-funded research

Government institutions often have access to (or can generate) scientific data that can accelerate innovation across disciplines. Publicly funded data initiatives have driven many advancements in different fields. For example, NASA's EMIT, Germany's EnMAP, and Japan's HISUI offer invaluable data for developing AI models for climate science.

Recognising this, Australia's government has displayed a clear commitment to facilitating open access to data, including providing access to government datasets under the Creative Commons licences and through the Australian Government Data Catalogue. While these efforts represent a positive step forward, it is crucial to further enhance the accessibility and utility of these datasets by making them more discoverable, standardised, and aligned with research needs.

In its interim data and digital strategy, the government acknowledged that access to government data remains limited and is not used to its full extent. Addressing these challenges will help unlock the full potential of these datasets to advance scientific research across Australia. This potential was highlighted during the Covid-19 pandemic, when a CSIRO research team used AI to identify virus mutations on only 0.3% of the available viral data points due to a lack of data for the rest. This underscores the transformative impact that high-quality, accessible datasets could have on scientific progress.

To encourage greater accessibility and utility of government data, the Australian Government can lead the charge by creating a list of priority areas for which the scientific community lacks data, then directing its data-related efforts to enhance the availability and quality of datasets relevant to those areas. Such a targeted approach not only focuses resources on the most pressing challenges but also incentivises the broader use of government data by public institutions, AI companies, and research organisations in Australia to drive scientific progress. The Australian Government holds significant amounts of data, with Commonwealth agencies alone reporting an average growth of 328% in data collection—so the key challenge will be to establish effective mechanisms for organising, curating, and sharing this data in ways that are aligned with the evolving needs of the research community, while adhering to safeguards and privacy protections. This could include advancing data standardisation across relevant agencies, improving interoperability between datasets, and further refining secure yet accessible platforms that enable seamless sharing and collaboration between government, academia, and industry.

Facilitate the creation of anonymised, aggregated, and representative datasets in sensitive contexts

Although data sharing fuels scientific advancements, it must be approached with care, particularly for sensitive data such as healthcare records, which are widely recognised as among the most sensitive forms of personal information in Australia. Australians expect that personal information collected by the government is kept safe and secure by appropriate protections.

In these sensitive contexts, the Australian Government could play a leading role in enabling the creation of fully anonymised, broadly representative datasets that support AI model development and address gaps in public goods and services. One promising avenue is to promote greater experimentation with Privacy Enhancing Technologies—an approach already being explored in Singapore—to enable a balance where valuable insights can still be derived while ensuring personal and sensitive data are protected.

Additionally, careful attention must be paid to ensuring that datasets are broadly representative of Australia's diverse population, including Aboriginal and Torres Strait Islander communities. This is especially critical in sensitive areas such as healthcare. The Australian Institute of Health and Welfare has highlighted that biased datasets can exacerbate socio-economic health inequalities. The Department of Health and Aged Care has similarly cautioned that "AI algorithms can inherit biases if they are trained on or developed with limited or biased data sets. In healthcare settings, biased algorithms can lead to exacerbation of inequities, existing social inequalities, and disparities in patient care, especially in underrepresented populations."

There is an opportunity for the Australian Government to demonstrate leadership in responsibly managing sensitive datasets by aggregating and disseminating high-quality, representative data—particularly in healthcare and medicine. This could be supported by the development of clear guidelines and best practices for creating clinical datasets that reflect the full diversity of Australian patient populations.

04 Pillar Two:
Investment –
Invest in the Science of AI

Government investment plays a critical role in sustaining a long-term, ambitious scientific research agenda—particularly in areas where outcomes may not deliver immediate commercial returns. For Australia to remain at the forefront of global scientific innovation, the government should continue to increase funding in high-priority domains while also directing support toward areas where private capital may be less inclined to invest due to limited near-term returns.

This support can take several forms, such as (a) creating programmes and initiatives, (b) supporting interdisciplinary research, and (c) building a strong pool of talent. Such investments not only provide the necessary resources for scientific advancements but also fosters collaboration among interdisciplinary groups. Encouraging public-private partnerships in these areas would allow Australia to harness the combined strengths of government, academia, and industry—aligning public funding and academic expertise with the private sector's resources and ability to commercialise research findings.

2.1 AI Programmes and Initiatives that Drive Socially Beneficial Scientific Innovations

Extend existing and establish new financial support mechanisms for small businesses advancing AI-enabled scientific applications

Financial support mechanisms—such as low-interest loans, targeted grants, and digital "jump start" programs—can stimulate private investment and encourage startups in Australia to contribute to scientific research through AI innovation. The Australian Government can build on initiatives like the AI Adopt Program (AIAP) to improve access to capital, particularly for small and medium-sized enterprises working on AI-driven solutions in science and research.

Other countries in the region are adopting similar initiatives—for example, Malaysia's Digital Catalyst Grant (MDCG), which provides up to RM 1 million or 50% of project costs to drive innovation in the country's digital and AI sectors. Expanding such programs and tailoring them to the needs of early-stage ventures would help accelerate the development and commercialisation of AI technologies with high scientific and societal impact.

Create public Grand Challenges that focus on solving scientific problems

"AI Grand Challenge" programmes spur innovation in science and technology by (a) identifying and prioritising urgent problems and (b) creating a competitive environment for groups of interdisciplinary researchers to collaborate. Funded by governments or the private sector, these challenges should focus on technical innovation in applications of AI that would fundamentally transform the process of science, engineering, or medicine. Research shows that challenge prizes attract unconventional entrants, lead to novel R&D approaches, and induce innovations beyond what would have occurred without the prize.

Australia is already making promising strides at the state level. In Western Australia, for example, nearly AU$2 million was awarded to four researchers under the Innovation Challenge – Generative Artificial Intelligence Applications program. Backed by the State Government's Future Health Research and Innovation (FHRI) Fund, the initiative aims to improve healthcare outcomes by using cutting-edge AI to address critical needs in medical research, diagnostics, and training. Scaling such initiatives at the national level would position Australia as a leader in mission-driven AI research.

To implement and amplify the impact of these programs, public-private partnerships should be actively encouraged. The AI Sprint initiative – an effort between the National AI Centre, Stone & Chalk (Australia's largest innovation community), and Google Cloud – offers a strong example for future public-private grand challenges targeting complex scientific and societal problems. Areas ripe for national-level AI grand challenges in Australia include climate change mitigation, public health, and social issues – all of which were identified as pressing concerns in Australia's National Science and Research Priorities.

Convening and scaling up communities of practice in AI for Science

Australia has a strong base of scientific expertise across different research institutes and organisations. However, realising the full benefits of AI in science will require more structured collaboration across disciplines and institutions. One way to enable this is by convening and expanding communities of practice—networks of scientists, researchers, and developers focused on applying AI to scientific challenges.

By supporting these communities of practice, the Australian Government can foster ongoing knowledge exchange, encourage interdisciplinary research, and accelerate the diffusion of innovative approaches and tools. This is particularly important in emerging and fast-moving domains like AI, where practical knowledge, shared experiences, and access to real-world use cases can significantly enhance research outcomes.

There are already promising approaches to build on. For instance, Google's newly launched community of practice in Australia offers a platform for knowledge exchange and collaboration. Built on the Google Developer Group platform, this initiative is organised by the research community itself and tailored to meet its specific needs. Through this community, scientific researchers across both the public and private sectors in Australia are encouraged to share their experiences and collaborate, using Google and other AI tools to advance their work. Expanding on such platforms—and integrating them with new initiatives focused specifically on AI for science—would further strengthen Australia's research ecosystem and promote a culture of open collaboration.

Amplify the impact of not-for-profit organisations that use scientific advances to benefit communities

The Australian Government can play a greater role in enabling socially beneficial applications of AI and scientific research by supporting the not-for-profit sector. Not-for-profit organisations often serve as early adopters of science-driven solutions to real-world problems, particularly in areas where commercial incentives are limited. One example is the Minderoo Foundation, which is actively leveraging AI in initiatives like the OceanOmics programme to monitor Australia's marine biodiversity.

Support for such initiatives can include grants and financial aid, or more importantly, collaborative efforts for scaling up solutions. For example, the Indian government is scaling a not-for-profit-developed precision agriculture tool, which has boosted farmer profits by 20% and reduced pesticide use by 25%. Additionally, equipping Australia's not-for-profit sector with AI tools can boost their efficiency and amplify their impact. Programmes such as the AI for Changemakers, AI Collaboratives, and Google for Startups demonstrate the value of partnerships between tech companies and not-for-profits, offering tailored AI tools and expertise to scale organisations' efforts.

2.2 Interdisciplinary Research to Strengthen Collaboration Across Disciplines

Establish and fund interdisciplinary research centres and programmes in AI for science to tackle complex scientific challenges

Interdisciplinary collaboration between AI and scientific domain experts is crucial for developing more effective and accurate AI solutions in science. However, this is sometimes hindered by siloed research environments and a lack of incentives for interdisciplinary work in career advancement. As recognised in Australia's National Science Statement, there is a need to "incentivise new approaches to science, including greater multidisciplinary collaboration across humanities and science disciplines".

Australia has a strong foundation to build on. The country produces 3.5% of the world's publications and 5.8% of citations, with 15% of Australian publications ranking in the top 10% globally. Australian research is cited 42.2% above the world average and demonstrates global strengths in a range of fields such as biomedical and clinical sciences, information and computing sciences, and the physical sciences.

Establishing dedicated, interdisciplinary AI for science research centres would unlock new discovery pathways by incentivising collaboration between AI experts and non-AI scientists in Australia, integrate knowledge from various fields, and strengthen cross-sector innovation. The U.S.'s National Science Foundation (NSF) has successfully established interdisciplinary institutes to motivate interdisciplinary research to solve complex research problems, although sustained funding is required to support research centres and pursue long-term research agendas. In Australia, Charles Sturt University has introduced a promising approach through its Acceleration Fellowships, which seek to promote interdisciplinary research in AI. Scaling such initiatives nationally would strengthen Australia's capability to lead in AI-driven scientific research.

Fund research at the intersection of AI and other emerging technologies

Converging advancements in AI with other emerging technologies – such as quantum computing – present unprecedented opportunities for synergistic breakthroughs. Quantum computing is a multidisciplinary field at the intersection of computer science, physics, and mathematics that seeks to use the information processing power of quantum mechanics to solve otherwise difficult computational problems.

In Australia, Google has sponsored new partnerships aimed at advancing Australia's position as a global quantum pioneer. This includes collaborations with field-leading universities, including the Quantum Software and Information (QSI) group at the University of Technology Sydney (UTS). These partnerships aim to grow Australia's capabilities across the full stack of quantum computing—from quantum algorithms to quantum hardware research.

Strategic government investment at the intersection of AI and quantum computing can serve as a catalyst for additional private-sector funding, while enabling research into new applications in climate science, healthcare, sustainability, and novel AI methods. What makes the intersection of AI and quantum computing unique is that advances in AI can power progress towards a stable quantum computer, and breakthroughs powered by quantum computing would advance AI itself by uncovering novel algorithms or solving computationally infeasible problems. Investing in research at the intersection of AI and emerging technologies would enable Australian researchers to tackle complex problems that require novel approaches, strengthen Australia's position in cutting-edge science, and drive innovations with real-world impact.

2.3 Building a Strong Pool of Talent

Invest in AI education across all scientific disciplines to develop the next generation of AI-skilled scientists and developers

Australia has a strong foundation on which to build, with world-leading institutions such as CSIRO and the Australian Artificial Intelligence Institute at the University of Technology Sydney advancing research at the intersection of AI and science. However, the country faces a noticeable AI skills gap. CSIRO has estimated that Australian industry will need up to 161,000 new AI specialist workers by 2030.

To help close this gap, the Australian Government should expand investments in scholarships, fellowships, and research grants for graduate students and early-career professionals working in AI – such as developing new models, algorithms, and techniques – as well as those at the interface of AI and scientific disciplines. These efforts should be supported through both public funding and public-private partnerships. The Google PhD Fellowship Program, for example, has supported over 800 aspiring researchers from more than 210 universities in 53 countries since 2009, including in Australia.

In parallel, AI education should be integrated more deeply into Australia's science, technology, engineering, and mathematics (STEM) curricula from an early age. As noted in CSIRO's AI in Science report, meeting future needs will require a lifelong learning approach, with sustained investment across all stages of education and skills development. One promising example is a recent STEM event in Western Australia, hosted by Schools Plus and supported by Google.org, where students from ten local schools engaged in introductory AI activities related to science, technology, engineering and mathematics. Programmes like this help build foundational understanding, spark curiosity, and inspire the next generation to explore how AI can transform science. Additionally, to support teachers in delivering AI education, the CSER 'Teaching AI in the Classroom' MOOCs, supported by Google, are available free of charge to all Australian teachers. Launched in November last year, these courses provide teachers with an opportunity to upskill and enhance their AI teaching capabilities. Together, these initiatives can help cultivate a generation of researchers and technologists who not only harness AI for scientific progress, but also push the boundaries of AI innovation itself.

Compete for talent across STEM fields, wherever it is

STEM talent is global, and to remain competitive, Australia must tap into international and increasingly mobile pools of expertise across science and AI. The Australian Government has taken important steps in this direction, including the recent introduction of the National Innovation Visa, aimed at attracting highly skilled individuals in emerging industries, technology, and scientific research.

To build on this momentum, the government should expand access to training programs and invest in world-class research infrastructure, while also strengthening domestic pathways to develop and retain talent. This includes proactively educating the next generation of AI and science experts. Programmes like Grow with Google, which trained over 600,000 Australians and more than 40,000 small businesses in Australia during the pandemic, show how scalable initiatives can help equip the Australian public with critical digital and technical skills. Similar efforts tailored to scientific and AI domains would further bolster Australia's talent pipeline and innovation capacity.

Support not-for-profit organisations that provide AI skilling programs

Not-for-profit organisations that focus on AI upskilling and reskilling play a crucial role in broadening access to AI capabilities within communities and equipping the next generation of AI innovators, developers, and adopters in Australia. One example is Apolitical, a not-for-profit that launched the Government AI Campus to build AI literacy among policymakers, including those in Australia. The programme provides globally accessible courses, events, and curated content aimed at helping public servants develop the skills needed to engage with AI effectively. The Australian Government should support such not-for-profits by offering grants and contracts, providing access to training and educational resources, and streamlining application and evaluation processes. Data-driven approaches to grant allocation can further ensure support is targeted to high-impact, education-focused initiatives—enabling them to scale and reach more individuals.

05 Pillar Three: **Innovation –** Implement Pro-Science and Innovation Legal Frameworks

Australian policymakers, like their counterparts around the world, are working to keep pace with digital innovation by assessing the adequacy of existing laws and considering new regulatory frameworks. The task is challenging not only because AI is a general-purpose technology that will affect a wide range of economic and social activities, but also because the implications of AI vary depending on the context for its use.

To support AI-enabled science, Australia must strike a careful balance between providing appropriate safeguards and enabling innovation. A further challenge lies in managing potential fragmentation. With many countries moving at different speeds and in different directions, there is a risk of a patchwork of conflicting or inconsistent AI regulations complicating scientific collaboration across borders. Regulatory ambiguity and uncertainty can be especially burdensome for scientific researchers, who are already grappling with the challenges of simple access to AI tools. For Australia, interoperability with evolving approaches to AI governance in the UK, US, Singapore, Japan, and other like-minded countries will help ease cross-border cooperation on science and technology.

In addition to this, balanced copyright laws that support a pro-innovation and scientific discovery agenda are essential. This includes access to publicly available scientific papers. Copyright laws in other countries, such as the fair use doctrine and text and data mining (TDM) exceptions, allow for uses of copyrighted, publicly-available material during model development or scientific experimentation.

Australia's Productivity Commission has acknowledged the importance of limitations and exceptions to copyright laws for advancing AI technology development. In its response to the Senate Select Committee on Adopting AI, the Productivity Commission underscored the importance of clear and consistent arrangements to enable text and data mining for AI model training. It identified this as a key potential enabler of AI innovation in Australia. Other jurisdictions, including Singapore, the United States, and Japan, have taken steps to clarify how AI developers can deploy text and data mining for model training, a crucial factor in determining the ability to integrate AI into scientific research without confronting legal uncertainty.

In this context, the Attorney General's establishment of the Copyright and AI Reference Group and Steering Committee with cross-sector industry stakeholders is a positive step in developing a balanced debate on AI-related copyright challenges in Australia. For the scientific community, this work is vital to providing researchers with the legal certainty necessary to confidently incorporate AI into the scientific inquiry process.

In parallel, promoting AI adoption in scientific research should be a key priority for Australian policy. This includes identifying barriers to the deployment of AI in research fields with the greatest need and/or lowest current uptake, and working with research institutions on "proof of concept" initiatives that demonstrate the value of AI-enabled methods. The Australian Government can play a catalytic role by identifying promising AI applications already in use across Australia's research landscape, and exploring how these can be scaled to support broader scientific progress.

Risk-based, sector-specific, and technology-agnostic approaches to regulation – aligned with global best practices – will help ensure that Australia's legal frameworks remain adaptive, supportive of scientific progress, and positioned to unlock AI's full potential in research and innovation.

3.1 Harmonised Regulations for Responsible and Reasonable Use of Data

Establish harmonised data privacy laws that focus on responsible and reasonable data collection and use

Pro-innovation privacy laws should balance safeguarding personal data and enabling technological progress. In Australia, policymakers must ensure privacy protections are applied proportionally, safeguarding user privacy while recognising the transformative potential of AI and its scientific applications.

Privacy regulations should aim to be adaptive, risk-based, and technologically neutral, and focus on mitigating the potential harms of outputs, rather than regulating the inputs used in development. They should stay future-oriented, engaging with Australia's scientists and industry as new privacy issues arise with evolving technologies and their scientific applications. Additionally, the Australian Government should harmonise efforts internationally and across regulatory domains to avoid fragmentation – a point made by the Productivity Commission, which emphasised the need to examine existing technology-neutral laws that already cover use of AI, such as privacy laws, among others.

To further bolster privacy and innovation, the government should actively encourage the development and adoption of privacy-enhancing technologies (PETs). This approach is echoed in Japan's LDP proposal, which advocates for the use of PETs in AI model development, and Singapore's National AI Strategy, which highlights the need to invest in PETs to overcome data protection and sharing barriers while facilitating more data flows. Investing in PETs can unlock Australia's full potential of data for scientific advancements, particularly in fields such as medical science and healthcare, while ensuring individuals' privacy and data confidentiality are upheld. For further recommendations and insights, we encourage readers to explore Google's Policy Recommendations on Generative AI and Privacy.

Strengthen trade policies and support cross-border data flows

Trade is critical both to the development of AI research and to the diffusion of scientific applications of AI around the world. Nearly a quarter of scientific research papers published today involve authors from multiple countries. Cross-border collaboration is further enhanced by AI software libraries that are publicly available, such as Google's TensorStore and Flood-Filling Networks which are widely used in neuroscience, or DeepVariant and DeepConsensus frequently used in genomics. These libraries enable researchers to rapidly prototype ideas through working code rather than just research papers.

The Australian Government has recognised the value of cross-border data flows in supporting innovation and has distinguished itself as an advocate for open, trusted data transfers. Notably, the Privacy and Other Legislation Amendment Act 2024 (Cth), passed in late 2024, amended the Privacy Act 1988 (Cth) to include a whitelist mechanism, which can be exercised in respect of jurisdictions with substantially similar privacy laws, to assist companies looking to disclose personal information overseas. Australia has also taken active steps to sign digital economy agreements that support cross-border data flows and international alignment of AI frameworks like the Australia-Singapore Digital Economy Agreement, in addition to continuously supporting discussions in the G20, WTO, and Indo-Pacific Economic Framework (IPEF) on further facilitating data flows. These efforts will go a long way in supporting AI-powered scientific discoveries, as they enhance the volume, variety and diversity of data.

Looking ahead, Australia will need to continue building up key alliances and to expand its trade policies to further support cross border data flows. This includes beginning with the extension of digital trade agreements to more Asia-Pacific economies. Embedding strong, science-supportive data and AI provisions in these agreements will be critical. Japan and the UK's recent agreement to facilitate smoother cross-border transfers of personal data in academia and the public sector—aimed at accelerating drug development and medical research—offers a constructive approach for enabling innovation through trusted data flows.

Using and aggregating data from different regions will allow Australian researchers to access a broader range of samples, variables, and conditions, leading to robust solutions that generalise well to real-world scenarios. Strengthening the global flow of data will ultimately ensure Australia's scientific community maintain and deepen their connections with partners around the world.

3.2 Regulations that Facilitate Responsible AI Progress

Adopt a proportionate and risk-based approach to regulation that is focused on the context of use and actual risks, rather than the underlying technology

AI is too important not to regulate - and too important not to regulate well. A proportionate, risk-based approach that targets potentially harmful use cases—where known risks are likely or could have significant consequences—is essential to both safeguard the Australian public and create space for scientific progress.

The Australian Government's commitment to a balanced, risk-based approach is welcome. The release of the Voluntary AI Safety Standard and proposed mandatory guardrails for high-risk AI settings in 2024 reflects a clear intent to avoid overregulation of low-risk applications that could stifle innovation.

As the government further develops its implementation framework, a critical next step will be ensuring an appropriately targeted and clearly defined definition of risk based on the context of use and actual risks, rather than the underlying technology. It is our long-held view that a risk-based framework must take into account the likelihood of harm alongside the severity of harm, as well as considering the cost of not using AI in terms of forgone benefits (i.e., the cost of lost opportunities), particularly where scientific research is concerned.

Aligning Australia's regulatory guardrails with international frameworks, such as ISO standards and the OECD's AI principles, would further strengthen this approach. Such alignment would not only support safe and responsible AI use in Australia, but also facilitate scientific collaboration across borders—particularly in fields like medical research and climate science, where international data-sharing and interoperability are essential.

Ensure a whole-of-government, interagency approach to develop a cohesive government AI policy

Given the cross-cutting nature of AI, it is essential that the Australian Government avoids siloed approaches to AI regulation. The government has signalled plans to update legal frameworks across a range of areas, including privacy, copyright, online competition, anti-misinformation, and cybersecurity. Ensuring coherence across these efforts will be challenging.

Several regulators have already cautioned against the risks of regulatory overlap and duplication. For instance, both the Digital Platform Regulators Forum (DP-REG) and the Office of the Australian Information Commissioner (OAIC) have expressed a preference for a framework approach, warning that an AI-specific law could lead to fragmentation and public confusion. It is vital that Australia develops an interagency framework that would help align policies, avoid duplication or conflicting approaches, and ensure that regulatory settings evolve in step with AI-driven advancements in scientific research.

Exempt pre-market AI R&D for scientific purposes from AI regulations

Early-stage scientific research using AI should not be burdened by the same regulations intended for market-ready products. As the Australian Government considers whether it should introduce exemptions or carve-out mechanisms, it should take into account the need to exempt activities related to R&D for scientific purposes prior to placing products on the market. The European Union's AI Act provides a useful reference, including exemptions for "any research, testing or development activity regarding AI systems or AI models prior to their being placed on the market." This approach ensures that regulation addresses real-world risks arising from deployment, rather than constraining the exploratory and iterative nature of scientific inquiry. Regulatory efforts in Australia should similarly prioritise use cases that present a significant risk of harm or misuse due to deployment, rather than imposing blanket restrictions during testing and development. Doing so would help foster scientific innovation and ensure that AI-powered technologies with public benefit are not unduly delayed in reaching the market.

Foster international cooperation frameworks and embrace scientific community guidelines for AI-powered research

As AI continues to transform scientific inquiry, international cooperation frameworks offer Australia a valuable platform to work with like-minded partners to shape responsible and safe development of AI-driven technologies. Through collaboration, countries can explore mutually beneficial approaches that prioritise safety, security, and preventing significant societal harm.

Australia has already taken meaningful steps in this direction. By signing the GPAI Belgrade Declaration in 2024, the Australian Government affirmed its commitment to a shared global vision where "sciences play a critical role in responding to the complex challenges of our time and are important for social and economic development that leaves no one behind and that promotes peace, safety and sustainable development". This provides an important basis for Australia to contribute scientific expertise and leadership.

In parallel, the Australian Government can build on this by embracing community-driven guidelines that help ensure scientific research involving AI is conducted responsibly without the need for prescriptive laws. These include the Hague Ethical Guidelines in chemistry and professional codes of conduct, such as the international medical code of ethics, which Australian scientists can follow to ensure their research is safe and trustworthy.

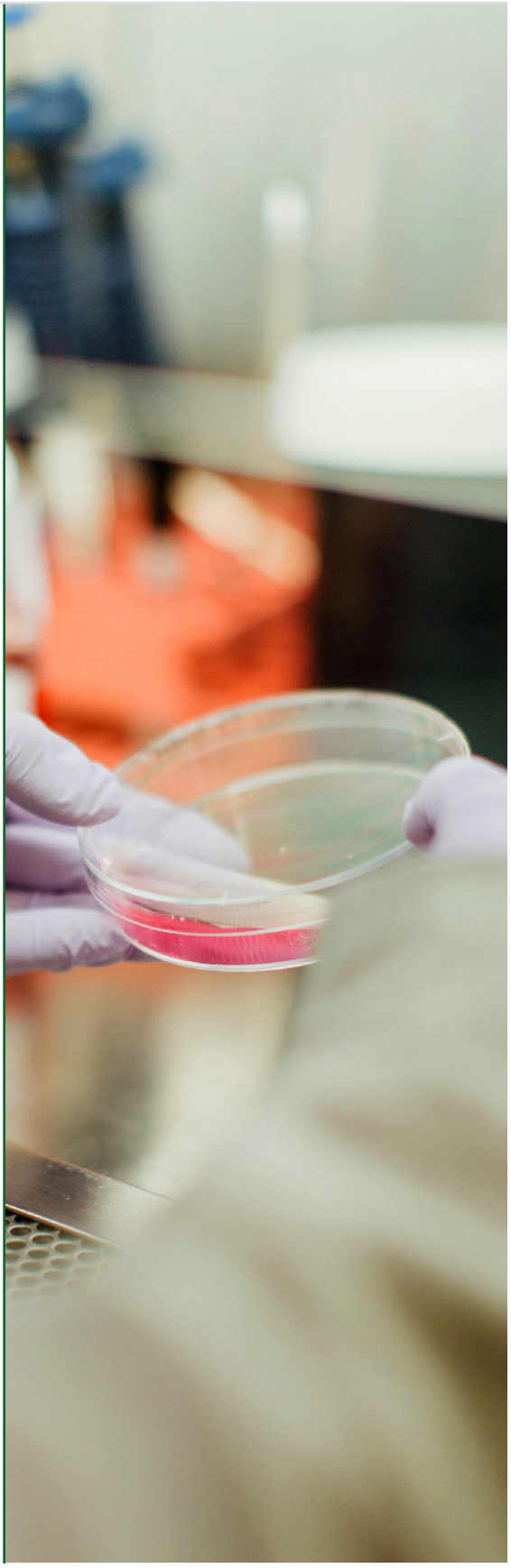
Establish vendor-agnostic regulatory sandboxes for fast experimentation

Regulatory sandboxes offer a key way to accelerate the transfer of research into tangible products and services. Participating firms obtain a waiver from specific legal provisions or compliance processes to be able to rapidly innovate. Sandboxes are particularly beneficial for resource-constrained small businesses and startups, helping them navigate complex regulatory landscapes.

Australia already has experience with sandbox models in sectors such as financial services and energy. The Enhanced Regulatory Sandbox allows fintech innovators to test new products without immediately triggering full regulatory compliance. In the electricity sector, the Australian Energy Innovation Toolkit framework enables regulators to issue trial waivers, which "temporarily exempt an innovator from having to comply with specific rules that are acting as regulatory barriers to allowing an innovative trial to proceed."

A similar approach can be applied to AI. For example, Spain's AI regulatory sandbox brings together multiple government agencies—including the Data Protection Agency and the Agency of Medicines and Medical Devices—to enable safe experimentation with AI systems. These frameworks not only allow innovators to trial AI-driven solutions but also give regulators the opportunity to gain practical insights from the early stage technology when considering different regulatory frameworks.

By adopting vendor-agnostic AI sandboxes, the Australian Government can support rapid development of AI-enabled scientific tools while testing adaptive regulatory models in partnership with industry, academia, and civil society. This would ensure that regulation keeps pace with innovation.



06 Conclusion

AI is a breakthrough in how we make breakthroughs. But the scientific benefits of AI are not guaranteed. Public policies will play a significant role in shaping whether and how Australia achieves AI's full scientific potential, and whether we can make new discoveries and apply them toward practical solutions to health, energy, and other key challenges.

AI has the power to democratise science in Australia—bringing more researchers into the fold, accelerating discovery, and enabling solutions at scale. To unlock this potential, Australia can foster a thriving ecosystem for AI-powered science by increasing access to AI infrastructure, investing in the future of AI for science, and implementing pro-science and innovation legal frameworks. This includes building on existing laws as a strong foundation for safe AI use, aligning with global standards on AI safety, and ensuring consistent and clear privacy and copyright rules to enable the open data access that fuels AI innovation.

To ensure the greatest possible chance for scientific breakthroughs, Australia should also establish AI for science resource centres, along with supporting the creation of a multinational infrastructure, providing safe access to scientific data, computational resources, and educational materials. The government should also invest in AI education across all scientific disciplines, direct funding towards interdisciplinary research projects, and create public grand challenges focused on solving critical scientific problems to encourage collaborative innovation and develop a strong pool of talent.

By working together to promote responsible innovation, international collaboration, and broad-based access to AI resources, Australia can unlock the transformative potential of AI to address humanity's most pressing scientific challenges and create a brighter future for everyone.

07

Appendix:
Global Illustrations of AI's Transformational Impact on Science

Natural Sciences

Connectomics
Science 2024

- Mapping a 3D, nanoscale-resolution map of a piece of the human brain to a level of detail never previously seen.
- This work may change our understanding of how the brain works which could help researchers better understand neurological diseases such as Alzheimer's and also answer fundamental questions (eg. how memories form).

AlphaFold
Nature 2024, Science 2023, Nature 2021

- Predicts the structure of all of life's molecules including proteins, DNA, RNA, ligands and how they interact.
- Researchers have used AlphaFold for scientific discovery - ranging from developing new malaria vaccines, to tackling antibiotic resistance to developing new gene therapy methods for treating diseases like Cancer, tackling pathogens that blight our crops, and developing plastic-eating enzymes.

AlphaMissense
Science 2023

- Predicts the pathogenicity of missense variants by integrating knowledge gained from both protein structure and evolutionary characteristics.
- Helps researchers determine whether a specific genetic variant is likely to cause a disease, e.g., to help unpick the genetic drivers of epilepsy.

Human Pangenome
Nature 2023

- The first draft human pangenome that combines assembled genomes from 47 people from diverse ancestries around the world.
- This draft pangenome is a new resource that better represents human genetic diversity, allowing scientists and doctors to more accurately diagnose and treat diseases and develop new therapeutics.

GNoME
Nature 2023

- Helps generate novel candidate crystals and predict their stability.
- Discovered 2.2M new crystals - equivalent to nearly 800 years worth of knowledge from classical research techniques.

AlphaProteo

- Generates new protein binders for diverse target proteins.
- Can lead to the discovery of new drugs, the development of biosensors and improve our understanding of biological processes.

Climate Science & Sustainability

Flood Forecasting
Nature 2024

- AI model that achieves reliability in predicting extreme riverine events at up to a five-day lead time.
- Integrated into Google's Flood Hub platform Google Search, Google Maps, and available in over 100 countries, covering 700M people.

NeuralGCM
Nature 2024

- Produces ensemble weather forecasts.
- It can simulate over 70,000 days of the atmosphere in the time it would take a physics-based model to simulate only 19 days; it is 1K to 1M times more computationally efficient than SOTA physics models.
- Openly available, which, combined with its ease of use and efficiency, could make climate modeling more accessible to researchers.

GraphCast
Nature 2023, Science 2023

- AI model that predicts weather conditions up to 10 days in advance.
- Openly available model, which predicts the tracks of cyclones with great accuracy further into the future, identifies atmospheric rivers associated with flood risk, and predicts the onset of extreme temperatures.

Contrails
arXiv 2023, arXiv 2023

- AI model that identifies areas where airplane contrails are likely to form, allowing for flight rerouting to reduce the climate impact of air travel.
- Reducing the frequency of contrail formation could have a significant impact on emissions from air travel as they account for ~35% of the global warming impacts of the aviation industry.

Wildfire Detection
arXiv 2022

- AI model that analyses satellite imagery to map real-time boundaries of large wildfires.

FireSat

- An AI-powered global satellite constellation designed to detect and track bushfires the size of a classroom (5x5 metres) within 20 minutes.

Energy

Magnetic Plasma Control

Nature 2022

- The first deep reinforcement learning system that autonomously discovers how to stabilise and shape the plasma within an operational tokamak. Stabilising plasma is a critical step on the path toward stable fusion.

TORAX

- An open source plasma core simulator, which enables new directions for plasma scenario design and accelerates the research in the fusion space.

Health Sciences

Breast Cancer Prediction

Nature 2020

- An AI-powered system, which integrates into breast cancer screening workflows to help radiologists identify breast cancer earlier and more consistently.

Lung Cancer Detection

Nature Medicine 2019

- Lung cancer leads to over 1.8 million deaths per year worldwide, accounting for almost one in five cancer deaths, and is the largest cause of cancer mortality.
- This research shows AI can help physicians more accurately screen for lung cancer and identify the disease.

Preventing blindness

JAMA 2016

- Automated Retinal Disease Assessment (ARDA) uses AI to detect diabetic retinopathy.
- Currently being used to detect diabetic retinopathy in India and the European Union.
- Almost 3,000 new screenings are supported by ARDA weekly.

Multimodal Medical AI

MedGemini

- A Gemini-based multimodal medical model, which has demonstrated important advances in clinical reasoning, multimodal, and long-context capabilities across various modalities such as images, surgical videos, genomics, ultralong health records, ECGs, and more.

MedLM

- A family of foundation models fine-tuned for healthcare.
- Encompasses a range of applications, including answering medical queries, summarising complex medical information, and extracting insights from unstructured data.

Mathematics

AlphaGeometry

- Solved 83% of all historical International Mathematical Olympiad (IMO) geometry problems.
- Prior version demonstrated AI performance on geometry problems approaching the level of a human Olympiad gold-medalist.

AlphaProof

- A reinforcement-learning-based system that trains itself to prove mathematical statements.
- A significant advancement for formal math reasoning.

Quantum Computing

Willow

State-of-the-art quantum chip

- Can reduce errors exponentially as we scale up using more qubits.
- Cracks a key challenge in quantum error correction that the field has pursued for almost 30 years.

Continuous Quantum Error Correction

Nature 2023, arXiv 2022

- Researchers developed an ML algorithm for continuous quantum error correction that uses a recurrent neural network to identify bit-flip errors.
- This breakthrough, and others like it, will accelerate progress towards a large-scale error-corrected quantum computer.

Quantum Gravity

Nature 2022

- Researchers were able to explore quantum gravity by replicating the dynamics of a traversable holographic wormhole on a 9-qubit quantum computer.
- Represents a step towards being able to study quantum gravity in a laboratory setting.

Quantum Chemistry Simulations

Nature 2022

- The largest chemistry simulations to date on a quantum computer using Fermionic quantum Monte Carlo (QMC) methods.
- These simulations will offer accurate predictions of chemical reactivity and kinetics.

Education

LearnLM

- A family of models fine-tuned for learning, based on learning science principles.
- Helps simplify and improve the process of lesson planning to help teachers discover unique activities, find engaging materials, and differentiate their lessons and content to meet each of their students where they are.