Determining our future:
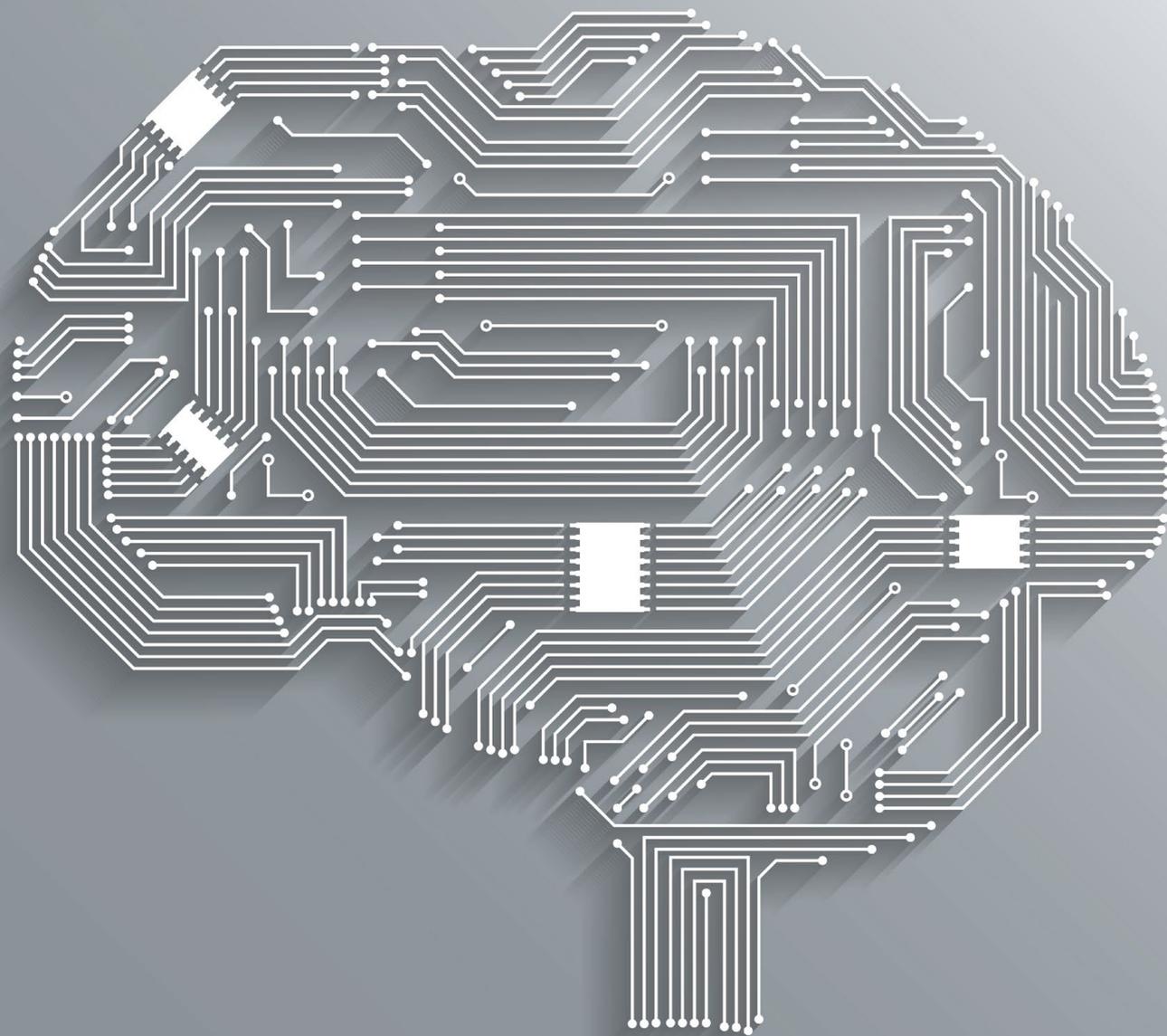# Artificial Intelligence

Opportunities and challenges for New Zealand: A call to action

Contents

Foreword

As organisations committed to long-term prosperity, the Institute of Directors and Chapman Tripp believe Artificial Intelligence (AI) is an extraordinary opportunity and challenge for New Zealand's future.

Already, AI has a growing effect on our daily lives. Its potential impacts are profound. In the near future, it is likely to drive – at an unprecedented pace – highly disruptive change to our economy, society, and institutions.

As such, AI presents huge opportunities and risks to all New Zealanders. This report highlights just a few of these and raises key questions we believe need to be answered.

AI will raise major social, ethical, and policy issues in almost every sector. It is critical – for New Zealand's sake – that we actively consider, lift awareness of, and prepare for the changes AI will bring.

This work needs to start now.

With this in mind, we call on the Government to establish a high-level working group on AI.

The working group should be tasked with:

- considering the potential impacts of AI on New Zealand
- identifying major areas of opportunity and concern, and
- making recommendations about how New Zealand should prepare for AI-driven change.

The working group should include expertise in science, business, law, ethics, society, and government. It should reconvene and report periodically, so its advice keeps up with the pace of change in AI technology.

AI is an extraordinary challenge for our future.

Establishing a high-level working group is a critical first step to help New Zealand rise to that challenge.

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Introduction

The potential reach of Artificial Intelligence (AI) is pervasive. The future impacts on the economy and society will be significant and disruptive. Governments, businesses, investors and research institutes around the world are applying ever-greater time and effort into developing and deploying the next generation of AI systems and considering the implications for policy and regulation.

AI technologies have been rapidly evolving over the past 10 years. They are extensively used already – in tools such as phones, search engines, vehicles, logistics, health services, financial services, industrial processes, public services, and military systems.

AI is globally-relevant and cutting edge. Nobody has a monopoly on the unique knowledge, impact and possibilities it presents; and nobody can predict with any certainty how AI will transform our future. But we can be sure the reach of AI will continue to grow and at an increasing pace. Allied with other forms of digital and technological innovation, AI poses significant opportunities and challenges for New Zealand.

The use of AI technologies could lead to greater productivity, enhanced social good and the creation of new fields of work. But AI also presents risks. These could include greater inequality and unemployment from disrupted industries and professions.

We have a duty to seek a deeper understanding of New Zealand's potential as an AI-assisted economy and society, to ensure AI is a positive part of New Zealand's future.

Strategic and co-ordinated leadership is critical if we are to maximise opportunities and prepare for the profound change AI will likely have on business and society – across every sector.

What is AI?

AI is difficult to define. Experts define it to include technologies that seek to mimic cognitive functions humans typically associate with other human minds, such as learning and problem solving.[1] Some define AI without reference to human minds, such as Nils J Nilsson:[2]

> Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment.

The goal of much AI research is to push forward the boundary of machine intelligence with the eventual goal of creating artificial general intelligence – a machine that could successfully perform any intellectual task in any domain that a human can.

This contrasts with most uses of artificial intelligence today where AI performs one task in a narrow domain, such as driving a car, recognising speech, searching the internet, playing chess or making product recommendations. The development of AI within these narrow domains often creates a paradox, known as the "AI effect". As new AI technologies are brought into common use, people become so accustomed to them, that the technology is no longer considered AI, and newer technology continually emerges (eg search engines, online advertising and GPS route planning).[3]

Often the development of AI technologies is benchmarked against the capability of the human mind. However, there are already many AI systems that exceed that capability in narrow domains such as chess, pattern recognition, data analytics and scheduling.

According to the median estimate of respondents to *Future Progress in Artificial Intelligence: A Survey of Expert Opinion*[4], there is a 50% chance AI will reach a higher level than the general intelligence of a human in the next 24 years. That rises to a 90% chance within 60 years.

The increasing reach of AI has spurred large-scale private sector investment into AI technologies. Google, Microsoft, Apple, Facebook, Amazon and Baidu have begun an AI 'arms race', poaching researchers, setting up laboratories and buying start-ups. The use of AI technologies in industry and government will continue to expand in the foreseeable future.

How is AI used?

Advances in AI technology and its implementation may help transform the quality of critical services in education, science, healthcare and government. AI is often used to reduce costs, introduce new efficiencies, and raise the quality of life.

Development of AI systems has been slow over the past 20 years and uneven across different sectors, but is accelerating rapidly.[5] Applications where AI has already had significant impacts include:

Transportation and logistics:

AI is being applied to transport planning, driver assistance, collision avoidance and other safety systems. Car manufacturers are developing driverless technologies and advances are being made in intelligent public transportation and unmanned aircraft for cargo transportation. The Ports of Auckland is partially automating its container terminal with autonomous straddle carriers. Domino's Pizza is launching in New Zealand the first commercial drone delivery service. The New Zealand Ministry of Transport and NZ Transport Agency have begun to review transport legislation to clarify the legality and liability risks associated with autonomous vehicles.[6] This issue was thrown into sharp relief following the death of a man in the US who had been watching a movie while his Tesla car drove in 'autopilot mode'.[7]

Financial services:

AI technologies play a growing role in financial services. Algorithmic and high frequency trading systems have been used since the early 1990s to achieve faster processing times, analysis of large datasets, pricing and order execution. Machine learning and analytics are now being used to self-correct and continuously improve automated trading strategies with little human interaction. Outside of trading, robo-advice platforms will improve accessibility to sophisticated financial management tools for investors, and may see the role of human advisers diminish in the face of significant margin pressure.[8]

E-commerce:

Online shopping as well as brick and mortar stores are assisted by AI technologies, from product recommendation engines (which generate approximately 35% of the sales revenue on websites such as Amazon) to targeted advertising based on past purchases. In the US, Lowe's home improvement store is introducing robots to check inventory and guide customers to products.[9]

Education:

While we believe that a quality education system will always require active engagement by teachers, AI systems promise to enhance education at all levels, particularly by providing personalised learning systems at scale.[10] Already language tutoring courses are using AI voice recognition technologies to assist students, and similar applications are being used by US Air Force technicians to diagnose electrical system issues in aircraft.[11] The use of AI deep learning analytics may also be used to model educational outcomes against expectations to help improve student engagement, behaviour and outcomes.

Healthcare:

AI is being used to process and analyse healthcare data and support medical diagnoses. Soon, image recognition AI will be able to analyse large sets of MRI and CT scans to identify and diagnose malignant tumours with a higher degree of accuracy than expert radiologists.[12] Recently, Counties-Manukau District Health Board announced a partnership with IBM to test their advanced cognitive computing tool, Watson.[13] Healthcare analytics and AI deep learning techniques will allow finer-grained, more personalised diagnosis and treatment. Advances have the potential to improve the life quality, health and wellbeing of the elderly through low cost, automated monitoring technologies and personalised health management systems.[14] These AI based healthcare systems will, however, continually need to balance privacy concerns against the benefits they promise to deliver.

Robotics:

AI has been applied to robotics in industry for many years. Heavy industries such as automobile and semi-conductor manufacturing have deployed robots for reasons of effectiveness, precision, accuracy and speed. Robots operate in many areas of society including our homes – for example, robot vacuum cleaners and lawnmowers.

Machine learning:

AI focuses on algorithms that can teach themselves to learn, understand, reason, plan and act when given new information. One example is Netflix's use of machine learning to predict the movies a person may enjoy based on viewing history. Global technology giants are beginning to make their machine learning tools available as free open source software. In April 2016, Google released its TensorFlow machine learning toolkit, the same framework it uses for photo recognition and automated email replies.[15] Facebook, Microsoft and Yahoo have released some of their own tools in an attempt to gain an advantage via wide adoption of their AI platforms.

Internet of Things:

Internet-enabled devices are increasingly connecting to other devices (vehicles, fridges, to large engines and power-grids). The goal of this technology is to make devices 'talk' to one another and to make decisions autonomously. Manufacturers are adding sensors to new or existing product lines to provide new analytic or software options.[16]

Military systems:

Governments worldwide are testing and deploying more sophisticated autonomous weapons systems. The capability to wage war will likely become dominated by AI systems, working with humans as well as independently.[17]

The impact on New Zealand

While the impact of AI on the New Zealand economy is impossible to quantify in advance, many sectors should be investing more in AI technologies to make the most of their full potential. This extends from start-ups, to SMEs and corporates, to government agencies and educational institutions.

AI is expected to have the largest impact on developed countries that depend on knowledge resources and productivity gains for growth. New Zealand is one such country. Our focus on primary production and our relative underinvestment in technology companies may see us fall behind other counties which are better able to realise productivity gains from AI technologies.

Lower socio-economic communities are likely to be most affected by the development of AI. Low-skilled and repetitive jobs are most at risk of being displaced by technology. At the same time, AI may bring significant benefits to poorer communities and make better use of limited resources through predictive modelling and personalisation of services and support.[18]

Government revenue may be affected by AI. Accomplishing tasks with AI instead of people will often be faster and more accurate. This could encourage a shift in investment away from human resources towards capital expenditure, destabilising income-related revenue.[19]

Key questions

- How can we use AI to build our competitive advantage in key industries?

- Is New Zealand investing enough in AI development?

- How do we ensure the benefits of AI are broadly shared across our economy and society?

Disrupting jobs and the economy

What determines vulnerability to automation, experts say, is not so much whether the work concerned is manual or skilled, but whether or not it is routine.[20] Since the age of the steam engine, machines have increasingly performed many forms of routine manual labour. Now those machines may also use AI technologies to perform some routine cognitive tasks too.

The Future of Life Institute notes that significant parts of the world economy – including finance, insurance, actuarial, and many consumer markets – could be susceptible to disruption through the use of AI technologies that learn, model and predict human and market behaviours.[21]

Just as the Industrial Revolution reduced the demand for human labour in manufacturing and agriculture, AI technologies have the potential to reduce the need for skilled professionals in service fields that have been largely insulated from disruption, such as finance, accounting, law and medicine.[22]

AI has already disrupted many industries. The manufacturing industry was one of the first to experience the impact with increased automation and the use of robotics. AI-related industrial applications will replace humans in a number of readily disrupted fields, including call centres, customer services, legal document review, or any other industry involving other routine tasks.[23]

It remains an open debate whether, like previous industrial revolutions, AI ultimately leads, after an initial period of disruption to established skills and industries, to greater employment as new work becomes available in areas that have not been automated.

Regardless, New Zealanders need to be prepared for the human resource implications of AI, which will extend across education, job retraining, and – most likely – immigration policies.

Key questions

- What New Zealand industries will be most disrupted by AI?

- What impact will AI have on our economy as some jobs are replaced by AI-driven automation?

- How do we encourage new jobs and industries that AI may promote?

- How does the education system need to evolve to address AI-driven change?

Addressing legal and policy issues

AI presents substantial legal and regulatory challenges. These challenges include problems with controlling and foreseeing the actions of autonomous systems. How will we assign legal and moral responsibility for harm caused by autonomous technologies that operate with little or no human intervention?[24]

New Zealand policymakers are already giving thought to the regulations that are needed for autonomous vehicles.[25] The widespread adoption of driverless or driver assistance systems will pose complex legal challenges. For example, how do we determine liability for an accident arising as a result of an AI system, and not caused by the driver?

AI systems may act unpredictably. One example is the 'flash crash' of 2010, where algorithmic trading systems created a US$1 trillion dollar stock-market crash and rebound in just 36 minutes.

If the actions of AI systems are sufficiently unpredictable or beyond the control of human agency, it may be unfair to hold the systems' designers responsible for the harms that the systems cause. Victims may be left with no way of obtaining compensation for losses.[26]

New Zealand will need to adapt existing regulation in areas, such as:

- healthcare eg whether particular AI systems in healthcare should be regulated as medical devices or some other way
- transport eg how autonomous vehicles should be registered, and
- finance eg whether legal regimes should be created to supervise the use of AI systems.

For development of artificial general intelligence, the law may require new ways of attributing agency and causation. These issues will require special consideration in New Zealand due to our unique system of accident compensation. For instance, New Zealand must ensure that manufacturers and developers of AI technologies are not unduly subsidised by the application of ACC's no fault principle.

Development of AI systems will also have an impact upon workplace safety regimes and the liability attached to them. As AI systems become increasingly autonomous, employment and health and safety legislation will need to be clear about the responsibilities and liabilities of directors and organisations.

Key questions

- Should decisions made by AI systems be attributed to their creators?

- Should AI systems be recognised in law as legal persons?

- Are New Zealand's regulatory and legislative processes adaptive enough to respond to and encourage innovations in AI?

Maintaining privacy, ethics and security

AI technology is likely to generate major ethical, privacy and security concerns. These need to be addressed and solved early.

Existing AI technologies that use pattern recognition and machine learning coupled with facial recognition already raise privacy concerns. A 2014 Carnegie Mellon study demonstrated the ability to re-identify individuals online and offline, with high accuracy in near real time, and infer sensitive information about them, by combining facial recognition and deep analysis of social media data.[27] In Russia, there was outcry over the use of the app Findface, which allows users to photograph strangers and determine their identity from profile pictures on social networks.[28]

There are obvious benefits of AI technology in law enforcement and intelligence, particularly the use of AI analytics to uncover white collar crime, such as credit card fraud.[29] But the use of AI by state agencies raises legitimate privacy concerns that have not been the subject of great public debate in New Zealand.

Development of AI systems may also raise issues regarding bias – especially when used as a tool to aid law enforcement. For instance, government agencies and AI developers should ensure that AI systems used in risk-based security screening processes at airports and ports do not engage in biased profiling.[30]

Sensors and monitoring devices connected to the internet are becoming ever more common – in clothing, in personal fitness devices, in city infrastructure and even in people themselves. At the same time, more data is being gathered and shared for medical purposes, law enforcement, education, and welfare. Big data techniques are increasingly using AI to create population-scale data and produce individualised analytics and recommendations.[31] It is not always clear who owns such data, how it should be used, and who can profit from it.

Several companies around the world are working on AI technology that focuses on social interaction. This includes toys that learn to respond to a child's interactions and that can become, in effect, surrogate friends.

As AI systems become more interconnected in our daily lives and are used in a growing number of critical infrastructure roles, they will take up an increasing proportion of the cyber-attack surface area. In recent times, cyber-attacks have targeted the Ukraine national power grid and a German nuclear power plant.[32] But AI will also be part of the solution, with machine-learning techniques likely to improve detection and defend against cyberattacks.[33]

Key questions

- What does privacy mean to New Zealanders in an AI world?

- What ethical challenges does the widespread use of AI raise?

- Do we have the right frameworks to protect data and make sure it can be used most effectively?

Keeping control

Leaders in many fields have voiced concerns over safety and the risk of losing control of AI systems. Initially the subject of science fiction (think Skynet in the Terminator movies), these concerns are now tangible in certain types of safety-critical AI applications – such as vehicles and weapons platforms – where it may be necessary to retain some form of human control.

In January 2015, the Future of Life Institute published an open letter signed by over 100 leaders in the AI field.[34] The letter warns that we must do more to ensure that "AI systems … do what we want them to do" and goes on to note that:

The potential benefits [of AI] are huge, since everything that civilization has to offer is a product of human intelligence, [but] because of the great potential of AI, it is important to research how to reap its benefits, while avoiding potential pitfalls.

Similar concerns exist in relation to potential threats posed by self-improving AI systems.[35] Elon Musk, in a 2014 interview at MIT, famously called AI *"our greatest existential threat"*. Professor Stephen Hawking, in a 2014 interview with BBC, said that *"humans, limited by slow biological evolution, couldn't compete and would be superseded by AI"*.

Stanford's One-Hundred Year Study of AI notes that *"we could one day lose control of AI systems via the rise of superintelligences that do not act in accordance with human wishes – and that such powerful systems would threaten humanity"*.[36]

Google's DeepMind lab has developed an AI 'off-switch', while others are developing a principles-based framework to address security.

Key question

- What controls and limitations should be placed on AI technology?

How other governments are responding

While parts of our public and private sectors are considering the implications of AI and supporting its development in specific areas, there is no whole-of-government or whole-of-nation approach. This poses a considerable risk. We may fall behind other countries, lose an opportunity to develop world-leading public policy on AI, and be forced to accept technical, ethical, and legal standards and practices set in overseas jurisdictions.

The Secretary General of the OECD says "…we need to analyse the digitisation of the economy and society from a whole-of-government perspective. We need to climb out of our policy silos and reach across them to better understand how digitisation is transforming our lives, how we can exploit it, and how we can help those in danger of being left behind".[37]

Governments around the world are establishing policy programmes and tasking agencies to address how AI technologies might be harnessed to deliver social and economic outcomes.

- In the United States, the White House has established a National Science and Technology Council sub-committee on machine learning and artificial intelligence, tasked with monitoring advances and technology milestones in AI and machine learning within the Federal Government, private sector and internationally.[38]

- In Canada, the Government's Information and Communications Technology Council published a paper in April 2015 on *Artificial Intelligence in Canada,*[39] in which it issued a call to action for Canada to establish strategies to keep up with the pace of AI-related economic transformations.

- In the United Kingdom, the Science and Technology Committee of the House of Commons is undertaking an inquiry into robotics and artificial intelligence.[40]

- In Japan, the Government proposed establishing an international set of basic rules for developing artificial intelligence technologies at a recent meeting of G7 ICT Ministers. The eight principles include making AI networks secure, transparent and controllable by human beings.[41]

- In Singapore, the Government in 2014 launched a world-leading 'smart nation' initiative which is essentially about using technology to benefit citizens.[42] The Government is restructuring agencies to focus on infrastructure development and regulating new technologies (with a focus on robotics, AI, the Internet of Things and big data).

- In South Korea, the Government has announced it will establish a task force for AI application and industrialisation and increase its support for R&D on AI.

Key question

- Is New Zealand doing enough to keep ahead?

Our call to action

Public and private sector leaders need to work together to promote greater development of AI technologies and to ensure there is a co-ordinated approach to prepare for the effects AI will have on the economy, work, education, and welfare. This will require big-picture thinking, long-term vision and appropriate oversight.

As a critical first step, we call upon the Government to establish a high-level working group to consider the potential impact of AI technologies, including in the social, legal and economic arena.

It needs to be multidisciplinary, and include leaders from the private, public, and community sectors, including expertise in science, business, law, ethics, society, and government.

The working group should be tasked with identifying major areas of opportunity and concern, and making recommendations about how New Zealand should prepare for AI-driven change.

It should reconvene and report periodically to ensure its advice keeps up with the pace of change in AI technology.

We commend the work the Government is already doing to lead collaboration on other national technology challenges, such as engaging with the private sector to develop a National Cyber Security Strategy and establishing a National Computer Emergency Response Team (CERT).

We also call for greater collaboration and co-ordination among AI researchers, policymakers and industry members at sector level. We welcome the New Zealand Law Foundation's recent launch of the Information Law & Policy Project to develop law and policy around information technology, data, information and cyber-security.[43] We encourage similar work in other sectors where AI will play an important role.

The potential economic and social opportunities from AI technologies are immense. The public and private sectors must move promptly and together to ensure we are prepared to reap the benefits, and address the risks of AI.

Endnotes

1   Stuart Russell and Peter Norvig *Artificial Intelligence: A Modern Approach* (3rd ed, Upper Saddle River, NJ, Prentice Hall, 2009) at 2.

2   Nils J Nilsson *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge, UK, Cambridge University Press, 2010).

3   Pamela McCorduck *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence* (2nd ed, Natick, MA, 2004).

4   Nick Bostrom and Vincent C Millar "Future Progress in Artificial Intelligence: A survey of expert opinion" in Vincent C Muller (ed) *Fundamental Issues of Artificial Intelligence* (Synthese Library, Berlin, Springer, 2016) at 553.

5   Stone et al *Artificial Intelligence and Life in 2030 – Stanford One Hundred Year Study on Artificial Intelligence: Report of the 2015-2016 Study Panel (September 2016) (ai100.stanford. edu) (the Stanford 100 Year Study)* at 6.

6   New Zealand Ministry of Transport *Autonomous including driverless vehicles* (7 March 2016) (www.transport.govt.nz). NZTA offers an approved testing process and support for autonomous vehicle testing in New Zealand (www.nzta.govt.nz).

7   Sam Levin and Nicky Woolf *Tesla driver killed while using autopilot was watching Harry Potter,* The Guardian (1 July 2016) (www.theguardian.com).

8   See the World Economic Forum Report *The Future of Financial Services: How disruptive innovations are reshaping the way financial services are structured, provisioned and consumed* (June 2015) (www3.weforum.org) at 19.

9   Lowe's *Lowe's Introduces LoweBot - The Next Generation Robot to Enhance the Home Improvement Shopping Experience in the Bay area* (30 August 2016) (lowes.com).

10   The *Stanford 100 Year Study* at 33.

11   Ibid at 32.

12   The next twenty years may not result in fully automated radiology, but initial developments in image 'triage', where scans are ordered or sorted into those with the highest incidence of risk factors, will likely improve the speed and cost of medical imaging. See *Stanford One Hundred Year Study on Artificial Intelligence* (September 2016) at 27.

13   Geraint Martin *Beginning a Revolution* (29 May 2014) (www.countiesmanukau.health.nz).

14   The *Stanford 100 Year Study* at 28.

15   Google published TensorFlow under an open source license (www.tensorflow.org). Google notes that: *"By sharing what we believe to be one of the best machine learning toolboxes in the world, we hope to create an open standard for exchanging research ideas and putting machine learning in products".*

16   PwC *Tech Breakthroughs Megatrend: how to prepare for its impact* (May 2016) (www.pwc.com).

17   As one example: Andrew Dalton *Combat AI beats the Air Force's top tactical experts* (Engadget, 28 June 2016) (www.engadget.com).

18   The *Stanford 100 Year Study* at 31.

19   Ibid at 46.

20   The Economist *The Return of the Machinery Question* (25 June 2016).

21   Future of Life Institute *Research Priorities for Robust and Beneficial Artificial Intelligence: An Open Letter* (January 2015) (futureoflife.org).

22   See e.g. Aaron Smith & Janna Anderson *AI, Robotics, and the Future of Jobs* (Pew Research Centre, 6 Aug 2014) (www.pewinternet.org) at 52.

23   For a dystopian view, see Martin Ford, *Rise of the Robots: Technology and the Threat of a Jobless Future* (2015).

24   Matthew U Scherer *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies and Strategies* (Harvard Journal of Law and Technology, Vol 29, No 2, Spring 2016) at 6.

25   New Zealand Ministry of Transport *Autonomous including driverless Vehicles* (7 March 2016) (www.transport.govt.nz).

26   Matthew U Scherer *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies and Strategies* (Harvard Journal of Law and Technology, Vol 29, No 2, Spring 2016) at 14 and 16.

27   Allesandro Acquisti et al *Face Recognition and Privacy in the Age of Augmented Reality* (Journal of Privacy and Confidentiality (2014) 6, number 2) at 19.

28   The Guardian *Face Recognition App taking Russia by storm may bring end to Public Anonymity* (17 May 2016) (www.theguardian.com).

29   The *Stanford 100 Year Study* at 36.

30   Ibid at 37.

31   Ibid at 27.

32   Wynyard Group *Hackers step up attacks on key infrastructure* (6 May 2016) (www.wynyardgroup.com)

33   Stuart Russel et al *Research Priorities for Robust and Beneficial Artificial Intelligence January 2015* (futureoflife.org).

34   Future of Life Institute *Research Priorities for Robust and Beneficial Artificial Intelligence: An Open Letter* (January 2015) (futureoflife.org). The Institute has also published a separate open letter calling for a ban on offensive autonomous weapons beyond meaningful human control (July 2015).

35   Including Nick Bostrom, author of the book *Superintelligence: Paths Dangers Strategies.*

36   Eric Horvitz *Stanford One Hundred Year Study on Artificial Intelligence: Reflections and Framing* (2014). In a subsequent research paper, the 2015-2016 Study Panel appeared to be less concerned about this issue, where they noted that "[w]hile the Study Panel do not consider it likely that near-term AI systems will autonomously *choose* to inflict harm on people, it will be possible for people to use AI-based systems for harmful as well as hurtful purposes." See the *Stanford 100 Year Study* at 10.

37   Angel Gurria, *OECD Meeting on the Digital Economy: Innovation, Growth, and Social Prosperity, opening remarks,* 22 June 2016 (www.oecd.org).

38   The White House has also recently co-hosted four public workshops on AI to spur public dialogue on AI and to identify challenges and opportunities relating to this emerging technology, which will feed into a public report due later this year.

39   Canada Information and Communications Technology Council *Artificial Intelligence in Canada: Where do we stand?* (April 2015).

40   United Kingdom Parliament Robotics and artificial intelligence inquiry (www.parliament.uk).

41   Japan Times *Japan pushes for basic AI rules at G-7 tech meeting* (29 April 2016). See also Japan's *Proposal of Discussion toward formulation of AI R&D Guideline* (www.japan.go.jp).

42   See www.smartnation.sg

43   New Zealand Law Foundation *Information Law & Policy Project* (www.lawfoundation.org.nz).
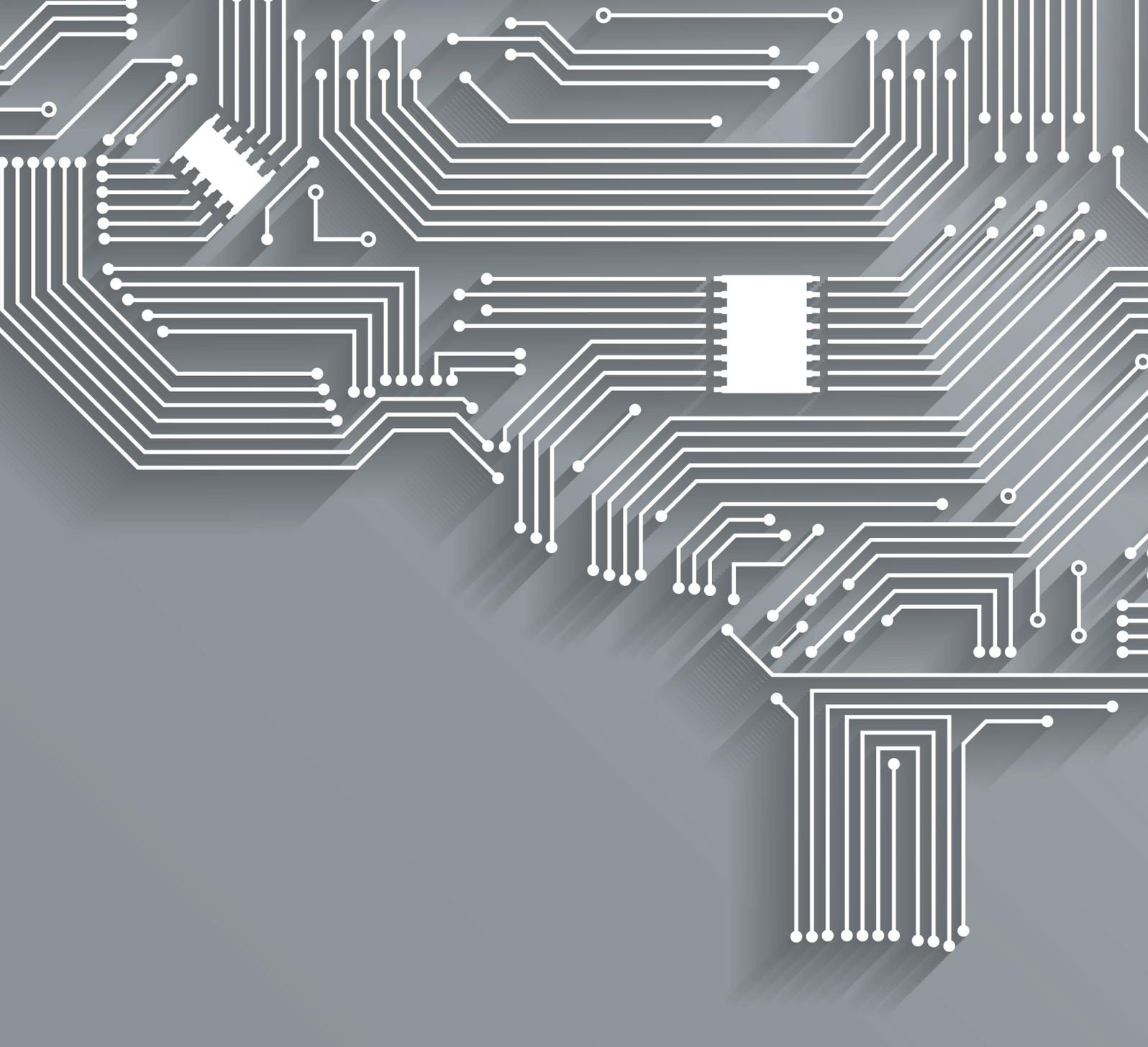
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