THE EFFECTIVE AND ETHICAL DEVELOPMENT OF
ARTIFICIAL INTELLIGENCE
AN OPPORTUNITY TO IMPROVE OUR WELLBEING

SUMMARY PAPER

- Artificial intelligence (AI) is a collection of computational methods and techniques which can help perform tasks and solve problems.

- AI presents significant opportunities to improve Australia's social, economic and ecological wellbeing. Inclusive and universal design principles in AI development can make AI more accessible and inclusive of diverse human experiences.

- AI technologies need careful implementation and monitoring strategies to ensure systems are used ethically and can safeguard the use of data.

- While the full impact on the workforce is yet to emerge, AI adoption will become necessary in many fields. New jobs and roles will be needed to address these AI-informed systems in future.

What is artificial intelligence?

Artificial Intelligence (AI) is a collection of interrelated technologies and computational techniques that produce machine-based intelligence. This includes technologies such as computer vision, natural language processing and machine learning. Techniques are all at varying stages of development, but broadly share a set of opportunities and challenges.

If developed and deployed appropriately, AI technologies have the potential to enhance Australia's wellbeing, lift the economy, improve sustainability and create a more equitable and inclusive society. AI technologies are already having transformative impacts in areas such as health, manufacturing, mining and finance. PwC has estimated that AI could contribute up to US$15.7 trillion to the global economy in 2030.[1] At a national level, it has been estimated that Australia could increase its national income by A$2 trillion by 2030 from productivity gains afforded by automation and AI technologies.[2]

Future opportunities and challenges

As AI technologies mature over the next decade and new opportunities emerge, there is a need to ensure technologies are developed responsibly. A proactive approach to development, deployment and uptake will help realise the social and economic potential of AI in the future, as well as mitigate potential and anticipated challenges and risks.

1 PwC (2017) *Sizing the prize: What's the real value of AI for your business and how can you capitalise?* Available at https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html
2 AlphaBeta (2017) *The Automation Advantage*. Available at https://alphabeta.com/wp-content/uploads/2017/08/The-Automation-Advantage.pdf

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APPLICATIONS OF AI

The applications of AI range from sophisticated robotic systems to efficient and intelligent data analysis. In addition to enhancing existing processes, AI technologies can make a material difference to how we access and experience many aspects of public and private life. Some key applications for the coming decade are outlined below.

Appropriate regulatory frameworks will be key to supporting the safe and trusted implementation of AI across a number of sectors, especially in mobility and health care. Clear understanding and transparency of AI, especially in health care, will be paramount to building trust.

KEY APPLICATIONS FOR THE COMING DECADE
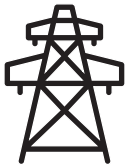
Energy

AI will play an important role in Australia's transition to a carbon-free, cost-effective and secure future grid. AI systems can be used in the management and optimisation of distributed energy resources, energy consumption, production and storage.

Mobility and transport

Autonomous vehicles supported by AI are expected to have far-reaching impacts, including decreased traffic accidents and emissions, streamlined use, and improved accessibility.

Manufacturing

AI-driven optimisation in manufacturing will likely increase efficiencies and reduce costs. Key opportunities include AI technologies designed to enhance existing work processes, and a production-line transition towards high variety and adaptability of products, providing increased customisation and personalised experiences.

Healthcare

AI technologies and data analytics will facilitate early disease detection and diagnosis, as well as inform broader understanding of disease pathways and monitoring end of life care.

Agriculture

AI powered agricultural technologies will help farmers confront climate challenges, achieve sustainability goals and meet changing consumer preferences. Autonomous machines, precision farming and data analytics can assist in sustainable farm management strategies, including precise and minimal delivery of chemicals through precision farming and improving the quantity and quality of production.

Mining

Australia's autonomous mining operations represent some of the largest industrial automation programs worldwide. Functions include automated hauling and drilling, intelligent sensing, mine-wide asset and supply-chain optimisation and remote tele-operation. These functions help reduce waste, and improve the productivity and safety of operations.

Law

AI in the legal system could see intelligent research systems, automated document review, and legal data analytics transform current processes. It is anticipated that these mechanisms could provide more equitable access to legal resources and streamline dispute resolution.

KEY CONSIDERATIONS

Human-centered deployment

AI has the potential to advance the progression of social, economic and cultural rights; but it is equally possible for AI to be implemented in a way that perpetuates social injustice or inequality. AI development should be underpinned by human rights principles, to ensure it is inclusive of all members of society, including Indigenous populations, culturally and linguistically diverse groups, people who identify as LGBQTI, women, older people, children, and people with a disability. For example, AI technologies may be used to enhance services for Indigenous peoples to accommodate needs that services designed with a one-size-fits-all approach cannot. Diversity across the board is key to ensuring these AI systems are appropriately designed to be accessible, inclusive and in a manner that reduces prejudice and bias.

As the technology matures, identifying key areas for regulation to support policy responses would help maximise economic and social benefits. Given AI's reach across diverse policy regimes, regulatory responses by government should draw on the expertise of a range of academic, industry and community stakeholders. Key considerations include data, privacy, liability, the future workforce, and community engagement.

Data

Data is essential for AI to learn and generate outputs. Datasets are often generated in the background, through smart technologies or services embedded in cities and homes. When data is drawn from non-representative samples, or excludes populations, collection can lead to bias or discrimination in AI decision-making or AI systems. Data integrity and standards will be important to build systems that are ethical, inclusive and foster community trust.

Key considerations for AI data include data protection and privacy, data sovereignty, storage and security of national data, data interoperability and data inclusivity. There will be an ongoing need to balance AI data-analytics with design processes, market competitiveness, and the application of AI in practice.

Changing nature of work

There has been much debate about the extent that AI and automation will transform the nature of work. Some argue that AI will lead to the displacement of occupations, while others argue this disruption will be minimal with AI affecting tasks rather than whole occupations. While the long-lasting ramifications of AI adoption on the workforce remain uncertain, it is clear that many companies will need to adopt AI to remain globally competitive.

Encouraging the development of interdisciplinary skillsets will help create an adaptable and creative workforce for the future. This includes incorporation of ethics and human rights principles into AI education and training (and vice versa). Additionally, initiatives aimed at encouraging greater gender parity in STEM subjects and in the workforce will be crucial to improving diversity and representation of women in AI development and application.

Community trust and engagement

AI technologies will emerge at the macro level as well as within people's homes and workplaces. As the applications of AI become increasingly complex, it will be important to foster greater community, industry and government understanding of what AI technologies are, how data can be used, and how the technologies can be used responsibly and effectively.

Ongoing, inclusive consultation and engagement, particularly with communities, will be essential to secure trust and understanding in the development and maturation of AI, as well as foster usage that is aligned with practical applications.

REALISING THE POTENTIAL

AI will be a key technological development of the 21st century, and if harnessed correctly, promises substantial social and economic benefits.

With our world-leading research capabilities, comparative strength and existing investment in sectors such as health, manufacturing, finance and mining, Australia is well-equipped to advance and deploy AI technologies.

International developments in AI are progressing quickly, demonstrating a shared global commitment. Keeping up with these advancements in a strategic and considered manner will be key to safeguarding Australia's ongoing competitiveness and capacity for innovation in this area.

To ensure that AI systems are ethical and minimise societal risks, their future development in Australia should draw on the collective expertise and experience of governments, industry and community. Crucially, a vision which aligns AI with social equity and human wellbeing will be important to make AI in Australia a reality.

HORIZON SCANNING
SERIES

We live in a time of rapid change; change that is driven by developments in science and technology and challenged by our capacity to adapt in the present and prepare for the future. ACOLA's Horizon Scanning reports present independent and timely analyses to guide decision makers through the decade ahead.

ACOLA's full report on *The Effective and Ethical Development of Artificial Intelligence: An opportunity to improve our wellbeing* was commissioned by Australia's Chief Scientist, Dr Alan Finkel AO, on behalf of the National Science and Technology Council with funding support and in partnership with the Australian Government through the Australian Research Council (project number CS170100008); the Department of Industry, Innovation and Science; and the Department of Prime Minister and Cabinet.

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"With careful planning, AI offers great opportunities for Australia, provided we ensure that the use of the technology does not compromise our human values. As a nation, we should look to set the global example for the responsible adoption of AI."

Professor Toby Walsh FAA
Co-chair, Expert Working Group

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