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Members of the Victorian Parliament have established an All-Party Group on Artificial Intelligence (AI) to learn more about this technology and the impacts it will have on Victorians in the future. This primer provides a basic explanation of some of the key issues surrounding AI.

## Executive Summary

### What is Artificial Intelligence?

Artificial Intelligence (AI) refers to simulated human intelligence performed by computers and machines.

### Why is it important?

The capacity to benefit from, and adapt to, the challenges and opportunities presented by this cognitive revolution is arguably one of the greatest strategic issues facing Victoria, and Australia at large. In addition to the threat of job losses, the issues of mass data collection and privacy are also of concern.<sup>1</sup>

AI is arguably one of the most important issues facing us in the future. AI offers many benefits and opportunities, as well as many challenges – we now need a prominent and informed public debate on AI in Victoria.

### The state of play

Due to enormous advances in computing and wide availability of data, the processing power of computers continues to develop exponentially, rather than linearly, which has profound implications for the pace of AI technology.

The opportunities associated with AI include significantly enhanced economic productivity, improved public services, as well as scientific and technological breakthroughs in areas such as medicine, education, transport and finance.

### Risks

In addition to the potential loss of jobs and disruption to employment markets, concerns about accountability and privacy will intensify, while the ability of AI to enhance or replace human decision-making raises important legal and ethical questions.

### How are governments responding?

In the last 18 months, the governments of Canada, United States, United Kingdom, China, and Japan have all introduced national AI development plans, while the EU is considering a pan-European Agency.

In January 2017, Members of the UK Parliament established an All-Party Parliamentary Group on Artificial Intelligence to explore the impact and implications of AI.

### Victoria must now take a lead

Governments, businesses, communities, individuals – no one will be exempt from the impact of AI. Victorian Parliamentarians are now taking the lead through the establishment of a *Victorian All-Party Parliamentary Group on Artificial Intelligence* to learn more about AI and help prepare Victorians for the future.

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<sup>1</sup> *An Intelligent Future? Maximising the opportunities and minimising the risks of artificial intelligence in the UK*, p. 16, Future Advocacy (2016)

## Technology continues to develop faster – why is this happening?

The main driver of the answer to this question is that the processing power of computers is developing exponentially. That is the result of something known as *Moore's Law*, named after the co-founder of Intel Corporation, Gordon Moore, who, in 1965 predicted that the number of transistors per silicon chip would double every two years.<sup>2</sup> Up until today, this has proved to be a remarkably accurate prediction – and it has profound implications for the pace of technological development to come.

We can expect massive advances in AI in the near future – making it hard to predict where AI might take us in the short to medium term, let alone long term.

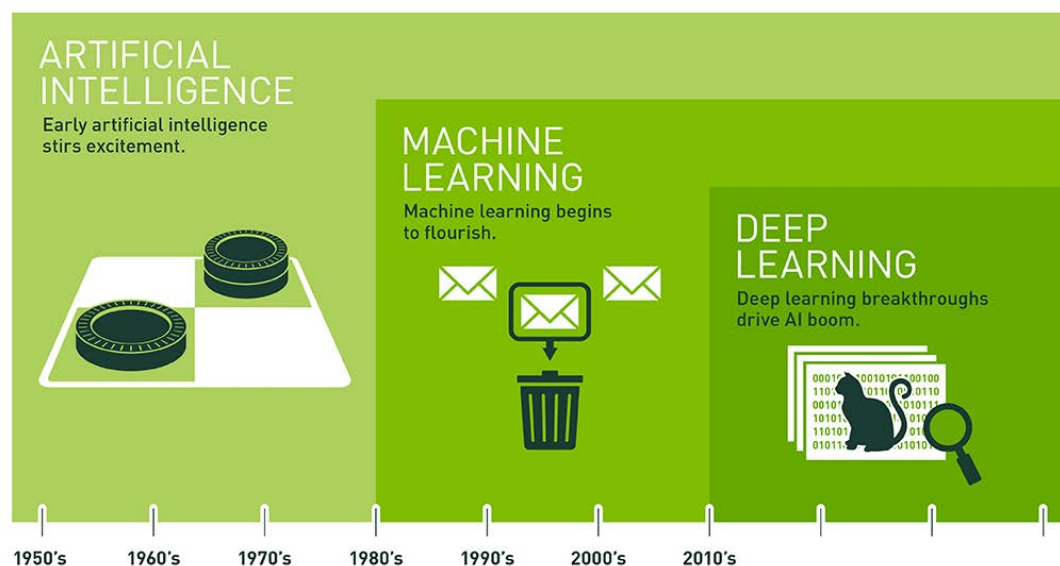
This is because technology is now developing exponentially. Unlike linear growth, which results from repeatedly adding a constant, exponential growth is the repeated multiplication of a constant.

## How AI works

**Algorithms** are crucial to AI. They are sets of codes followed to solve a task. AI results when machines perform tasks based on algorithms in an 'intelligent' manner.

**Machine Learning** is the practice of using algorithms to parse data, learn from it, and then determine or predict something. So rather than hand-coding software routines with a specific set of instructions to accomplish a particular task, the machine is 'trained' using large amounts of data and algorithms that give it the ability to learn how to perform the task.<sup>3</sup>

**Deep Learning** is a subset of machine learning. While a machine learning model needs to be told how it should make accurate predictions (by feeding it more data), a deep learning model is able to learn that through its own computing 'brain'. It is similar to how a human would perceive something, think about it, and then draw a conclusion. To achieve this, deep learning uses a layered structure of algorithms called an **artificial neural network**, the design of which is inspired by the biological neural network of the human brain.<sup>4</sup>



Source: *What's the Difference Between Artificial Intelligence, Machine Learning, and Deep Learning?*, Michael Copeland (2016)

<sup>2</sup> <https://www.britannica.com/topic/Moores-law>

<sup>3</sup> *What's the Difference Between Artificial Intelligence, Machine Learning, and Deep Learning?*, Michael Copeland, Nvidia.com (2016)

<sup>4</sup> *A Simple Way to Understand Machine Learning vs Deep Learning*, Brett Grossfeld, Zendesk.com (2017)

## The impact and implications of AI

As in previous times of rapid change, the discussions in politics, business, and communities in general tend to be divided into ones of optimism and pessimism. It is important to acknowledge and recognise the changes that are taking place now and to start thinking about how society can adapt and thrive as the new reality rapidly unfolds.

Below are four of the main areas we can expect considerable changes taking place and the questions these changes raise for us.



### Economic

The economic implications of AI are receiving the bulk of media attention. This area evokes a fair degree of pessimism, as well as some optimistic observations.

A widely cited study by Michael Osborne and Carl Benedikt Frey of Oxford University, states that across the OECD an average of **57% of jobs are at risk of being automated**.<sup>5</sup>

What determines vulnerability to automation is not so much whether the work concerned is manual or white-collar, but whether or not it is routine.<sup>6</sup>

Experts are also worried that, as a result of workplace automation, there will be job polarisation, with a job market increasingly segregated into **low-skill/low-pay** and **high-skill/high-pay** segments.<sup>7</sup>

However, others argue that we have seen it all before and that in the past technology has created more jobs than it destroys. This pattern can be seen in industry after industry after the introduction of computers, according to James Bessen from Boston University – rather than

destroying jobs, automation redefines them, and in ways that reduce costs and boost demand.<sup>8</sup>

*... pretty much everyone agrees on the prescription: companies and governments will need to make it easier for workers to acquire new skills and switch jobs as needed.*

The Economist, June 2016



### Social

AI offers enormous opportunities for the improvement of our lives; ranging from medical breakthroughs for improved health outcomes and quality of life through to enhancing education at all levels by providing personalisation at scale.<sup>9</sup>

However, AI could widen existing inequalities if access to AI technologies is unfairly distributed across society.<sup>10</sup>

For example, job polarisation could exacerbate the fragmentation of our society between the ‘haves and have nots’. In anticipation of these concerns, calls for a stronger safety net are increasing, particularly around ‘negative income taxes’ or a ‘universal basic income’ to protect people from labour-market distortions and to help them switch to new jobs.<sup>11</sup>

The changing job landscape will require big changes in the way education is delivered. Most experts agree that in this new job market ‘enterprise skills’ (e.g., problem solving, creativity and social intelligence) will need to be placed at the heart of learning.<sup>12</sup>

<sup>5</sup> *Technology at Work v2.0*, Oxford Martin School (2016)

<sup>6</sup> *The return of the machinery question*, The Economist (2016)

<sup>7</sup> *The Fourth Industrial Revolution: what it means, how to respond*, World Economic Forum (2016)

<sup>8</sup> *The return of the machinery question*, The Economist (2016)

<sup>9</sup> *ibid.*

<sup>10</sup> *ibid.*

<sup>11</sup> *ibid.*

<sup>12</sup> *The New Work Order*, Foundation for Young Australians (2017)

## Some examples of how AI is being used



### Virtual assistants

Siri, Cortana, and Google Now are all driven by AI.



### Search engines

Google improves its results using intelligent algorithms.



### Purchase prediction

Amazon suggests products we may like based on our purchase or search history.



### Music and film recommendations

Spotify and Netflix suggest new songs and shows based on what we have previously listened to or watched.



### Legal advice

The chatbot *DoNotPay* has successfully contested 160,000 parking tickets in London and New York.



### Creating art

AI has been used to compose music, write poetry, and produce paintings.



### Water management

AI is being used to coordinate drones to test the water quality of a number of European rivers, including the Thames.



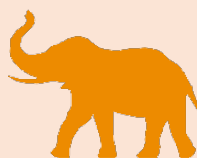
### Agriculture

AI is used to diagnose problems in crop growth; in smart tractors to selectively spray weeds with herbicide; and in satellite imaging to identify areas where farmers require more support.



### Transport

AI underpins a number of features in SatNav systems; is used to ease congestion in cities; and is behind recent advances in driverless cars.



### Wildlife Protection

AI has been successfully deployed to inform rangers' patrol routes in efforts to combat poaching in Uganda and Malaysia.



### Journalism

AI is being used to draft short articles and reports. The Washington Post deployed AI in its coverage of the Olympics.



### Health

AI is being used to interpret eye scans; improve treatment of severe combat wounds; and reduce hospital-acquired infections.

Source: *An Intelligent Future? Maximising the opportunities and minimising the risks of artificial intelligence in the UK*, Future Advocacy (2016)



## Legal

There are many legal considerations attached to the introduction of AI in our society. The wide and deep adoption of AI will increasingly raise the question of whether, and under what circumstances, an AI system could operate as the agent of a person or corporation. Already regulatory bodies in the United States, Canada, and elsewhere are setting the conditions under which software can enter into a binding contract.

AI is already assisting in fighting white-collar crime, and holds great promise in behavioral profiling, crime data analysis, managing crime scenes and assisting search and rescue events. As these tools become more sophisticated, they have the potential to substantially improve fairness and safety, but they also raise serious concerns around privacy, agency, bias and accountability.<sup>13</sup>



## Ethical

Broad and deep adoption of AI in our communities raises new questions. How do we feel about algorithms guiding parole decisions? How should self-driving cars behave in emergencies; should they risk injuring its occupants to avoid hitting a child who steps out in front of it? And what about the end of public anonymity when facial recognition apps allow strangers to identify you and your family in real time passing by on the street? These questions are no longer theoretical.<sup>14</sup>

## How are governments responding?

Recognising the importance of AI – and the speed at which the field is progressing – the governments of Canada, the United States, the United Kingdom, China, and Japan have all introduced national AI development plans.<sup>15</sup>

In January 2017, the UK established an *All-Party Parliamentary Group on AI* where members from all sides of Parliament meet regularly to explore the impact and implications of AI.<sup>16</sup>

## Victoria must take a lead

The field of AI is rapidly evolving. It holds enormous potential to be used for both positive or negative purposes. Given the exponential nature of its development, we can only speculate as to its medium to longer term impact.

What is clear is that it's essential to develop an understanding of, and response to, the many challenges and opportunities that this technological revolution will introduce to the economy and society.

Government is uniquely placed to respond to these challenges in a way that will contribute to our future. As Victorian Parliamentarians, we are taking the lead on this vital issue to increase understanding of AI and prepare our state for the future.

This primer was created with the assistance of the Victorian Parliamentary Library & Information Service, Committee for Melbourne and the Australian Academy of Technology and Engineering (ATSE).

COMMITTEE  
MELBOURNE<sup>FOR</sup>



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<sup>13</sup> *It's time for our justice system to embrace artificial intelligence*, Brookings Institution (2017)

<sup>14</sup> *The return of the machinery question*, The Economist (2016)

<sup>15</sup> *How Governments Are Preparing for Artificial Intelligence*, Center for Data Innovation (Aug 2017)

<sup>16</sup> [www.appg-ai.org](http://www.appg-ai.org)



