

Nicola Blackwood MP,  
Chair, Science and Technology Committee  
House of Commons  
London  
SW1A 0AA

27 April 2016

Dear Ms Blackwood,

I understand that the Science and Technology Committee is conducting an inquiry into Robotics and Artificial Intelligence and write to share a few thoughts on behalf of the Royal Society's working group on machine learning. I would also like to take this opportunity to offer to host a roundtable with members of the group if that might be helpful during the course of your inquiry.

As the Committee notes, the field of artificial intelligence has received significant recent attention, no doubt stimulated in part by the success of AlphaGo. Artificial intelligence (AI) is a broad term, which covers a range of technologies and applications. Although significant media attention is devoted to the development of human-level AI, or Artificial General Intelligence, to use its technical term, this is still some time from being developed. There are, however, technologies falling within the category technically termed Artificial Specific Intelligence, such as machine learning, which are already having an impact on society, and whose impact will increase substantially over the next five to ten years. Recognising this, the Royal Society is undertaking a project on machine learning, which I chair, aiming to stimulate a debate, to increase awareness and demonstrate the potential of machine learning, and highlight the opportunities and challenges it presents. Our early findings may therefore be helpful to you in your inquiry.

Machine learning is a way of programming a system to learn from data. It can be thought of as an enabling technology, which provides an algorithmic foundation for something like artificial intelligence, with learning being part of what is necessary to gain intelligence. This means that machine learning may feed into a range of different areas of interest to the Committee, including automated decision making, robotics, AI, and applications including medical treatments, driverless vehicles and finance. This technology already underpins many of the applications that we use in our daily lives, such as the voice recognition software on our phones, apps that we use for mapping journeys, and the 'Friends' suggested to us by Facebook. It also has the potential to have a transformative role across a diverse range of sectors. For example:

- An autonomous vehicle will need to take data about its environment, such as visual images from a camera, and translate this into useful information to be used to drive the vehicle. Machine learning allows processing of such data in order to make decisions or predictions about appropriate responses.
- In healthcare, machine learning is already being used to improve the accuracy of diagnostics by finding patterns which are not picked up by humans. In future, machine learning could make use of the potentially vast pool of data from patients, helping process and analyse this, in order to choose more effective treatments for patients.



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There are clear potential social benefits from this technology. There are also challenges and risks which arise from the social, legal and ethical questions posed by its use. The nature of these opportunities and challenges, and how policymakers should respond to them, is application-specific; it is dependent on how the technology is put to use. We are considering a range of these issues, asking questions such as:

- What are the ethical, social, legal and scientific challenges presented by machine learning?
- How can we build a skills pipeline which will support effective use of this technology?
- Which are the sectors where machine learning is already having an impact? Which are not reaping the full benefits of this technology? What are the barriers to its use and how can these be addressed?

We have also initiated a process of public dialogues to gain an understanding of public attitudes to these technologies, with the aim of finding what the public already know about machine learning, and the types of applications or scenarios which may cause concern.

I would be happy to share our early insights from this work as appropriate to assist the Committee with its inquiry.

Please contact the Society's Head of Public Affairs, Becky Purvis on [Becky.purvis@royalsociety.org](mailto:Becky.purvis@royalsociety.org) or 020 7451 2261 if you would like to discuss this further.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'P. Donnelly', with a stylized flourish at the end.

**Professor Peter Donnelly FMedSci FRS**  
Chair, Royal Society Machine Learning project  
Professor of Statistical Science  
Director, Wellcome Trust Centre for Human Genetics,  
University of Oxford