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Global Expert Mission
Artificial Intelligence in Canada 2017

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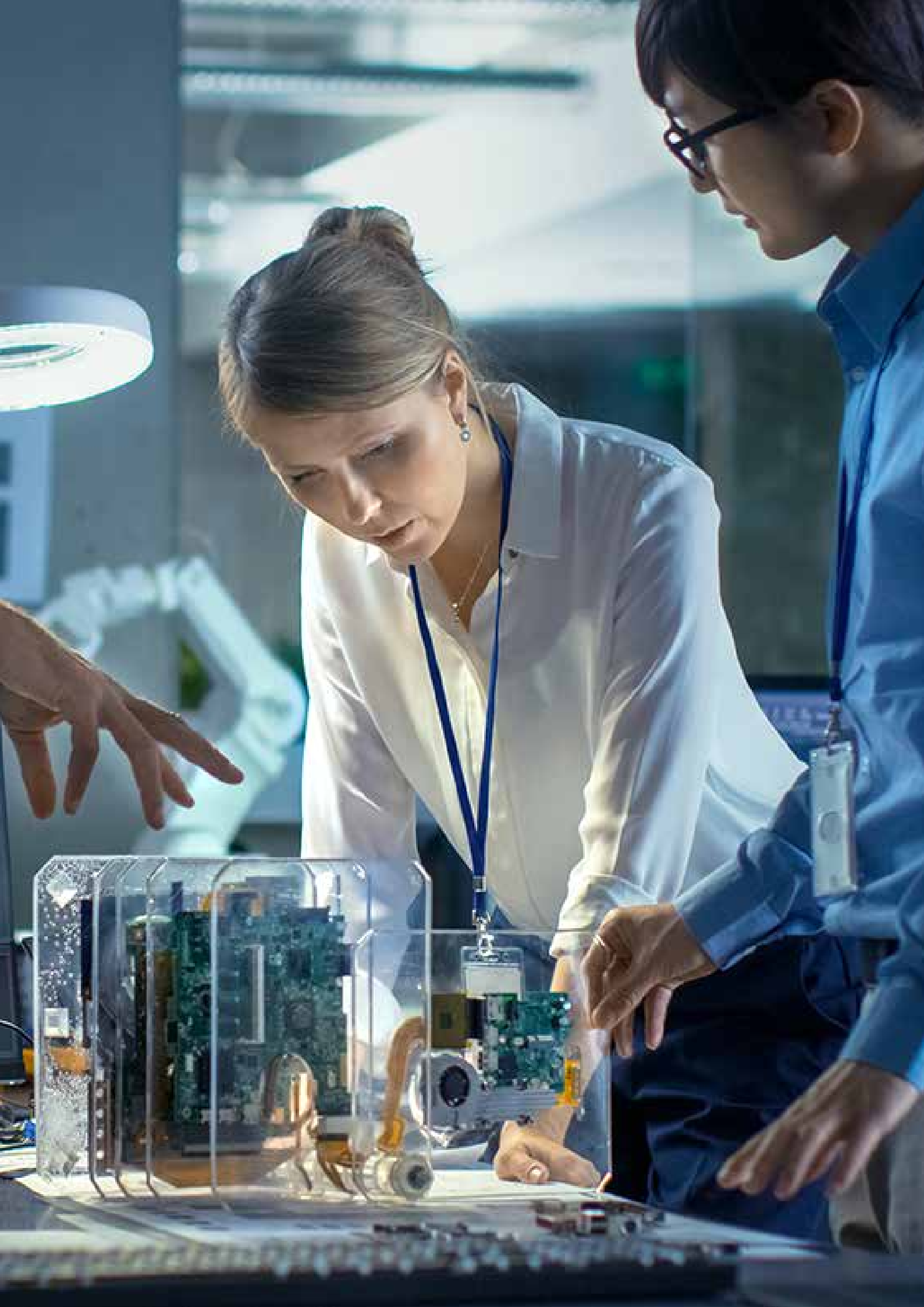

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Preface

Innovate UK's global missions programme is one of its most important tools to support the UK's Industrial Strategy's ambition for the UK to be the international partner of choice for science and innovation. Global collaborations are crucial in meeting the Industrial Strategy's Grand Challenges and will be further supported by the launch of a new International Research and Innovation Strategy.

Innovate UK's Global Expert Missions, led by Innovate UK's Knowledge Transfer Network, play an important role in building strategic partnerships, providing deep insight into the opportunities for UK innovation and shaping future programmes.

In October 2017, the Artificial Intelligent (AI) Expert Mission travelled to Toronto and Montréal. The UK delegation met with Canadian federal and provincial government officials, academics and commercial entities – gaining exposure to nearly forty AI-related organisations and learning about more than eighty programmes that could directly benefit collaboration, joint ventures and innovation opportunities for AI organisations in the UK.

In this publication, we share the information and insights gathered during the delegation's time in Canada.

Introduction

Artificial intelligence (AI) is a high-profile enabling technology that is developing at pace. This rapid level of progression and the tremendous socio-economic implications of AI mean that it is critical to engender a greater understanding of its capabilities and facilitate widespread uptake of the technology. As observed last year by Google's CEO Sundar Pichai[1], we are already evolving from a mobile-first to an AI-first world, where smart-home and on-the-go technology is commonplace – and experts in the sector estimate that within 10 years, large organisations will be led by AI-driven processes with support from human experience, rather than the other way around.

According to a McKinsey discussion paper from June 2017[2], early adopters of AI with a robust technology strategy have significantly higher profit margins. The research showed more 'traditional' sectors such as utilities and transportation lagging behind their more digitised peers; particularly in retail, financial services and healthcare.

Artificial intelligence in the UK can be traced to Professor Alan Turing's seminal paper Computing Machinery and Intelligence published in 1950 which concluded with his hope "that machines [would] eventually compete with men in all purely intellectual fields", perhaps beginning with "the playing of chess"[3].

The UK is perceived as a global authority in AI, yet there is no room for complacency. The House of Commons Science and Technology Committee's Report on Robotics and Artificial Intelligence (RAI)[4] in September 2016 acknowledged RAI as the 'fourth industrial revolution' that holds the potential to reshape fundamentally the way we live and work, and hence the immediate leadership and investment to create future growth in this sector. This call-for-action was underpinned by Innovate UK's £16m Industrial Strategy Challenge Fund (ISCF) on R&D competition for RAI in extreme and challenging environments in June 2017[5].

One of the other global frontrunners in the growth and commercialisation of AI is Canada, which is investing heavily in support networks for the technology to secure its position as a global leader in the field. It was the key objectives of the Global Expert Mission to explore the potential synergies and opportunities for future UK-Canada innovation collaboration to support the growth of businesses in both countries.

How AI could change our world – for the better

- Add an additional £630 billion to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5% to 3.9%.
- Five-fold increase in the number of AI jobs advertised in the UK, in the past three years.
- 77% improvement in productivity.
- 10% cut in UK energy consumption.
- Faster, more accurate diagnosis and personalised treatment of illness.
- Autonomous vehicle fleets enable mobility as a service.
- Affordable, customised financial planning.

[1] www.youtube.com/watch?v=5WRJYEA-mwY
[2] https://tinyurl.com/yapjawqd
[3] A M Turing, Computing Machinery and Intelligence, Mind, vol 49 (1950), pp 433–460.
[4] www.parliament.uk/business/committees/committees-a-z/commons-select/science-and-technology-committee/inquiries/parliament-2015/robotics-and-artificial-intelligence-inquiry-15-16/publications/
[5] https://apply-for-innovation-funding.service.gov.uk/competition/27/overview

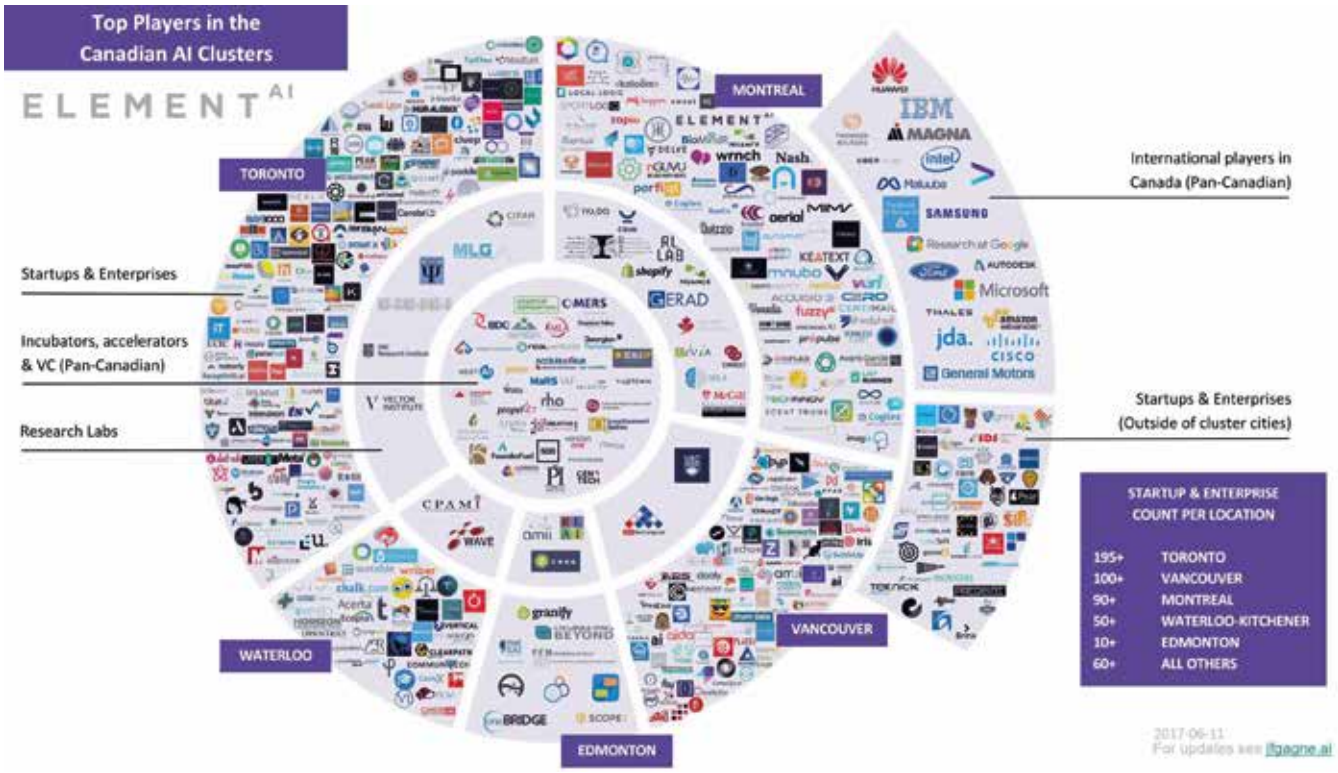
1. Artificial Intelligence in Canada

Some of the world's best AI researchers are located in Canadian universities. Several of these – such as Professor Yoshua Bengio of the University of Montreal – have helped to establish thriving SMEs such as Element AI, reinforcing Canada's position of strength and commercial capabilities in the field. Canada also has a favourable immigration programme for skilled workers and a supportive operating climate for ambitious AI start-ups.

The C$125 million (£73.5 million) Pan-Canadian Artificial Intelligence Strategy builds on a strong existing ecosystem that connects researchers in multiple Canadian cities, in particular, along the Toronto-Waterloo-Montréal corridor. The infrastructure that Canada has in place to support its strategy, from its burgeoning technology skills base to the ease of secure cross-border data transfer, makes it a highly attractive location for global technology companies to establish R&D centres, and there is growing interest in AI from both private and corporate investors. All the key pillar industries of the Canadian economy – healthcare, transport, manufacturing, banking and agriculture – offer an opportunity for growth in AI.

A number of Canadian Government departments and organisations are already engaged in AI-related activities. This includes supporting research and training in AI, leveraging AI to drive growth across Canada's industries as part of the government's economic development policy, and undertaking continuing policy foresight activities.

The breadth of the Canadian AI ecosystem is captured by the stakeholder map in Figure 1.



1.1 Policy Drivers and Stimuli

In March 2017, Prime Minister Justin Trudeau introduced the C$125 million Pan-Canadian Artificial Intelligence Strategy to promote collaboration between its main centres of expertise in Toronto–Waterloo, Montreal and Edmonton and to position Canada as a world-leading destination for AI investment. It has the following four core objectives:

1. To attract and retain outstanding AI researchers based at independent institutes in Canada's main AI centres – Edmonton, Montreal and Toronto.
2. To increase opportunities for graduate training in AI.
3. To develop national and international activities for AI research and training.
4. To create a programme that catalyses an inclusive, global conversation on the implications for AI in society.

The strategy is delivered through the Canadian Institute for Advanced Research (CIFAR)[6]. According to Brent Barron, CIFAR's Director of Public Policy, "It's about making sure that we (Canada) have the best researchers that are developing technologies, and also that they are training the people that can be the next AI pioneers and go into companies and understand and implement these technologies."

Like the UK, Canada is facing a number of significant obstacles to embedding AI in its SMEs and large traditional organisations, among them societal resistance based on negative media reports, a shortage of skilled talent, trust in data privacy and the availability of good quality or reliable data sets.

Large, high-quality datasets are difficult to access, particularly for SMEs which lack the resources to purchase or generate data which would be invaluable for growth and success – and many smaller companies, whilst aware of the need to collect data, have only been able to gather incomplete or impenetrable data sets. Furthermore, standardisation of data collection and exchange will be needed. The issues around data privacy and access are actively addressed by the Canadian central and provincial governments.

> " Governments are large repositories of data, and so people are trying to figure out what is the most responsible way to be able to unlock that data for citizens' benefit. (For example) Our healthcare systems are a key opportunity to be able to say, 'OK, well, what is the art of the possible?"
>
> Vasu Daggupaty, Team Lead for Digital Technology and Life Sciences, Ontario Investment Office

1.2 Canadian AI Landscape

Canada has developed excellent platforms around AI as a technology, with growing government and private investor support and prioritisation given to long-term value for the Canadian economy. The activities of the Canadian AI research base and start-up community discussed during the mission were perceived as being very much equivalent to the work of the research community in the UK.

Canadian AI capabilities are clustered around the three main cities of Toronto (including Waterloo), Montréal and Edmonton. The key organisations engaged during the AI Expert Mission are highlighted <overleaf>.

[6] www.cifar.ca

1.2.1 Research Base

Vector Institute for Artificial Intelligence
Launched as part of the Pan-Canadian Artificial Intelligence Strategy, the Vector Institute[7] works with academic institutions, industry, start-ups, incubators and accelerators to advance AI research and drive the application, adoption and commercialisation of AI technologies across Canada. As a not-for-profit organisation, the Vector Institute receives both government and private funding, with financial support from CIFAR to its operations and research mission totalling C$40 million (£23.5 million). The Government of Ontario is also investing C$50 million, with around C$90 million coming from the private sector so far.

Montréal Institute for Learning Algorithms (MILA)
Founded and led by Professor Yoshua Bengio, MILA[8] is a world-renowned research lab that has pioneered the field of AI, deep learning and neural networks for applications in vision, speech and language to various domains. They include neural language modelling, neural machine translation, object recognition, structured output generative modelling and neural speech recognition.

It is one of the three centres funded by the Pan-Canadian Artificial Intelligence Strategy. In September 2017, Facebook opened the Facebook Artificial Intelligence Research (FAIR) Centre at MILA as part of its US$7.5 million investment in the Montréal AI ecosystem. The lab also received donations of C$4.5 million and C$7 million from Google and Microsoft.

The Expert Mission learned how PhD students are using generative modelling in language translation, caption generation and video understanding based on AI and deep learning.

Institute for Data Valorisation (IVADO)
IVADO[9] in Montréal is a data science hub aiming to support the development of the new economy that is evolving around vast data processing to support decision-making and meet the data needs of both large corporations and start-ups. With a significant sum of funding (in excess of C$230 million) in a collaboration between industry and academia with an international flavour, IVADO is about developing the ecosystem, data-driven innovation and training the next generation of data scientists. It maps trends and metrics based on data research and facilitates research-industry partnerships.

Centre for Applied Genomics (TCAG), Hospital for Sick Children
At TCAG[10], part of the research arm of The Hospital for Sick Children[11] (also known as the SickKids Hospital) in Toronto, investigations are underway into characterising the genetic causes and origins of various diseases, with a focus on neurodevelopmental, neuropsychiatric, and neuromuscular disorders.

Working with large, high-quality whole-genome sequencing datasets, AI researchers are using artificial neural networks to more accurately identify genetic variants that may be associated with these disorders, with potentially ground-breaking effects for people living with conditions such as autism spectrum disorder, ADHD, schizophrenia, and cerebral palsy. Using powerful next-generation DNA sequencing machines, TCAG researchers are able to analyse complex data sets quickly and at a fraction of the cost, which one day will lead to expedited diagnosis, and treatment. TCAG is also an active entity behind the Personal Genome Project Canada (PGP-C)[12,13], which is building a comprehensive public data resource integrating participants' whole genome sequencing data with health information to advance scientific understanding of genetic and environmental contributions to human health and disease.

Centre for Intelligent Machines (CIM), University of McGill
At the Centre for Intelligent Machines (CIM)[14] at the University of McGill, researchers have a particular interest in robot-human interaction, again using computer vision for attention tracking, so that robots are better able to interact with people by understanding what they are paying attention to. One example of the benefits of this is safer interaction in factory settings, such as automotive assembly workshops.

École de Technologie Supérieure (ETS)
At the École de Technologie Supérieure (ETS) in Montréal, researchers are focusing on the use of AI in furthering diagnostics, including the prediction of disease evolution based on organ abnormalities. An example includes using AI algorithms to look into body parts inaccessible to radiologists or doctors for improved detection and diagnosis.

HEC Montréal
HEC Montréal[15], the University of Montréal's business school, is home to the biggest user experience research laboratory in North America and is using neurophysiological data such as eye tracking to understand how people interact with computers and optimise user experience.

[7] https://vectorinstitute.ai
[8] https://mila.quebec
[9] https://ivado.ca/en
[10] www.tcag.ca
[11] www.sickkids.ca
[12] https://personalgenomes.ca
[13] www.sickkids.ca/AboutSickKids/Newsroom/Past-News/2018/personal-genome-project-whole-genome-sequencing-transform-Canadians-manage-health-care.html
[14] www.cim.mcgill.ca
[15] www.hec.ca/en

1.2.2 Business Knowledge Centres

Element AI

One of Canada's most successful new AI businesses is Element AI[16], which in just over a year, has managed to raise C$102 million in a Series A round of financing from investors including Microsoft Ventures, Intel Capital, NVIDIA and Business Development Bank of Canada; a record for an AI company, giving it an estimated valuation in excess of US$400m. Co-founded by Yoshua Bengio, Element AI is a cross-cutting consultancy that matches commercial challenges to AI solutions – providing an attractive environment for machine learning experts to work on real challenges and problems, and at the same time, addressing the needs of old economy organisations which would have a hard time attracting AI talent. This approach helps to solve the issue of emerging talent having to choose between remaining in a university setting or being snapped up by technology giants such as Google.
Element AI's success is due partly to its efforts to support the uptake of AI outside of large technology companies, which to date have made the most of AI by funnelling it into consumer applications. It fills this gap and helps big corporations and government benefit from the rapid innovation that has been taking place in machine learning.

In addition to its 100+ in-house engineers, developers and UX designers, Element AI also runs and funds a successful University Faculty Fellowship programme to gain access to the talent and latest research in Canadian universities.

Autodesk Technology Centre

Based at the MaRs Discovery District[17] in Toronto, Autodesk[18] – best known for its AutoCAD design software – is pioneering the creative use of AI technology for the manufacturing and built environments by using generative design for products and architecture by identifying spatial need based on data. It is working on an AI-enabled system to remove repetition and automate the processing of cloud data, which has relevance to the manufacturing sector as well as construction, hence opening up the possibility of human-robot collaboration in the workplace.

The Autodesk Research team designed its own new office space using this methodology, with data guiding its design principles with simulation and visualisation. It has already had interest from corporate clients in replicating the process.

Imagia

The team at Montréal-based Imagia[19] are devising machine learning-based solutions to enable personalised medical care. It uses radiomics – quantitative data extracted from medical images – to recommend personalised patient care by predicting clinical outcomes and detecting disease-specific markers from imaging data. This can be scaled up for imbalanced and weakly scaled data, with deep radiomics providing test results weeks before they might be available in a lab using traditional biopsy methods.
Imagia's image-guided machines for gastroenterological surgeries is described by the company as having 90% diagnostic accuracy and significant pathology cost savings. It currently has a number of partnerships with NHS hospitals in England.

Ubisoft La Forge

Ubisoft La Forge[20] is Ubisoft's R&D and prototyping centre in Montréal where ideas on technology, originating from a collaboration between university research and production teams, are brought to life. Alongside a greater integration of machine learning with games, Ubisoft's expertise and game engines are being used as simulators to address real-life societal needs such as prosthetic engineering and patient rehabilitation.

1.2.3 Commercialisation and Incubation

Mission delegates were impressed with the business-led approach of the accelerator programmes visited in Toronto, especially on the end-to-end nature of the programmes. i.e. outputs from research, through applied industrial research and right up to commercialisation. They are very good at aligning the investment and accelerator/incubators with the applied R&D activities.

> "These (mentors) are very prominent people that have built things, scaled them, and sold them. So (the start-ups') first interaction is with a top-tier person."
>
> Kristjan Sigurdson, Associate Director and AI Lead, CDL

[16] www.elementai.com
[17] www.marsdd.com
[18] www.autodesk.com/toronto
[19] www.imagia.com
[20] https://montreal.ubisoft.com/en/ubisoft-la-forge

> " It (incubation) shouldn't just become an academic exercise of creating more stuff. We want trophies every single time."
>
> Helen Kontozopolous, Director, DCSIL, University of Toronto

Creative Destruction Lab (CDL)

The CDL[21] programme started at the University of Toronto's Rotman School of Business in 2012 and has since expanded to business schools in Vancouver, Calgary and Montréal as well as at New York University. The seed-stage programme uses an objectives-based mentoring process with the goal of maximising equity value creation. Its AI stream was launched in 2015 as the first programme in the world to focus exclusively on scalable AI, machine learning and quantum machine learning start-ups.

Alongside practical business support from MBA students and law faculties in the development of financial models and the evaluation of potential markets, CDL matches its start-ups with high-profile mentors, many of whom are successful technology entrepreneurs and leading investors who provide significant financial support to CDL as well as commit time to mentor and investment into the start-ups.

There are nearly 100 companies in CDL's 2017/18 cohort, including four from the UK. Whilst some 60% of CDL's start-ups will be cut from its accelerator programme (i.e. if none of the mentors are willing to support the start-ups over the next period), the potential for success for those that survive, however, is very significant: the equity value created since CDL was founded in 2012 is now over C$950m.

Department of Computer Sciences Innovation Lab (DCSIL), University of Toronto

DCSIL[22] is an accelerator at the University of Toronto. It annually pre-qualifies and admits only 10-15 early-stage start-ups whose technologies offer solutions to an actual industry-defined/scope challenge.

To achieve this, the DCSIL team arranges strategic meetings between start-ups and potential corporate partners in its assessment phase. There are no free pilots in the programme, either – corporate partners who work with the start-ups have to invest at least C$50,000 in the partnership.

One of its recent successes is the fintech app Stack, a mobile-based financial services provider which has just signed a Canada-wide partnership deal with Mastercard.

Whilst researchers and start-ups must allocate an equity stake to the university under the University of Toronto's IP policy, that rate – carefully negotiated by DSCIL with the support of the university's lawyers – is just a few percentage points and often zero. This represents what one mission delegate described as "a very enlightened means of fostering spin-outs."

1.3 Funding and Investment

The Canadian AI landscape incorporates a number of operating models that effectively bridge the gap between research and industry.

The Canadian public funding offer is complex, comprising multiple bodies with sometimes overlapping interests. For instance, the Ontario government has innovative collaborative programmes with the provinces of Alberta and Quebec. Funding is available at both a federal and provincial level, with regional priorities determined by each province's population, economic strengths, geographic and climatic influences, and political landscape.

Canada's leading academics are noticeably more actively involved in, or at least advising, one or more start-up or commercial companies. Key figures such as Geoffrey Hinton, Raquel Urtasun and Joelle Pineau divide their time between teaching and tech corporations like Google Brain, Uber and Facebook's new AI lab. Initiatives such as CIFAR Fellow and Element AI University Faculty Fellowship are effective stepping stones for academic researchers.

Natural Sciences and Engineering Research Council of Canada (NSERC)

The Natural Sciences and Engineering Research Council[23] provides R&D grant support to all technology disciplines across Canada. With an annual budget of more than C$1 billion, it is the equivalent of the Research Council UK (RCUK, now absorbed into UK Research & Innovation). Through its Research Partnerships Programme that offers competitive grants on Collaborative R&D, Strategic Project, etc., NSERC fosters academic-business collaboration to meet the objectives of the Government of Canada's Science and Technology Strategy[24]. As well as co-investing with other federal (e.g. Mitacs) and provincial (e.g. OCE) agencies, it is also active in running bilateral collaborative R&D programmes with countries including Israel, South Africa, Germany and China.

[21] www.creativedestructionlab.com
[22] www.dcsil.ca
[23] http://nserc-crsng.gc.ca
[24] www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07419.html

National Research Council of Canada (NRC) Industrial Research Assistance Programme (IRAP)

Within the NRC[25] , IRAP[26] provides support to innovative and creative SMEs, through programmes such as Eureka and the Canadian International Innovation Program. Part of its role is in helping firms grow through international collaboration. They fund collaborative R&D between Canadian SMEs and their international partners, work with Global Affairs Canada and the Trade Commissioners Services to locate new partners and develop shared projects.

Canadian Institute for Advanced Research (CIFAR)

Leading the delivery of the C$125 million Pan-Canadian Artificial Intelligence Strategy, CIFAR plays a significant role in supporting the fundamental breakthroughs in AI research in Canada. In addition to funding the three newly-established AI institutes – the Alberta Machine Intelligence Institute (AMII)[27] in Edmonton, the Vector Institute in Toronto and MILA in Montreal, CIFAR also runs the following programmes:

- Learning in Machines & Brains Program, a world-renowned initiative that pioneered Deep Learning by bringing together leading computer scientists, biologists, neuroscientists, psychologists and others to create collaborations that have propelled artificial intelligence research forward in the last ten years. Co-directed by Professor Yoshua Bengio, CIFAR Fellows and Advisors work on AI and Deep Learning at top technology companies (e.g. Google, Facebook, Baidu and OpenAI) and key research institutes (e.g. Stanford University, Alan Turing Institute[28] , McGill University, MIT and Inria[29]).

- Canada CIFAR Chairs in AI Program, to fund academic chairs at one of the three AI Institutes to support the recruitment and training of young researchers, including both graduate students and postdoctoral fellows.

- AI & Society Program, which funds policy-relevant working groups to examine the economic implications from AI, to inform the public and policy-makers.

- National AI Program, a programme of national activities building on CIFAR's summer and winter schools in AI, and support activities that are national and collaborative in scope such as an annual meeting of Canada CIFAR Chairs in AI, and aims to ensure that Canada is well-positioned for sustained global leadership in AI research and innovation.

Mitacs

Mitacs[30] is a national organisation that provides skills development and industry experience for graduates through internships, studentships and secondments. They are funded by central and regional government. The Mitacs model has similarities with Innovate UK's Knowledge Transfer Partnership (KTP)[31] scheme, but appears to provides a four-month unit of student engagement that can be multiplied according to project needs. Interns may stay with a company for several years, and larger projects can involve as many as 150 internships. Costs are shared 50-50 between Mitacs and the sponsoring company. Academic supervisors must be involved to support the project, and each intern is mentored within the company. Mitacs is open for international collaboration, allowing exchanges between Canadian universities and overseas companies, overseas universities and Canadian companies, or between university research groups.

Business Development Bank of Canada (BDC)

Established in 1944 as a financially sustainable Crown corporation operating at arm's length from its sole shareholder of the Government of Canada, BDC[32] complements the role of private-sector investment in growing Canadian businesses through financing, advisory services and capital, with a focus on SMEs. By offering venture capital, growth and transition capital and growth equity, BDC has helped to support the AI ecosystem including an investment in Element AI.

Provincial Governments

Provincial governments often make large investments in local research and are important potential partners for the UK. For example, the Ontario Centres of Excellence (OCE)[33], as the delivery arm of the province's innovation programmes, has established regional innovation centres and manages programmes in industry-academic R&D collaboration, commercialisation, entrepreneurship, and strategic initiatives, such as the Cybersecurity Fintech Innovation Pilot Programme, which leverages Toronto's strengths as a fintech powerhouse to support the scale-up of SMEs in the sector.

Private Investment

Private investment in AI technology research in Canada is substantial and growing. For instance, CIFAR is also strongly backed by multiple corporate and private donors, while the Royal Bank of Canada has established a new AI lab. Global conglomerates have also invested actively in the Canadian AI innovation ecosystem, including Apple, Google, Thales, Microsoft, Intel, IBM, Huawei, Samsung, Ford, General Motor, Cisco, Uber and Autodesk.

[25] www.nrc-cnrc.gc.ca/eng
[26] www.nrc-cnrc.gc.ca/eng/irap
[27] www.amii.ca
[28] www.turing.ac.uk
[29] www.inria.fr/en
[30] www.mitacs.ca/en
[31] https://ktn-uk.co.uk/
[32] www.bdc.ca
[33] www.oce-ontario.org

2. Working with Canada

> " From mutual values to a shared sovereign, few countries have as much in common as Canada and the UK. Prime Minister May and I met today to deepen our historic partnership on a number of issues, and to ensure the continued prosperity of people and businesses on both sides of the Atlantic."
>
> The Rt. Hon. Justin Trudeau, Prime Minister of Canada, September 2017

2.1 Synergy in UK-Canada Partnership

Even before the signing of Memoranda of Understanding (MoU) on innovation between Canada and the UK in September 2017[34] (with a similar MOU between the UK and the Province of Ontario in late September 2017), there were clear synergies between the countries in their commitment to innovation funding – through Canada's C$1.26 billion Strategic Innovation Fund, created in March 2017 and in the UK, through the £1 billion Industrial Strategy Challenge Fund (ISCF); also announced in the Spring of 2017.

Both funding programmes are prioritising investment in high-growth sectors such as high-value manufacturing, aerospace, clean energy and robotics and artificial intelligence.

Historically, Canada and the UK have had strong working relationships. This was demonstrated by the open and encouraging discussions about partnership opportunities throughout the Expert Mission. Some early examples linked to existing and forthcoming programmes with valuable collaborative potential were swiftly identified. Delegations from both countries were keen to emphasise the value of combining the relative strengths of Canada and the UK in AI in order to compete at a global scale with countries such as China and the US.

> " There is an opportunity for countries like the UK and Canada to collaborate and change the world balance [in AI and machine learning] away from just the US and China."
>
> Professor Yoshua Bengio, Founder of MILA

"Both countries punch well above their weight in artificial intelligence and machine learning," said Frank Wood, Associate Professor at the University of Oxford and Alan Turing Institute Fellow, "Canada is the locus, focus and one of the major points of origin of the deep learning revolution, and the UK is the locus, focus, and origin of the school of thought surrounding Bayesian and probabilistic methods and machine learning, and there is very likely to be a confluence of the two in the near future as the next wave of fundamental and applied advances in machine learning."

From facilitating access to data to fostering public understanding of the value of AI technology, Canada and the UK also face a number of shared challenges that could easily be examined in a bilateral capacity. An example of this is analysing the socioeconomic impacts of AI, with an initial investigation into this subject already undertaken by the Engineering and Physical Sciences Research Council (EPSRC)[35] and the Royal Society[36] in the UK and a commitment to comprehensive exploration as part of the Pan-Canadian Artificial Intelligence Strategy.

2.2 Factors Supporting a Successful Collaboration

Because of its position as a global player in AI and its investment in a comprehensive strategy to further that position, Canada is actively engaging in discussions with a range of possible partners, including China, Israel, Taiwan and Germany. While the UK is viewed as a welcome collaborator with strong AI expertise and track record, there is a need to be agile and act with some expediency in order not to miss out on building timely bilateral partnership opportunities.

There was a strong bilateral interest during the Expert Mission to further understand the level of alignment and synergy in the AI sector. Among the suggestions made were joint projects in mapping the AI value chain and funding exchange visits between Canada and the UK for leading researchers and innovators from each country, but mindful of the risks of a 'brain drain' away from the UK.

[34] https://pm.gc.ca/eng/news/2017/09/18/prime-minister-canada-announces-closer-collaboration-united-kingdom
[35] https://epsrc.ukri.org
[36] https://royalsociety.org

There are a number of existing innovation programmes in Canada that may offer an immediate opportunity to the UK. For example, the OCE's GlobalStart Voucher[37] programme, which helps start-ups emerging from campus-based accelerator programmes to access international markets. With further funding deferred until after the Ontario provincial election in the spring of 2018, it is a timely window of opportunity to explore future cooperation UK-Ontario programmes.

With a significant global shortage of AI talent, the UK and Canada collectively have some of the best universities and research centres to produce graduate and postgraduate researcher and engineers to meet the needs of both national and global growths.

With a synergistic mutual interest in AI innovation and potential economic and social impacts, which is underpinned by a strong political, historical and cultural alignment, any potential challenges to joint working between the UK and Canada are far less than any the UK may face in partnerships with other countries.

Equally important, there is strong and unambiguous ambition and desire for the Canadian AI stakeholders to collaborate with the UK in terms of research, skills training and commercialisation of technologies. Canada has a strong strategy and a will to focus on AI. There are only three options here for the UK – to collaborate, to compete, or to do nothing. The last two are not viable. The UK will be pushing on an open door in AI collaboration with Canada with a significant potential to benefit both economies. We should collaborate quickly.

[37] www.oce-ontario.org/programs/entrepreneurship-programs/globalstart-voucher-program/how-it-works

Conclusion

There is a great deal of complementarity between the UK and Canada – with each country delivering similar outputs regarding AI research. Expert Mission delegates thought Canada had a particularly strong strategy of successfully integrating its research base at its universities with applied industrial research and ultimately through to accelerator programmes. This has created a range of commercial outcomes and a positive feedback loop between the industry and academia.

Expert Mission participants felt that the Canadian approach was well thought out and executed – and already beginning to show positive outcomes. Working with Canada on joint projects in AI would have significant advantages, allowing both countries to pool expertise and compete in the global market alongside larger players such as China and the United States. The bilateral innovation MoU signed between the UK and Canada during Prime Minister May's visit in September 2017 offers a concrete platform to build future collaborative programmes and offers a natural starting point for such activities.

Annex 1
List of UK Participants

Cambridge Applied Research[38]
Alchera Technologies[39]
Assentian Partners[40]
Digital Catapult Centre
Gyana AI[41]
Innovate UK
Knowledge Transfer Network (KTN)
Privitar[42]
TravelAI[43]
UK Science and Innovation Network (SIN) Canada[44]

[38] www.cambridgeapplied.co.uk
[39] www.alcheratechnologies.com
[40] www.assentian.com
[41] www.gyana.co.uk
[42] www.privitar.com
[43] www.travelai.info
[44] www.gov.uk/world/organisations/uk-science-innovation-network-in-canada

Canada Participants

Alberta Machine Intelligence Institute (AMII)[45]

Autodesk Technology Centre

Canadian Institute for Advanced Research (CIFAR)

Center for Interuniversity Research and Analysis of Organizations (CIRANO)[46]

Creative Destruction Lab (CDL)

Department is Foreign Affairs, Trade and Development Canada (DFAIT)[47]

École de Technologie Supérieure (ETS), Laboratory of Imaging, Vision and Artificial Intelligence (LIVIA)[48]

Element AI

Fasken Martineau[49]

Fonds de recherche du Québec-Santé (FRQS)[50]

Genome Québec[51]

HEC Montréal Tech3Lab[52]

Imagia

Institute for Data Valorisation (IVADO)

Investment Québec[53]

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