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**Artificial Intelligence and Discovery Science: Playing to Canada’s Strengths**

Organized by: Friends of the Canadian Institutes of Health Research

Keynote: Alan Bernstein, President and CEO, CIFAR, 2017 Henry G. Friesen International Prizewinner

Speakers: Brenda Andrews, Director, Andrew’s Lab, University of Toronto; Doina Precup, Associate Professor, McGill University; Dr Rémi Quirion, Chief Scientist of Quebec; Linda Rabeneck, Vice President, Prevention and Cancer Control, Cancer Care Ontario; Peter Zandstra, Director, School of Biomedical Engineering, University of British Columbia

Discussants: Henry Friesen, Professor Emeritus, University of Manitoba; Roderick McInnes, Acting President, Canadian Institutes of Health Research and Director, Lady Davis Institute, Jewish General Hospital, McGill University; Duncan J. Stewart, CEO and Scientific Director, Ottawa Hospital Research Institute; Vivek Goel, Vice President, Research and Innovation, University of Toronto

Moderators: Eric Meslin, President & CEO, Council of Canadian Academies; André Picard, Health Reporter and Columnist, The Globe and Mail

**Takeaways and recommendations**

The opportunity for Canada

* The potential impact of artificial intelligence (AI) could be as significant as the industrial revolution of the 19th century.
* Canada’s global advantage in deep learning (a subset of machine learning) stems from the pioneering work of Geoffrey Hinton and early support from CIFAR and NSERC.
* AI could mark a turning point in Canada’s innovation performance, fueled by the highest levels of venture capital financing in nearly a decade, and underpinned by publicly funded research at the federal, provincial and institutional levels.
* The Canadian AI advantage can only be fully realized by developing and importing skilled talent, accessible markets, capital and companies willing to adopt new technologies into existing industries.
* Canada leads in the combination of functional genomics and machine learning which is proving effective for predicting the functional variation in genomes.
* AI promises advances in biomedical engineering by connecting chronic diseases – the largest health burden in Canada - to gene regulatory networks by understanding how stem cells make decisions.
* AI can be effectively deployed to evaluate health and health systems in the general population.

The challenges

* AI brings potential ethical and economic perils and requires a watchdog to oversee standards, engage in fact-based debate and prepare for the potential backlash over job losses to robots.
* The ethical, environmental, economic, legal and social (GEL3S) aspects of genomics have been largely marginalized and it’s important not to make the same mistake with AI.
* AI’s rapid scientific development makes it difficult to keep pace with safeguards and standards.
* The fields of AI’s and pattern recognition are strongly connected but here is room for improvement.
* Self-learning algorithms such as Alphaville could lead to the invention of new things that humans currently don’t know how to do. The field is developing rapidly, leading to some concern over the deployment of such systems.

Training future AI professionals

* Young researchers must be given the oxygen to excel at AI if its potential is to be realized.
* Students appreciate the breadth of training and additional resources they receive from researchers with ties to both academia and industry.
* The importance of continuing fundamental research in AI is being challenged by companies such as Facebook, Google and Amazon which are hiring away key talent.
* The explosion of AI is a powerful illustration of how the importance of fundamental research may only be recognized and exploited after 20 or 30 years. As a result, support for fundamental research, and the students working in areas related to AI, must continue.