By email: ee.reps@aph.gov.au

5 July 2024

Australian Academy of Science submission to the
Inquiry into the Digital Transformation of Workplaces

The rapid uptake of artificial intelligence (AI) is transforming the practice of science, and AI tools are expected to become essential to most scientific fields in the next decade. While AI presents an opportunity to enhance productivity and accelerate discovery, promoting the responsible and ethical adoption of AI is essential to preparing Australia's scientific workforce and the science system.

The Academy recommends the following:

- AI training is required to ensure the scientific workforce has skills in the fundamentals of AI research and responsible use of AI.

- The government should lead the development of clear, evidence-informed guidelines that address the risks AI brings to the research sector in collaboration with the research community.

- To reduce bias and harm in AI models, efforts must be made to improve diversity in the AI workforce.

- Australia must urgently plan for and develop its future sovereign high-performance computing capability as a critical enabler of advancement in AI and science.

- Australia needs an open science strategy and to take action to meet the UNESCO Recommendation on Open Science to unlock the full potential of data as an asset to power research and innovation.

Australia must prepare its science workforce for digital transformation

Australia needs to ensure it has the capacity, technology, skills and knowledge among our scientific workforce to seize the opportunities presented by AI and to participate in its development to boost economic productivity and innovation.

Much like other sectors, the use of AI tools has the potential to change the nature of work and enhance the efficiency and productivity of scientific research. For example, administrative tasks such as academic writing can be performed more quickly,[1] and AI can already augment and automate literature reviews and data acquisition and analysis. There is also the potential for "AI research assistants" that could operate independently while supervised by human scientists.[2]

Major barriers to AI adoption are the lack of a diverse, skilled workforce, and insufficient skills in data literacy and understanding of AI in the research workforce.

A shortage of workers skilled in AI represents a key risk for Australia, especially over the next five years, with severe competition for local and international talent.

Our next generation of researchers, higher degree research students, will need to be prepared for this shift. They will require training to enhance their capability to evaluate and engage with emerging digital technologies such as AI. This will allow them to imagine how AI could benefit their research and prepare them for future collaborations, and to beware of the risks.

The shift to adopting AI tools for use in some research tasks will also require today's scientists to broaden their existing skills. Specific skillsets that will need to be addressed include prompt generation, understanding the fundamentals of AI research, and the responsible use of AI.

Guidance is needed to maximise opportunities, manage risks and impacts of AI on scientific practices

AI offers great opportunities to Australia's scientific workforce, but without guidance on how researchers should use AI tools, there is risk of misuse. A nuanced, evidence-based approach is needed to ensure that the integration of AI into research practices enhances, rather than compromises, the integrity of scientific inquiry.

AI can open new possibilities in evaluating research,[3] however it is essential that AI tools do not undermine the role of expertise, human judgement and the peer review process.

Potential risks for research presented by AI tools include:

- Facilitating misconduct, including inappropriate use to hallucinate or mimic genuine research or using Large Language Models (LLMs) to produce research papers or theses with authors fraudulently presenting outputs as their own;
- Using AI to manipulate or fabricate data;
- Pollution of scientific research, where manipulated data or research affects AI-trained models, misguiding future research and threatening the reliability of scientific research.

There have already been instances of AI-generated papers being published.[4] These risks could lead to fraudulent and manipulated data being published in peer-reviewed journals. As scientific funding is often determined using publication and citation metrics this could compromise metrics used to allocate research funding.

To mitigate these risks and ensure that AI is used responsibly and ethically, there is an urgent need for clear, evidence-informed guidelines for the research sector.

A limitation of AI is biased outputs because of a lack of diversity and biases in training data and models. AI has been shown to have biases against women, and to exhibit racial stereotypes.[5] Efforts to prioritise diversity and inclusion of under-represented communities, including in hiring practices,[6] would help to foster inclusion and amplify under-represented voices in AI development.

Lack of diversity also contributes to risk of harm towards marginalised communities. There is no measure of Indigenous participation in AI in Australia. Consequently, issues of Indigenous importance, such as data sovereignty, do not receive adequate attention.[7]

Sovereign high-performance computing and data will enable advancements in AI and science

As outlined in the Academy's submission to the Government's *Supporting responsible AI: discussion paper*, computing power and software is essential for development and adoption of AI tools.[8]

It is unrealistic and reckless to rely on access to computing power and data storage from other nations and commercial entities for our research capability. Australia must urgently plan for and develop its future sovereign high-performance computing capability as a critical enabler of advances in AI and science.

Open science is an important enabler of AI technologies

The massive amounts of data produced globally have the potential to be used by AI tools, but much of this data is not accessible to train and test AI. Applying open data and FAIR principles (Findable, Accessible, Interoperable and Reusable) to datasets would support the science system to maximise the benefits of AI and enhance transparency and accountability.

Australia needs an open science strategy and to take actions to meet the UNESCO Recommendation on Open Science to unlock the full potential of data as the asset it is to power research and innovation.

To discuss or clarify any aspect of this submission, please contact Mr Chris Anderson, Director Science Policy at Chris.Anderson@science.org.au.

References

1. Shakked Noy, Whitney Zhang, 'Experimental evidence on the productivity effects of generative artificial intelligence.' *Science*, **381**, 187-192 (2023). doi:10.1126/science.adh2586

2. Stevens, R. Testimony of Rick Stevens before the Senate Energy & Natural Resource Committee Hearing to examine recent advances in artificial intelligence and the Department of Energy's role in ensuring U.S. competitiveness and security in emerging technologies. (2023). https://www.energy.senate.gov/services/files/CF8309D8-C0A1-40C7-944F-CF71EF523FF8

3. Australian Government, Department of Education, *Australian Universities Accord Final Report*. (2024). https://www.education.gov.au/australian-universities-accord/resources/final-report

4. Koplin, J. 'AI-assisted writing is quietly booming in academic journals. Here's why that's ok.' *The Conversation*, (2024). https://theconversation.com/ai-assisted-writing-is-quietly-booming-in-academic-journals-heres-why-thats-ok-229416

5. UNESCO, 'Challenging systematic prejudices: an investigation into bias against women and girls in large language models'. (2024). https://unesdoc.unesco.org/ark:/48223/pf0000388971

6. Randery, T. 'Time to beat the diversity gap in artificial intelligence', OECD.AI Policy Observatory. (2023). https://oecd.ai/en/wonk/time-to-beat-the-diversity-gap-in-artificial-intelligence

7. Carroll, S. R. *et al.* 'The CARE principles for Indigenous data governance'. *Data Sci J* **19**, 1–12 (2020).

8. Australian Academy of Science, 'Australian Academy of Science submission on Supporting responsible AI: discussion paper'. (2023). https://www.science.org.au/supporting-science/science-policy-and-analysis/submissions-to-government/submission-supporting-responsible-ai

9. UNESCO, 'UNESCO Recommendation on Open Science.' (2021). https://unesdoc.unesco.org/ark:/48223/pf0000379949