

TOP TEN RESEARCH CHALLENGES

Our ten top challenges and the institutions which can solve them

We use machine learning techniques to help identify the universities and research institutions ready to solve Australia's most pressing challenges.

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No question is more important for Australia's research community than where our nation's research resources should be directed. Because in these straitened times, with governments running large budget deficits, research funding is limited.

which have come together in a perfect storm. There is climate change and the need for an accelerated shift to sustainable energy. There is geopolitical uncertainty, concerns about national security, and growing political and economic divides. There are also ageing populations and numerous global health issues, including the pandemic.

Thinking about these challenges led us to construct a list of ten major research challenges for Australia. And we decided to analyse how well prepared our universities, and other research institutions such as the CSIRO, are to find useful solutions to these challenges

We took a data-driven approach to the problem. The Australian's partner, League of Scholars, used machine learning techniques to create a comprehensive set of research topics for each of the ten challenge areas. Using these lists of topics they looked for all the Australian researchers who had a self-identified research interest in a topic that is part of each challenge, and which university or institution they worked for. Finally, they counted citations to papers published in peer-reviewed journals by these authors over the past five years to identify the five universities, or other institutions, which have made the most contribution.

Of course this is not the only way to gauge how well institutions measure up to research challenges. But it is an objective method based on each institution's research capacity and research record. The ten challenge areas are:

- [Renewable energy](#)
- [Climate change](#)
- [Quantum technology](#)
- [Food and agriculture](#)
- [Healthy ageing](#)
- [Disability and rehabilitation](#)
- [Indigenous research](#)
- [Cybersecurity](#)
- [Medical technology and devices](#)
- [Media technology](#)

Clearly there are many other areas of research importance but these ten were chosen to reflect the breadth and depth of the issues Australia is facing in the 2020s. We included areas of red alert (renewable energy, climate change, cybersecurity), business opportunities (food and agriculture, medical tech, media tech), a new technology (quantum), and important wellbeing areas (healthy ageing, disability and rehabilitation).

Each research theme has been chosen because it requires experts from a wide variety of topics, fields and in many cases entirely different disciplines. For example, medical technology and devices needs expertise in advanced manufacturing, materials science and electronic engineering as well as medicine and surgery. And media technology spans expertise across many different domains including animation and 3D modelling, music, gaming, and digital video.

We included indigenous research even though it is quite different to the other nine challenges. The issues in indigenous research are to give it adequate resources, to

In narrowing down the list we deliberately focused on multidisciplinary research areas even though this led to a decision to leave out a crucial area of applied research – artificial intelligence – which is covered in our separate analysis of 250 research fields. Another area of importance which we intentionally omitted is nuclear engineering. If Australia goes ahead with the plan to build and deploy nuclear submarines, then research in this area will be critical. We left it out because we currently have very little capacity in this area in Australia; so little that it's hard

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