Artificial Intelligence Policy and Funding in Canada:

Public Investments, Private Interests

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Errata

CIFAR sought clarifications of their position regarding civil society organizations and funding. A previous version of this report stated “[CIFAR] does not support civil society organizations”. CIFAR asserts that they do, for example with “three open calls for proposals two for the AI & Society Workshops Program and one for Solution Networks. Both calls were open to applications from civil society organizations around the world.” (p.20) “Even though CIFAR made a commitment to civil society engagement” has now been removed.

A previous version of this report stated “CIFAR is an important player because it clusters investment and brokers large scale academic-corporate partnerships. One such partnership is with Google and Facebook.” This has been replaced with “endorses public, private and academic partnerships". Figure 4 has been amended to reflect that CIFAR does not receive funding from Google and CIFAR does not contribute funding to the Government of Québec (p.34). A previous version of this report stated “...Yoshua Bengio, Geoffrey Hinton, and Richard Sutton were selected very quickly to manage the funds for Mila, Vector, and Amii”. This was further clarified to “...were selected very quickly to be the scientific directors of their respective AI institutes, Mila, Vector, and Amii” (p.20). A previous version of this report stated “In 2017, with the announcement of the $950 million CIFAR budget.” This is corrected to the “$950 million Innovation Superclusters Initiative budget” (p.31).

A previous version of this report stated in Appendix 2, Items 1 and 2, “CIFAR - Supercluster” but it is “Government of Canada (CIHR, SSHRC and NSERC) - Canada First Research Excellence Fund”; “From the $950-million CIFAR budget” is replaced with “From the $900 million Canada First Research Excellence Fund...Source”; Item 3, “Quebec Government” is replaced with “Mila” (p.54).

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Executive Summary

Artificial intelligence (AI) technologies are becoming more prominent in our everyday lives, bringing with them long lasting political and socio-economic implications. The development and use of AI is supported both privately and publicly. Governments support AI because it promises economic growth, military advantage, and streamlining labour functions through automation. The Canadian government is investing heavily in AI, with billions of dollars in funding committed. As of August 2020, $1 billion in government contributions have been awarded across Canada. An additional $1.2 billion of planned government investments have been publicly announced for the province of Quebec. In Montreal, over $2 billion in private investments have been reported.

Power lies in funding and investment networks, yet public access to these networks is notoriously difficult. This exploratory research begins to examine public investment flows in AI. Access to financial flows is a gateway to understanding decisions made behind closed doors. Billions of taxpayers' money goes into AI. *How is the Canadian government building the innovation economy under AI?* To answer this question, public documents and datasets were analyzed, complemented by semi-structured research interviews, and participation at public events and meetings. From March to June 2020, the author conducted 53 research interviews with experts based in Canada. Interviewees included government officials, industry researchers and analysts, legal practitioners, non-profit practitioners, human rights advocates, and academics working in, or adjacent to the AI landscape. The report seeks to inform policymakers, researchers and civil society representatives.

The report examines the AI ecosystem in Canada; AI policy and funding; and AI in Quebec and Montreal. Because so much of AI resides in the private realm, it is worth questioning how the innovation economy is influenced by private interests and private power — and by extension, how AI public policy gets written. The research reveals the following findings:

1. **Public investments in AI technologies primarily benefit the private sector,** where government funding for AI goes mainly to industry and academia adjacent to industry.

2. **Even though Canada has federal AI policy, there is no national government AI strategy** for departments and agencies across federal, provincial or municipal levels.

3. **Companies linked to human rights abuses can pre-qualify as government AI suppliers**, and commit to Canada's Algorithmic Impact Assessment.

4. **Concentrations of power provide advantages to a handful of entities** with financial resources, data, and technologies across a few universities and affiliated research nonprofits, startups, and international (big) tech companies.

The report concludes with a call to build collective (policy) recommendations for public accountability of both government and companies when building, procuring and using AI technologies — and to imagine what an innovation economy for the people can look like.

Datasets that support analysis and findings include a 'living' list of AI entities that operate in Canada, open for feedback and collaboration; Government of Canada's AI grants and contributions; AI contracts; the pre-qualified AI suppliers list; and all contracts of vendors found in the pre-qualified AI suppliers list.

Résumé

Les technologies de l'intelligence artificielle (IA) prennent une importance grandissante dans notre quotidien, entraînant des conséquences politiques et socioéconomiques à long terme. Le développement et l'utilisation de l'IA bénéficie d'appuis à la fois publics et privés. Les gouvernements soutiennent l'IA parce qu'elle promet une croissance économique, un avantage militaire et la rationalisation des fonctions de travail grâce à l'automatisation. Le gouvernement du Canada investit massivement dans l'IA, avec des engagements de financement de l'ordre de milliards de dollars. Depuis le mois d'août 2020, un total de 1 milliard $ en contributions gouvernementales a été accordé à travers le Canada. Des investissements gouvernementaux supplémentaires de 1,2 milliard $ ont été annoncés publiquement dans la province de Québec. À Montréal, on rapporte plus de 2 milliards $ d'investissements privés.

Le pouvoir réside dans les réseaux de financement et d'investissement; pourtant, l'accès public à ces réseaux est notoirement difficile. La présente recherche exploratoire entame un examen des flux d'investissement public dans l'IA. L'accès aux flux financiers constitue une porte d'entrée pour mieux comprendre les décisions prises à huis clos. Des milliards de dollars des contribuables vont à l'IA. *Comment le gouvernement canadien construit-il l'économie de l'innovation dans le cadre de l'IA?* Pour répondre à cette question, des documents et jeux de données publics ont été analysés, puis complétés par des entretiens de recherche semi-dirigés et la participation à des réunions et des événements publics. Entre mars et juin 2020, l'auteure a mené 53 entretiens de recherche avec des expert·e·s basé·e·s au Canada. Les personnes interviewées incluent des représentant·e·s du gouvernement, des chercheur·euse·s et analystes de l'industrie, des juristes, des praticien·ne·s du secteur à but non lucratif, des défenseur·euse·s des droits de la personne et des universitaires travaillant dans le domaine de l'IA ou dans des secteurs connexes. Le rapport vise à informer les décideur·euse·s politiques, les chercheur·euse·s et les représentant·e·s de la société civile.

Le rapport examine : l'écosystème de l'IA au Canada; les politiques et le financement de l'IA; et l'IA au Québec et à Montréal. Puisqu'une grande partie de l'IA relève du secteur privé, il convient de se demander de quelle façon l'économie de l'innovation – et, par extension, l'élaboration des politiques publiques en matière d'IA – est influencée par des intérêts et des pouvoirs privés. La recherche révèle les résultats suivants :

1. **Les investissements publics dans les technologies de l'IA profitent avant tout au secteur privé**, où le financement gouvernemental de l'IA va principalement à l'industrie et au milieu universitaire adjacent à celle-ci.

2. **Même si le Canada possède une politique fédérale en matière d'IA**, il n'y a pas de stratégie gouvernementale dans ce domaine pour les agences et départements gouvernementaux à l'ordre fédéral, provincial ou municipal.

3. **Des entreprises liées à des violations des droits de la personne peuvent se préqualifier en tant que fournisseurs gouvernementaux de l'IA**, et s'engager à effectuer l'Évaluation de l'incidence algorithmique du Gouvernement du Canada.

4. **La concentration du pouvoir procure des avantages à une poignée d'entités** avec des ressources financières, des données et des technologies réparties dans quelques universités et les organisations à but non lucratif, jeunes entreprises et (grandes) entreprises technologiques internationales qui leur sont associées.

Le rapport se termine par un appel pour qu'elle élabore des recommandations (de politiques) collectives visant à responsabiliser à la fois le gouvernement et les entreprises lors de la construction, de l'acquisition et de l'utilisation des technologies de l'IA, et d'imaginer à quoi peut ressembler une économie de l'innovation au bénéfice des citoyen·ne·s.

Les jeux de données sur lesquels s'appuient l'analyse et les résultats incluent une liste évolutive des entités de l'IA qui opèrent au Canada, laquelle est ouverte aux commentaires et à la collaboration ; les subventions et contributions ainsi que les contrats du Gouvernement du Canada en matière d'IA ; la liste de fournisseurs d'IA préqualifiés ; et tous les contrats des fournisseurs trouvés dans la précédente liste.

AI POLICY AND FUNDING IN CANADA: PUBLIC INVESTMENTS, PRIVATE INTERESTS

How is the Canadian government building the innovation economy under AI?

Artificial intelligence (AI) permeates all industries and is not a standalone sector.

AI is ubiquitous through the research, products and services it offers: machine learning, deep learning, data analytics, data science, and/or automated decision making.

Who are the 10 most funded AI entities by the Canadian government?

1. Scale AI: $229.8M
2. AbCellera Biologics Inc: $175.6M
3. Digital Technology Supercluster: $152.8M
4. CAE Inc: $150M
5. North Inc: $48M
6. University of Toronto: $33M
7. Université de Montréal: $28M
8. Element AI: $20M
9. MindBridge Analytics: $14.5M
10. University of British Columbia: $8M

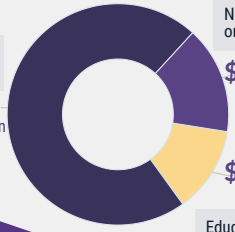
What is our AI ecosystem dataset?

A 'living' list of AI entities that operate in Canada, open for feedback and collaboration: tiny.cc/CanadaAIecosystem

Explore our AI funding datasets
1. AI grants & contributions
2. AI contracts
3. Contracts of vendors found in the pre-qualified AI suppliers list

$1 billion in contributions from the Government of Canada

includes $950 million for the AI Supercluster Initiative



Quebec, British Columbia and Ontario are the provinces awarded the most grants and contributions.

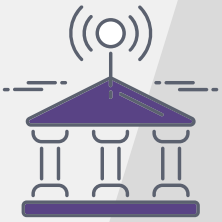
$16.5 billion amount AI promises to add to Canada's GDP, along with creating 16,000 jobs by 2030

$1.2 billion planned government investments have been publicly announced for the province of Quebec

THE MAKING OF PUBLIC POLICY

1. Public investments in AI technologies primarily benefit the private sector.

Government funding for AI goes mainly to industry and academia adjacent to industry.



AI policy resides under the Government of Canada Strategic Plan for Information Management and Information Technology 2017-2021 (TBS). Canada's Responsible use of AI in government includes:

- a set of guiding principles
- Directive on Automated Decision Making
- timeline for evolution of the Directive on ADM
- list of Government pre-qualified AI suppliers/vendors
- Algorithmic Impact Assessment (AIA)

2017 Announcement of the pan-Canadian AI (research) strategy

2018 G7 create 12 commitments in Charlevoix; Common Vision for the Future of AI

2019 Launch of the GPAI - Global Partnership on AI (ex-IPAI)

2. Even though Canada has a federal AI policy, there is no AI strategy for government departments and agencies at federal, provincial or municipal levels.

Who is involved?

Treasury Board of Canada Secretariat (TBS)
Creates and leads on AI policy in the federal government, provides leadership on digital government and open government.

Innovation, Science and Development Canada (ISED)
Coordinates the pan-Canadian AI strategy, the AI Supercluster Initiative and international partnerships.

Canadian Institute for Advanced Research (CIFAR)
Leads the pan-Canadian AI (research) strategy.

Public Services and Procurement Canada
Leads procurement across the government, including procurement of AI.

Global Affairs Canada (GAC)
Sets the international AI policy agenda.

Justice Canada
Reviews and provides legal opinions on law and AI.

Other departments and agencies involved include:

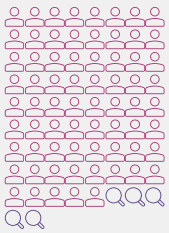
- Canada School of Public Service
- Canadian Digital Service
- Immigration, Refugees and Citizenship Canada
- National Defence
- National Research Council
- Shared Services Canada
- Statistics Canada
- Transport Canada

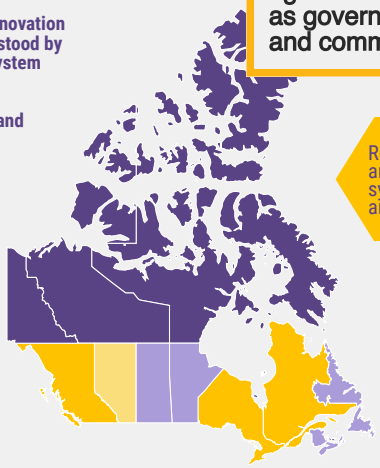
THE AI ECOSYSTEM

3. Companies linked to human rights abuses can pre-qualify as government AI suppliers, and commit to Canada's AIA.

The dynamics of the innovation economy can be understood by examining the AI ecosystem and its actors.

There are +710 public and private entities.
(AI ecosystem dataset, July 2020)





Responsible AI tools like the AIA are not fixing fundamental and systemic issues in government and corporate power structures.

66% of the Government of Canada's pre-qualified AI suppliers have headquarters in Canada.

4. Concentrations of power provide advantages to a handful of entities, with financial resources, data and technologies.

Who is in the AI ecosystem?

Private entities
- accelerators
- angel investors
- big consulting/audit firms
- big tech companies
- incubators
- institutional investors
- startups
- venture capital funds

Public entities
- academic labs & initiatives
- accelerators
- incubators
- nonprofits
- government institutions

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Introduction

The way artificial intelligence (AI) is designed, built, deployed and used is becoming increasingly prominent and more intertwined with existing and new technologies we use. It is difficult to identify what is truly AI, as the systems and companies that operate them are often opaque. Consequently, the technical capacity of AI products can be questioned because of their loose categorization anywhere from deep learning to data analytics. AI was also described more broadly and simply as a 'digital tool' by Prime Minister Trudeau in his 2019 Mandate Letter to the Minister of Innovation, Science and Industry, Minister Bains.[1] It is this loose categorization that enables both the hype and outlandish claims, but also exposes the weak spots of AI and leaves it open for questioning. AI is defined in this report as using machine learning and deep learning to create automated decision-making (ADM) systems.

The AI promise for governments stems from its potential for economic growth and technological innovation. Cities are being rebuilt to become AI Silicon Valleys.[2] Governments support AI because of its potential to improve the efficiency of service delivery through machine learning, predictive data analytics, and natural language processing.[3] Meanwhile, human bias and discrimination are replicated and amplified in new technologies we create.[4] AI technologies have caused and continue to cause harm and exacerbate structural bias in terms of race and gender.[5] Governments use AI to determine, in part, who gets a federal loan; who is allowed into the country; and who is released from prison.[6] There is concern over how AI is governed due to the way that its development is funded.

[1] Government of Canada. Prime Minister's Office. Minister of Innovation, Science, and Industry Mandate Letter. 2019.
[2] Roberge, Jonathan, Kevin Morin, and Marius Senneville. "Deep Learning's Governmentality." *AI Critique* | Volume (2019): 123.
[3] Government of Canada, Treasury Board of Canada Secretariat. Using Artificial Intelligence in government means balancing innovation with the ethical and responsible use of emerging technologies. October 2018.
[4] Benjamin, Ruha. *Race after technology: Abolitionist tools for the new jim code.* John Wiley & Sons, 2019.
[5] Buolamwini, Joy, and Timnit Gebru. "Gender shades: Intersectional accuracy disparities in commercial gender classification." In *Conference on fairness, accountability and transparency,* pp. 77-91. 2018.
[6] Angwin, Julia, Larson, Jeff, Mattu, Surya and Lauren Kirchner. Machine Bias: There's software used across the country to predict future criminals. And it's biased against blacks. *ProPublica.* May 2016.
Eubanks, Virginia. *Automating inequality: How high-tech tools profile, police, and punish the poor.* St. Martin's Press, 2018.

Governments invest in AI industry solutions to support global competition and the AI market. PricewaterhouseCoopers anticipates that by 2030 AI will contribute almost 16 trillion USD to the global economy, fueling the AI race.[7] The tech empires, the US, and China are leading the race to advance the development and deployment of AI with little to no regulation or public accountability. China plans to become the world leader in AI by 2030.[8] The US announced an investment of 1 billion USD in AI and Quantum Information Science research centres.[9] Singapore announced 150 million USD in the National AI Program and Singapore Data Science Consortium.[10] France announced 1.5 billion EUR in AI investments by 2022.[11] The UK kicked off AI research and strategy funding at 1.4 billion GBP.[12]

AI geopolitics matter. Canada is also positioning itself as a leader in AI. This is facilitated by economic development that strongly favours creating and building technological solutions like AI to support the innovation economy. Economic development also means seeding global talent and AI research, increasingly led by market (or private) regulation. According to the Prime Minister's Office, the large AI infrastructure investments known as the 'superclusters' promise to create 66,000 jobs and grow Canada's economy by $66 billion by 2030.[13] The federal government is investing heavily in AI. As of August 2020, $1 billion in contributions have been awarded across Canada (Tables 1 and 2). A total of $1.2 billion in public investments have also been committed for the province of Quebec (Appendix 2). In addition to public sector funding, over $2 billion has been announced in private investments for Montreal.[14] These commitments and announcements lack clarity, because they do not indicate exact budget allocations. The ambiguity in terms of financial details makes it difficult to track and to provide exact figures. Public announcements are also inconsistent when publishing expected deliverables, expected outcomes, recipients, and their alignment to existing programs.

This exploratory research examines: (1) AI ecosystem in Canada; (2) AI public policy and federal government funding; and (3) AI public investment flows across jurisdictions.

[7] Sizing the prize - PwC's Global Artificial Intelligence Study: Exploiting the AI Revolution. What's the real value of AI for your business and how can you capitalise? *PwC*. 2017.
[8] Kharpal, Arjun. China wants to be a $150 billion world leader in AI in less than 15 years. *CNBC.* July 2017.
[9] US Government. The Trump Administration Is Investing $1 Billion in Research Institutes to Advance Industries of the Future. August 2020.
[10] Bhunia, Priyankar. NRF Singapore to set up Data Science Consortium and launch national AI programme with S$150 million investment over 5 years. *OpenGovAsia*. October 2017.
[11] France to invest €1.5 billion in artificial intelligence by 2022. France 24. March 2018.
[12] Kahn, Jeremy and Alex Morales. U.K. Unveils $1.4 Billion Drive Into Artificial Intelligence. *Bloomberg.* April 2018.
[13] Government of Canada, Prime Minister's Office. Prime Minister announces investment in artificial intelligence to create over 16,000 jobs for Canadians. *Newswire.* December 2018.
[14] Montreal International. Montréal: Artificial intelligence serving the common good. n.d.

THE AI ECOSYSTEM IN CANADA

The AI ecosystem in Canada

The existing AI policy environment created niche access to funding scenarios for a specific set of actors. The dynamics of the innovation economy can be understood by getting to know the AI ecosystem and its actors in Canada. In 2019, according to Innovation, Science and Development Canada (ISED), the AI ecosystem included "more than 800 start-up companies, 60 public research labs, 75 incubators and accelerators, and 60 groups of investors'' clustered in Toronto, Montréal, Waterloo, Edmonton and Vancouver.[15] Additional details were not provided beyond these aggregate numbers. To fill this information gap, we created a public dataset of the AI ecosystem in Canada.[16] The number of entities was lower than what ISED estimated. As of July 2020, there were 710 (and counting) public and private entities that work with, research, fund and/or procure AI, that operate in Canada. Private entities include venture capital funds, angel investors, institutional investors, incubators, accelerators, startups, big tech companies, and major auditing firms. Public entities include academic labs and initiatives, incubators and accelerators, nonprofits, and government institutions (see the full methodology in Appendix 1 for more details).[17]

Having more open access to the AI ecosystem is important for public interest research so people can begin to get to know and understand its actors. This includes access to a variety of ways in which data can be presented both publicly and in open formats. However, most Canadian jurisdictions do not have open company data[18] beyond companies incorporated at the federal level, in the Maritime provinces, or in Quebec. It is important to note that Quebec data is available only from 2012 to 2016 in the OpenCorporates database. In March 2016, "the [Quebec] Registrar modified its website's terms of use to prohibit the compilation and dissemination of the Register data — effectively preventing contractually OpenCorporates from continuing to collect information from the Register."[19]

Even at the federal level, the government's public company register does not include publicly available data on shareholders or a freely available annual account. Another challenge is complicated company structures that exist to protect assets, minimize taxes, and diminish risk. Often these structures involve incorporating in multiple jurisdictions. For example, Corporation Canaccord Genuity is incorporated in Quebec,

[15] Government of Canada, ISED. Government of Canada and Government of Quebec announce the creation of an international centre of expertise in Montreal for the advancement of artificial intelligence. September 2019.
[16] Brandusescu, Ana, and Elissa, Kayal. [PUBLIC] AI ecosystem in Canada. *CIRM, McGill University.* July 2020.
[17] Note that in the AI ecosystem, civil society is an umbrella term that includes academia and nonprofit organizations that work with technology.
[18] The Open Company Data Index. n.d.
[19] Gratton, Éloïse. When is it legal to repurpose publicly available information for commercial purposes? *CanLII Connects*. October 2019.

the registered address is Vancouver, BC, and the governing legislation is Ontario.[20] If a company operates in Canada, but is headquartered abroad, chances are it will not be searchable in the database.

The AI ecosystem dataset in Canada shows the way that AI permeates all industries and is not a standalone sector. Its ubiquity is demonstrated by the research, products and services AI offers: machine learning, deep learning, data analytics, data science, and/or ADM, are a few examples. Many interviewees noted that AI branding matters in having a higher chance to receive funding.[21] The private sector greatly influences the AI ecosystem, the rhetoric and the discourse.

[20] OpenCorporates; Privacy policies on company websites are useful for finding the legal status of company names, aside from the URL or homepage name. Using http://opencorporates.com to search for companies has exponentially facilitated this process.
[21] A point also highlighted by Yuan Stevens in Move Fast and Break Things? Montreal's Role in the Global AI Industry. *Feminist and Accessible Publishing and Communications Technologies Speaker and Workshop Series, McGill University*. February 26, 2020.

AI PUBLIC POLICY AND FUNDING

AI public policy and funding

AI policy is built to support technological innovation that benefits long-term scientific advancements and the economy.[22] One of the priorities is human capital, "cultivating and attracting highly skilled AI talent."[23] This is evident given the large amount of corporations listed in the AI ecosystem dataset.

A lot of work on AI policy can be found at the federal level. The majority of AI policy is centralized within the Treasury Board of Canada Secretariat (TBS). Among its many roles, the TBS provides leadership to digital government, open government, open data and AI (the Directive on ADM, and the Algorithmic Impact Assessment). Public Services and Procurement Canada (PSPC) and ISED also play key roles. PSPC provides processes and technology that facilitate efficient, effective, and consistent procurement of AI across government departments and agencies. ISED coordinates non-governmental AI stakeholders, such as the AI Advisory Council, CIFAR Pan-Canadian AI Strategy, the Supercluster Initiative, and the AI Working Group for the Government of France and Government of Canada. In March 2017, the world's first strategy for AI led by the Canadian Institute for Advanced Research, better known as CIFAR, was announced with an investment of $125 million by the Government of Canada and ISED.[24] Worth highlighting is that this strategy is a pan-Canadian AI *research* strategy.[25] AI policy currently sits under Canada's strategy for information management and IT, with TBS. [26]

Other federal departments and agencies involved in AI policy include Justice Canada (reviews and provides legal opinions on AI and law), Statistics Canada, Canada Digital Services, Shared Services Canada, Canada School of Public Service, Employment and Social Development Canada, and National Research Council Canada.[27]

[22] Canadian Institute for Advanced Research. Canada funds $125 million Pan-Canadian Artificial Intelligence Strategy. March 2017.
[23] Oxford Insights. Government Artificial Intelligence Readiness Index 2019. This project was commissioned by Canada's International Development Research Centre (IDRC) as part of its AI for Development (AI4D) initiative.
[24] Government of Canada. Prime Minister's Office. Minister of Innovation, Science, and Industry Mandate Letter. December 2019.
[25] UNESCO. Canada first to adopt strategy for artificial intelligence. November 2018.
[26] Government of Canada Strategic Plan for Information Management and Information Technology 2017 to 2021: https://www.canada.ca/en/treasury-board-secretariat/services/information-technology/strategic-plan-2017-2021.html
[27] McGee, Natalie. Enabling the Responsible Use of Artificial Intelligence in the Government of Canada. *Government of Canada, TBS*. n.d.

The making of global policy

The international AI policy agenda was set by Global Affairs Canada (GAC) and ISED. GAC focused on promoting inclusion in AI "in a mandate letter to the Minister of Foreign Affairs, the GAC sought to understand critical perspectives on AI governance with a particular eye for bias toward race and gender, and with emphasis on labour and human rights."[28] This is seen through GAC's and International Development Research Centre (IDRC) sponsored programs, such as the Feminist AI Research Network.[29] GAC and CIFAR also partnered to organize an AI and human rights symposium, as part of CIFAR's AI & Society program.[30]

The Government of Canada is a part of and is currently leading Digital Nations, an international forum of leading digital governments.[31] The initiative includes a working group on AI to "support Members in the fulfilment of the Shared Approach for the Responsible Use of AI by Governments" that countries signed and adopted in November 2018.[32] The Shared Approach emphasizes transparency, accountability, and procedural fairness alongside openness (one of four goals): "Be as open as we can by sharing source code, training data, and other relevant information, all while protecting personal information, system integration, and national security and defence."[33]

ISED held two important international convenings to create global AI policy. The first was held in June 2018, in Charlevoix, Quebec, that followed a "multi-stakeholder, human-centric vision."[34] Here, the G7 gathered to create 12 commitments under the Charlevoix Common Vision for the Future of AI: "AI that fosters economic growth, societal trust, gender equality and inclusion depends on a predictable and stable policy environment that promotes innovation."[35] Subsequently, PM Trudeau and President Macron announced the Mandate for the IPAI[36] (now known as the Global Partnership on AI (GPAI))[37] to present Canada and France's vision of human-centric AI.

In December 2018, the second international convening was held by ISED. Here, the Quebec-headquartered company Element AI[38] hosted the G7 Multistakeholder

[28] McKelvey, Fenwick Robert and Maggie Macdonald. "Artificial Intelligence Policy Innovations at the Canadian Federal Government." *Canadian Journal of Communication*. 2019.
[29] <A+> Alliance and Gender at Work, supported by IDRC, launched a Feminist AI Research network. March 2020.
[30] CIFAR. AI & Society. n.d.
[31] Digital Nations. n.d.
[32] Digital Nations. Artificial Intelligence Working Group. n.d.
[33] Digital Nations. D9 approach for responsible use of AI by Governments. n.d.
[34] Outlined in the "2017 G7 ICT and Industry Ministers' Torino Declaration: Making the Next Production Revolution Inclusive, Open and Secure." September 2017.
[35] Government of Canada, International Relations. Charlevoix common vision for the future of artificial intelligence. June 2018; the Charlevoix commitments are based on the 2017 G7 ICT and Industry Ministers' Torino Declaration.
[36] Government of Canada, Prime Minister's Office. Mandate for the International Panel on Artificial Intelligence. December 2018.
[37] Global Partnership on Artificial Intelligence. n.d.
[38] As of November 2020, Element AI has been acquired by Silicon Valley company ServiceNow.

Conference on Artificial Intelligence[39] in Montreal, accompanied by industry representatives from DeepMind, Borealis AI (a subsidiary of Royal Bank of Canada), Siemens, Software AG; academia and nonprofit representatives from Access Now, Alan Turing Institute, CIFAR, MILA, University of Ottawa, Université de Montréal, University of British Columbia, Vector Institute, University of Tokyo, Center for Mathematical studies and their Applications (France), Instituto Italiano di technologica (Italy); and government representatives (including National Research Council of Canada). Note that the Charlevoix commitments are also recognized in the 2018 G7 Montreal Ministerial Statement on Artificial Intelligence created at this conference.

In May 2019, the Declaration[40] and organizational structure of the IPAI[41] was launched at the end of the informal meeting of G7 Digital ministers. The creation of the GPAI is a key element of the Canada-France Statement on Artificial Intelligence.[42] In addition, ISED announced the creation of the Advisory Council on Artificial Intelligence to "advise the Government of Canada on how best to build on Canada's AI strengths, identify opportunities to create economic growth that benefits all Canadians and ensure that AI advancements reflect Canadian values,"[43] which was co-chaired by representatives of the Royal Bank of Canada (RBC) and Mila.

The Pan-Canadian AI Strategy and public-private partnerships

The federal government appointed CIFAR to develop and lead the newly branded Pan-Canadian AI strategy in 2017.[44] Alongside government funding, the development of the AI [research] Strategy is supported financially by Facebook and the RBC Foundation. The three main AI clusters were established in Edmonton, Montreal, and Toronto, interconnected and led by the nonprofit AI research centres Amii, Mila, and Vector Institute. The AI Strategy is meant to support and enhance the number of AI researchers and skilled graduates, global thought leadership development and national research community: "The Canada CIFAR AI Chairs Program is the cornerstone program of the CIFAR Pan-Canadian AI Strategy. A total of $86.5 million over five years has been earmarked for this program to attract and retain world-leading AI researchers in Canada." Alongside Canada CIFAR AI Chairs, sit Facebook CIFAR AI chairs, the representatives of which have affiliations with Mila. The majority of the work on the AI strategy is done by and with academia and industry at the federal level. Interviews and meetings held with civil servants revealed that provincial governments and municipalities are new to AI policy.

[39] Government of Canada, ISED. G7 Multistakeholder Conference on Artificial Intelligence. December 2018.
[40] Government of Canada, ISED. Declaration of the International Panel on Artificial Intelligence. May 2019.
[41] Government of Canada, ISED. International Panel on Artificial Intelligence: Backgrounder. May 2019.
[42] Government of Canada, International Relations. Canada-France Statement on Artificial Intelligence. June 2018.
[43] Government of Canada, ISED. Government of Canada creates Advisory Council on Artificial Intelligence. May 2019.
[44] CIFAR. CIFAR Pan-Canadian Artificial Intelligence Strategy. n.d.

CIFAR is seen as a key player and major funder of AI work by the majority of interviewees. With a $41 million annual budget, CIFAR is composed of academics and business representatives that conduct cutting-edge research. Over the last three years, CIFAR has led three open calls for proposals two for the AI & Society Workshops Program and one for Solution Networks. Both calls were open to applications from civil society organizations around the world.[45] In the past, CIFAR has partnered with the Brookfield Institute for Innovation + Entrepreneurship in an effort to organize and host five labs (workshops) to explore ideas on AI Policy in Canada.[46] CIFAR is an important player because it clusters investment and endorses public, private and academic partnerships.[47] One such partnership is with RBC through the AI Catalyst Grants.[48] CIFAR's research and training programs are supported by small, unrestricted gifts from external organizations, including Facebook and RBC Foundation, distinct from the Pan-Canadian AI Strategy. In 2017, Facebook announced a $2.6 million 5-year investment for CIFAR's Learning in Machines & Brains program, and a Facebook-CIFAR Chair in AI at Mila.[49] In 2018, the RBC Foundation announced a $1 million 3-year donation for ethical AI at the launch of RBC's Borealis AI Montréal lab.[50]

Along with developing scientific excellence, CIFAR aims to also develop global thought leadership on socio-economic implications of AI. There is a concentration of research and activity via the three major AI research institutes in Montreal (Mila), Toronto (Vector Institute), and Edmonton (Alberta Machine Intelligence Institute - Amii). The institutes are "aggressively poaching top AI talent (so called Canada CIFAR AI Chairs), through a designated $66 million fund over the next five years. Up till June 2019, 46 researchers have been hired this way."[51] CIFAR's public-private funding mechanism is used to connect researchers and people. According to interviewee and serial entrepreneur Philippe Beaudoin, since its creation in 1981[52], CIFAR has been successful at funding research models and identifying famous professors that have a collaborative and entrepreneurial spirit. As such, Yoshua Bengio, Geoffrey Hinton, and Richard Sutton were selected very quickly to be scientific directors of their respective AI institutes, Mila, Vector, and Amii. Each one of the AI institutes is an incorporated not-for-profit with all funds and operations overseen by a governing board.

[45] CIFAR. About Us. n.d.
[46] Villeneuve, Sarah, Boskovic, Gaga, and Brent Barron. Rebooting Regulation: Exploring the Future of AI Policy in Canada. *Brookfield Institute.* May 2019.
[47] Mila. Google renews its commitment to Mila with close to $4M over three years. November, 2020.
[48] CIFAR. CIFAR AI Catalyst Grants. January 2020.
[49] CIFAR. Facebook announces major AI commitment to CIFAR. September 2017.
[50] CIFAR. RBC Foundation supports advancing ethical AI with $1 million commitment to CIFAR. October 2018.
[51] Kuziemski, Maciej, and Gianluca Misuraca. "AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings." *Telecommunications Policy* (2020): 101976.
[52] CIFAR was incorporated in 1981, but officially opened in 1982.

Responsible use of AI in government

At the federal level, the Government of Canada's Treasury Board of Canada Secretariat (TBS) has created the Responsible use of artificial intelligence (AI) in government landing page that includes the following:[53]

1. set of guiding principles;
2. Directive on ADM;
3. timeline for the evolution of the Directive on ADM;
4. list of Government of Canada's [pre-]qualified AI suppliers (vendors);
5. Algorithmic Impact Assessment (AIA);
6. Government of Canada's Strategic Plan for Information Management and Information Technology 2017 to 2021.

The [five] Guiding Principles are established for AI to be used effectively and ethically: government will develop and share tools and methods for measuring AI impact, prioritize transparency in its AI use and the benefit to the public, make sure there can be regress for AI by enforcing explainability in decision making, encourage openness in the tech it uses, but also prioritize data protection, and build capacity for training and skills needed to operationalize AI.

The Canadian government's AI Guiding Principles are aspirational, but they are not linked to a standalone government-wide strategy on AI. Instead, AI is a part of the Strategic Plan for Information Management and Information Technology 2017 to 2021.[54] The digital government strategy is supported by two major policies that guide how "right technologies" are implemented: the Directive on ADM[55] and the AIA,[56] both under the TBS, the main department that shapes how these technologies are governed. As of April 2020, compliance with the Directive is required and applies to any ADM system developed or procured after April 1, 2020. The Directive focuses on making sure that ADM systems "are deployed in a manner that reduces risks to Canadians and federal institutions, and leads to more efficient, accurate, consistent, and interpretable decisions made pursuant to Canadian law." On the transparency end, it focuses on availability of data and information on ADM systems that are used in federal institutions "where appropriate".[57] There is no Directive for how ADM systems should be used in the private sector.

[53] Government of Canada, TBS. Responsible use of AI. n.d.
[54] Government of Canada, TBS. Government of Canada Strategic Plan for Information Management and Information Technology 2017-2021. 2017.
[55] Government of Canada, TBS. Directive on Automated Decision-Making. 2019.
[56] Government of Canada, TBS. Algorithmic Impact Assessment. 2019.
[57] Ibid.

The AIA was created to determine the acceptability of AI solutions from an ethical and humane perspective. The AIA is made up of 60 questions for companies about their business process, their data and system design decisions targeted to those who design and build AI systems.[58] Interviewee Michael Karlin (Government of Canada) one of AIA's architects,[59] described its primary purpose as having a clear method on how the Directive would apply to different AI systems through a questionnaire that situated its questions in a tier that tracked AI systems' use. The secondary purpose of the AIA is to create a public facing dataset of what has been automated and why, to shine a light on ADM systems. "That level of transparency would scare departments to not cut corners," Karlin argued.

[58] A great explainer on the AIA by Mathieu Lemay. Understanding Canada's Algorithmic Impact Assessment Tool A must for doing business with the Federal Government. *Medium*. June 2019.
[59] The civil servants that designed the AIA and the ADM Directive have since moved on from TBS. During the interview, Michael Karlin was working for Canada's National Defence Department. Now he works for the Canadian Digital Service.

The list of pre-qualified AI suppliers for the Government of Canada

Two government agencies, Public Services and Procurement Canada and TBS, created a procurement process to find vendors to "who can provide the Government of Canada with responsible and effective AI services, solutions and products" across departments and agencies (Figure 1).

Figure 1. Government of Canada AI procurement strategy. Source: "Enabling the Responsible Use of Artificial Intelligence in the Government of Canada" by Natalie McGee (TBS - Government of Canada).[60]

In a step towards achieving this goal, the Request for Proposal (RFP) (tender notice) was published to support a streamlined procurement process for vendors that can provide AI solutions. The RFP is open until January 2025, available on the Public

[60] Also available in a presentation by Noel Corriveau for Bias & Discrimination in AI, an EdX MOOC course based on the IVADO School. 2020.

Works and Government Services Canada (i.e. public procurement) website.[61] The federal government public procurement website also includes the "List of Interested Suppliers for AI-IA Invitation to Qualify (ITQ) for Artificial Intelligence Source List."[62] The outcome resulted in the publication of the pre-qualified AI suppliers list in January 2019.[63] It is important to note that even though pre-qualification is important, a vendor is not guaranteed to be a main supplier, as this depends entirely on whether government departments use the list or not. Alex Benay, the former CIO of the Government of Canada considered the launch of the AI list (or the AI supplier framework) a "big day for automation of Government of Canada services and overall modernisation of our institutions."[64] The AI supplier framework/ process promised to facilitate the procurement of AI products and services for digital innovation in government by reducing "backlogs and processing times while offering unprecedented convenience and personalised service to citizens and businesses."[65]

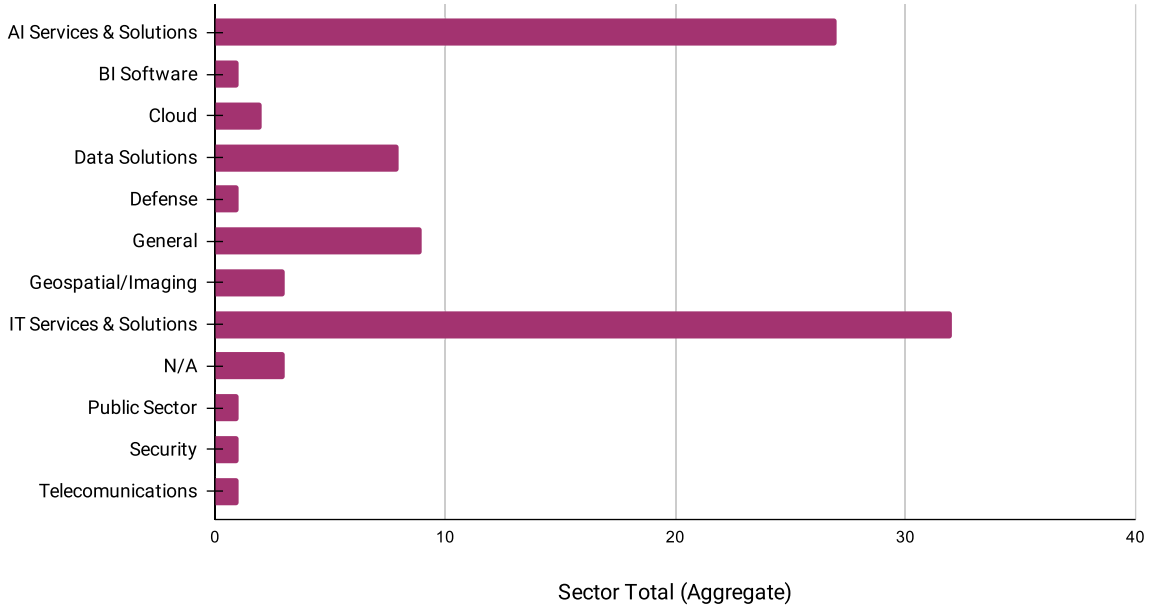


Figure 2. Pre-qualified AI suppliers and the sectors of products and services they provide.

The majority of these pre-qualified vendors build software or do consulting. In addition, the companies are categorized by sector based on what type of technology they build or create services on (Figure 3), rather than the domain it is intended for (i.e. IT sector instead of health sector).

[61] Government of Canada, Public Works and Government Services Canada. AI-IA Invitation to Qualify for Artificial Intelligence Source List (EN578-180001/A).
[62] Ibid, List of Interested Suppliers for AI-IA Invitation to Qualify for Artificial Intelligence Source List (EN578-180001/A). The ITQ is part of the first phase of the procurement process for companies to secure a spot on the pre-qualified suppliers list.
[63] Government of Canada, TBS. List of interested Artificial Intelligence (AI) suppliers.
An open dataset version was created to facilitate search.
[64] Leal, Natalie. 'Big day for automation' as Canada launches AI supplier framework. *Global Government Forum.* January 2019.
[65] Ibid.

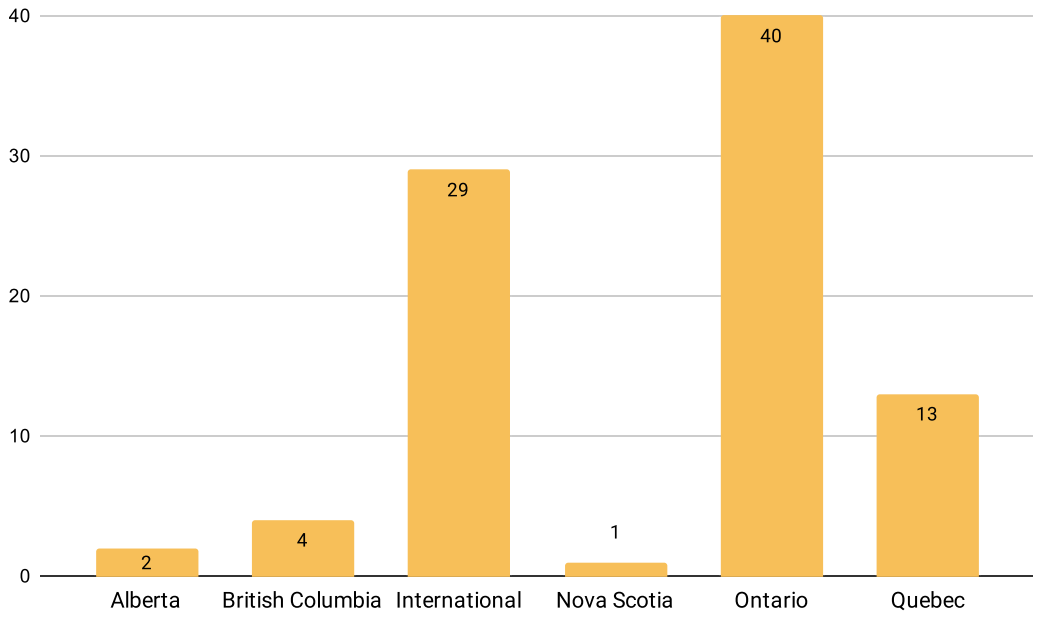


Figure 3. The total number of companies with headquarter (HQ) locations per Canadian province, as well as the total number of companies with HQs abroad.

Government of Canada funding streams for AI

This section examines two federal government funding streams for AI:

1. Grants and contributions:[66]
    a. Grants are awarded unconditionally based on certain funding criteria.
    b. Contributions are awarded to recipients based on an expectation of performance.
2. Contracts: awarded to entities that have to deliver a good or a service.

The main difference is that grants and contributions from the federal government generally fund industry-related research and development (R&D). In contrast, contracts are awarded to entities for delivery of goods or services.

To analyze federal government funding for AI and AI pre-qualified suppliers, three datasets have been created on the: (1) Government of Canada grants and contributions; (2) Government of Canada contracts; and (3) Government of Canada contracts awarded to AI pre-qualified suppliers.

[66] Government of Canada. Employment and Social Development Canada: "Grants are unconditional transfer payments that the Government provides to individuals or organizations for activities that meet eligibility criteria set by the funding program. Contributions are similar to grants, except that, in order to receive funding and be reimbursed for specific costs, recipients need to meet certain performance conditions. The government can also audit the recipients' use of funding."

Government of Canada grants and contributions

A dataset of federal government AI grants and contributions was also created by searching for the same AI-specific keywords.[67] The dataset includes a total of 1,307 federal government grants and contributions from September 2007 to June 2020. The total value awarded was $1.1 billion. The majority of this total was to support contributions: $1.02 billion.[68] $85 million was awarded to support grants. Overall, 72% of government grants and contributions go to for-profit organizations, 16% go to not-for-profit organizations and charities, and 13% go to academia (Table 1).

Table 1. Total value of Government of Canada grants and contributions by stakeholder group. Source: Grants and Contributions Open Data Portal.

Stakeholder group	Total value
For-profit organizations	794,920,040
Not-for-profit organizations and charities	173,890,056
Academia	139,125,173
Total	**$1,107,935,269**

[67] Government of Canada. Search Government Grants and Contributions.
[68] Only $84.8 million were found in government grants. Additionally, there was a small sum of $21,941 for 'other transfer payments' dedicated to youth wage subsidies.

The top three provinces that are awarded grants and contributions are Quebec, British Columbia, and Ontario (Table 2).

Table 2. Total value of Government of Canada grants and contributions by province and territory. Source: Grants and Contributions Open Data Portal.

Province/Territory	Total value
Quebec	472,169,783
British Columbia	361,833,461
Ontario	196,024,721
Alberta	35,904,026
Manitoba	19,038,842
New Brunswick	8,051,996
Nova Scotia	7,772,637
Saskatchewan	4,160,175
Newfoundland & Labrador	2,741,627
Other[69]	119,000
Prince Edward Island	119,000
Northwest Territories	0
Nunavut	0
Yukon	0
Total	**$1,107,935,269**

The government bodies that award the most grants and contributions are federal research agencies: the National Research Council of Canada (847), Natural Sciences and Engineering Research Council of Canada (300), and Canadian Institutes of Health Research (51). However, Innovation, Science and Economic Development Canada (ISED) is the government department that awards the highest value grants and contributions (Table 3).

[69] Note that the 'other' category includes government grants and contributions awarded to foreign/international entities.

Table 3. The top five Government of Canada AI contributions. Source: Grants and Contributions Open Data Portal. See Appendix 3 for more information on government contributions descriptions and timelines. Note that these are specific to AI and do not include IT work.

	Entity	Value	Project/Product description	Awarding department / agency
1	SCALE.AI [operates as Scale AI]	$229,765,127	"Based in Quebec, the AI-Powered Supply Chains Supercluster (Scale AI) will bring the retail, manufacturing, transportation, infrastructure, and information and communications technology sectors together to build intelligent supply chains through artificial intelligence and robotics. This supercluster will help Canadian small and medium-sized businesses scale up and help ensure Canada is a globally competitive export leader."	ISED
2	AbCellera Biologics Inc.	$175,631,000	"The project is in direct response to Canada's fight against COVID-19 and Canada's ability to respond to future pandemics. It will enable the rapid discovery of antibody therapies to treat and prevent COVID-19 and establish a Good Manufacturing Practice antibody production facility for Canada's long-term emergency preparedness."	ISED
3	Canada Association (Digital Technology Supercluster)	$152,843,759	"Based in British Columbia, the Digital Technology Supercluster will use bigger, better datasets and cutting-edge applications of augmented reality, cloud computing and machine learning to improve service delivery in the natural resources, precision health and manufacturing sectors. Employing digital technologies will save time and money and improve the health and lives of Canadians."	ISED
4	CAE Inc.	$150,000,000	"Project Digital Intelligence will enable CAE to transform its training platforms by leveraging the latest digital technologies including Artificial Intelligence, Cloud Computing, Big Data, and Augmented/Virtual Reality."	ISED
5	Université de Montréal	$28,068,600	"Data Serving Canadians: Deep Learning and Optimization for the Knowledge Revolution."	Canadian Institutes of Health Research

Government of Canada Contracts

The dataset of federal government AI contracts was created by searching for AI specific keywords: “artificial intelligence”, “AI”, “ADM”, “machine learning”, and “deep learning”.[70] The dataset includes 93 contracts with a total of $15 million from March 2006 to June 2020. From the dataset description, we cannot determine the province or territory that the contracts were awarded to.

The dataset of federal government contracts for AI pre-qualified suppliers was created to get a better idea of how much these vendors made from government contracts in general (Appendix 4). The analysis shows that 63 vendors have had prior or existing contracts with the government. From 2002 to present, the total value of the contracts is $26.5 billion. The top five vendors with the highest value contracts are IBM Canada, Calian, Microsoft Canada, Thales Canada, and CGI Information Systems and Management Consultants. These companies are not AI-first, but often use AI technologies in their products and services. Noteworthy is the Canadian government’s investment in IBM Canada: the company was awarded $12.3 billion over the last 18 years.[71]

The majority of pre-qualified AI suppliers build software or do consulting. In addition, the companies are categorized by sector based on the type of technology on which they build or create services, rather than the domain for which it is intended (i.e. IT sector instead of health sector). This categorization becomes a challenge when trying to identify AI-specific contracts based on AI-specific keywords.[72] This is because suppliers are more likely to appear in (procurement) contracts data rather than in grants and contributions data. The two types of data overlap only if a supplier gets R&D funding under a contribution agreement, and is separately awarded a procurement contract.

Fluid boundaries and definitions of what constitutes the AI market pose a challenge to tracking contracts and relationships between government and industry. This fluidity can be used to benefit certain stakeholders in specific contexts, such as being awarded government contracts and securing government funding. For example, Palantir Technologies Canada Inc. is a pre-qualified AI supplier that is not searchable under the federal government grants and contributions database, because it does not include federal government (procurement) contracts. Under the federal government contracts database, Palantir can only be searched by company name, because there

[70] Government of Canada, Open Data Portal. Proactive Disclosure - Contracts.
[71] IBM Canada Ltd. was awarded government contracts between September 2002 and June 2020.
[72] The search resulted in only 14 of the pre-qualified AI suppliers: AltaML Inc., Blue J Legal Inc., Chillwall AI, Contextere Corporation, DataPerformers Company Inc., Element AI Inc., Larus Technologies Group, Menya Solutions Inc., MindBridge Analytics Inc., Sightline Innovation Inc., Simon Fraser University, Solana Networks Inc., Solutions GeoLearn Inc., and Testfire Labs.

is no indication that it delivers AI-specific products or services. Others view it as a data mining company.[73] Palantir had a ~$1 million contract awarded by Canada's Department of National Defence that described the company as "information technology and telecommunications consultants."[74] Neither terms are specifically AI. Yet Palantir is grouped under the 'AI solutions-general' sector on the list of pre-qualified AI suppliers (Figure 2).[75]

[73] Fallon, Katy. UN warns of impact of smart borders on refugees: 'Data collection isn't apolitical'. *The Guardian*. November 2020.
[74] Government of Canada, TBS. Contract Details: Palantir Technologies Canada Inc.; Palantir Technologies Canada Inc. award from the Department of National Defense. Note that buyandsell.gc.ca is not comprehensive of all federal procurement.
[75] Government of Canada, TBS. List of interested Artificial Intelligence (AI) suppliers.

Case study: AI in Quebec and Montreal

The governmental and geopolitical influence is ever present in the need to position Montreal and Quebec in the global information economy. To this extent AI has become a key facet of Quebec's economic strategy, and have invested heavily in it.

Quebec's AI development strategy

Quebec and Montreal play an important role in Canada's AI investments and the connections between government, academia and industry. In the early 2000s, Canada weathered the 'AI winter'[76] with research subsidized by the Quebec Government.[77] In 2018, with the announcement of the $950 million Innovation Superclusters Initiative budget to pursue AI-related research, private and public investment in Montreal skyrocketed with $2 billion of investments by industry and $1 billion financing for university research.[78] Continued funding support for public and private entities was seen with the 2018 Quebec Government AI Strategy (Appendix 2).[79] One important nonprofit that has received continuous support, including its role in "positioning and empowerment" of Quebec with AI is Mila, legally re-named the Quebec Artificial Intelligence Institute (from *Montreal Institute for Learning Algorithms)*. Mila's mission covers a lot of ground: university research, training, technology transfer and social dialogue to support Quebec's AI development strategy.

Quebec's AI Strategy also states the need to invest in producing AI and data scientists, with specific support for IVADO (*Institut de valorisation des données*) and Scale AI. In short, Quebec's AI Strategy's goals are five-fold: to (1) maintain Quebec's academic leadership; (2) develop talent; (3) support technology transfer and marketing; (4) develop a centre of expertise in responsible AI; and (5) develop robust support structures. The Strategy notes the distinction between an ecosystem and a cluster in relation to Canada's AI landscape. It prefers the term 'ecosystem.' A cluster can be more focused in scope and reach, whereas an ecosystem permeates many industries and is found across many sectors. From government services to banking and finance, health, retail and manufacturing. In particular, the Montreal ecosystem includes 5,000 entities of various sorts in the ICT space that provides a pool of 91,000 workers. To balance industry resources is upcoming talent from academia. There are

[76] The term AI winter refers to a time frame of reduced funding and interest in AI research.
[77] Stevens, Yuan. Move Fast and Break Things? Montreal's Role in the Global AI Industry. Feminist and Accessible Publishing/ Communications Technologies Series, McGill University. February 26, 2020.
[78] Montreal International. Montréal: Artificial intelligence serving the common good. n.d.
Government of Canada, ISED. Innovation Superclusters Initiative. n.d.; Montreal International. Montréal: Artificial intelligence serving the common good. n.d.
[79] The Strategy for the Development of Quebec's Artificial Intelligence Ecosystem is advised by the Artificial Intelligence Cluster Steering Committee.

9,000 students enrolled in university programs specializing in AI and data processing. In line with the 2018 Quebec AI Strategy, Quebec will receive $5 million in funding to support the GPAI by launching a centre of excellence in Montreal. Details of management and overall governance are unclear. This decision was cemented at the G7 Leaders' Summit in 2019.[80] Montreal has positioned itself well for this centre: in 2017, the AI ecosystem and its key players helped put together the Montreal Declaration for the Development of Responsible AI, an effort led by Université de Montréal to champion AI ethics.[81] There were limitations to the public consultation and to the teams that designed this project — a niche group represented by public facing figures of the AI scene in the city. What was less obvious was private interest representation. The limitations of the Declaration surface when looking closer at the citizens' proposals,[82] or the detailed reports.[83] Overall, the principles that the Declaration penned leave much room for interpretation with no legal enforcement, leaving the accountability of AI technologies and its actors unknown.

According to Reflection AI, "Montreal's unique interconnected and collaborative ecosystem means it stays competitive and has an international focus, with talent and tech giants from around the world heading to the city to make it their home."[84] A few months after the start of the COVID-19 pandemic, in May 2020, Quebec announced a special pilot program for the immigration of healthcare professionals under the Quebec Experience Program (PEQ). Another pilot program was announced for AI workers but with little detail.[85] By October 2020, the Quebec Government published the draft regulation for implementing three new permanent immigration pilot programs — to select 1,650 people and their families for entry in Quebec — including 550 people for a program for workers in AI, IT, and visual effects sectors. The other two programs were created for orderlies and workers in food processing.[86] The AI program considers French speakers and non-French speakers who are not obligated to know the French language, but must have a full-time job in Quebec and an annual salary of $100,000 (in Montreal region).[87]

[80] Government of Canada. Government of Canada and Government of Quebec announce the creation of an international centre of expertise in Montreal for the advancement of artificial intelligence. 2019.
[81] Université de Montréal. Montreal Declaration for a Responsible Development of Artificial Intelligence. 2017.
[82] Montreal Declaration on the Development of Responsible AI. Citizens Proposals. October 2018.
[83] Ibid, Summary report of online surveys and proposals received for the Montréal responsible AI declaration.
[84] Reflection AI. Why Canada AI? The Montreal Mile. n.d..
[85] Thomas, Katelyn. Pilot project to bring 550 orderlies to Quebec in response to shortage. *Montreal CTV News.* May 2020.
[86] Quebec Government, Immigration Quebec. Draft regulation on three pilot programs and new intake rules for immigration applications 2020-2021. October 2020.
[87] Schué, Romain.Le gouvernement Legault veut favoriser l'immigration de certains anglophones. Radio-Canada. December 2020.

The PEQ was established in 2018, a program welcomed by future immigrants, as well as Quebec industry. The current reforms, however, "shut out many unskilled workers, which the province needs" stated the Quebec chapter of the Canadian Federation of Independent Business, as well as student organizations across Quebec.[88]

Public investment flows to Quebec and Montreal

The Montreal AI ecosystem has thrived financially in more ways than other cities across the country. Montreal has been in the spotlight of the gaming industry and other technology-related markets for the last two decades.[89] The media and public opinion also plays a role in shaping the narrative of Montreal as an AI-forward city — a new Silicon Valley.[90] The narrative seems to originate in 2018, when a Silicon Valley venture capital firm opened an office in Montreal, and the media started using the term. Now the narrative has shifted to include a stronger incorporation of AI and smart cities actors.

Financial flows from the federal government to Quebec and Montreal are seen in various forms of funding from federal government departments and agencies, notably ISED (Figure 4). Noteworthy is its $230 million investment from the Innovation Superclusters Initiative to support Montreal's Scale AI Supercluster on supply chains and SMEs.[91] The superclusters are expected to contribute $16.5 billion to Canada's GDP and help create 16,000 jobs over the next ten years. Private sector funding included $500 million in foreign direct investment. Another notable government investment is $40 million from CIFAR's Pan-Canadian AI Strategy to the Quebec government.[92] The federal government also supports projects, companies, and initiatives across Montreal and Quebec through the Social Sciences and Humanities Research Council (SSHRC) and Natural Sciences and Engineering Research Council (NSERC). At the subnational level, the Quebec Ministry of Economy and Innovation, Investissement Quebec, Caisse de dépôt et placement du Québec, Business Development Bank of Canada, and Anges Quebec play important funding roles. However, not all funders are listed due to the lack of publicly available information. The $1.23 billion for Quebec is derived from information disclosed in public announcements mainly from the government sources, with a portion of known but unquantified private sources (Figure 2, Appendix 2).

[88] Rukavina, Steve. CAQ government's third attempt at reforming immigration program faces fresh round of criticism. *CBC*. July 2020. Kim, Sequoia. CAQ's proposed reforms to PEQ spark criticism from student organizations across Québec. *McGill Tribune*. July 2020.
[89] Cohendet, Patrick, Laurent Simon, and Chahira Mehouachi. "From business ecosystems to ecosystems of innovation: the case of the video game industry in Montréal." *Industry and Innovation* (2020): 1-31.
[90] Raybaud, Alice. Montréal, nouvelle Silicon Valley de l'intelligence artificielle. *Le Monde*. October 2019.
[91] Government of Canada, ISED. Innovation Superclusters Initiative. n.d.
[92] Aguis, Christina. AI Funding in Canada & Major Research Cities. *Data Driven Investor*. February 2019.

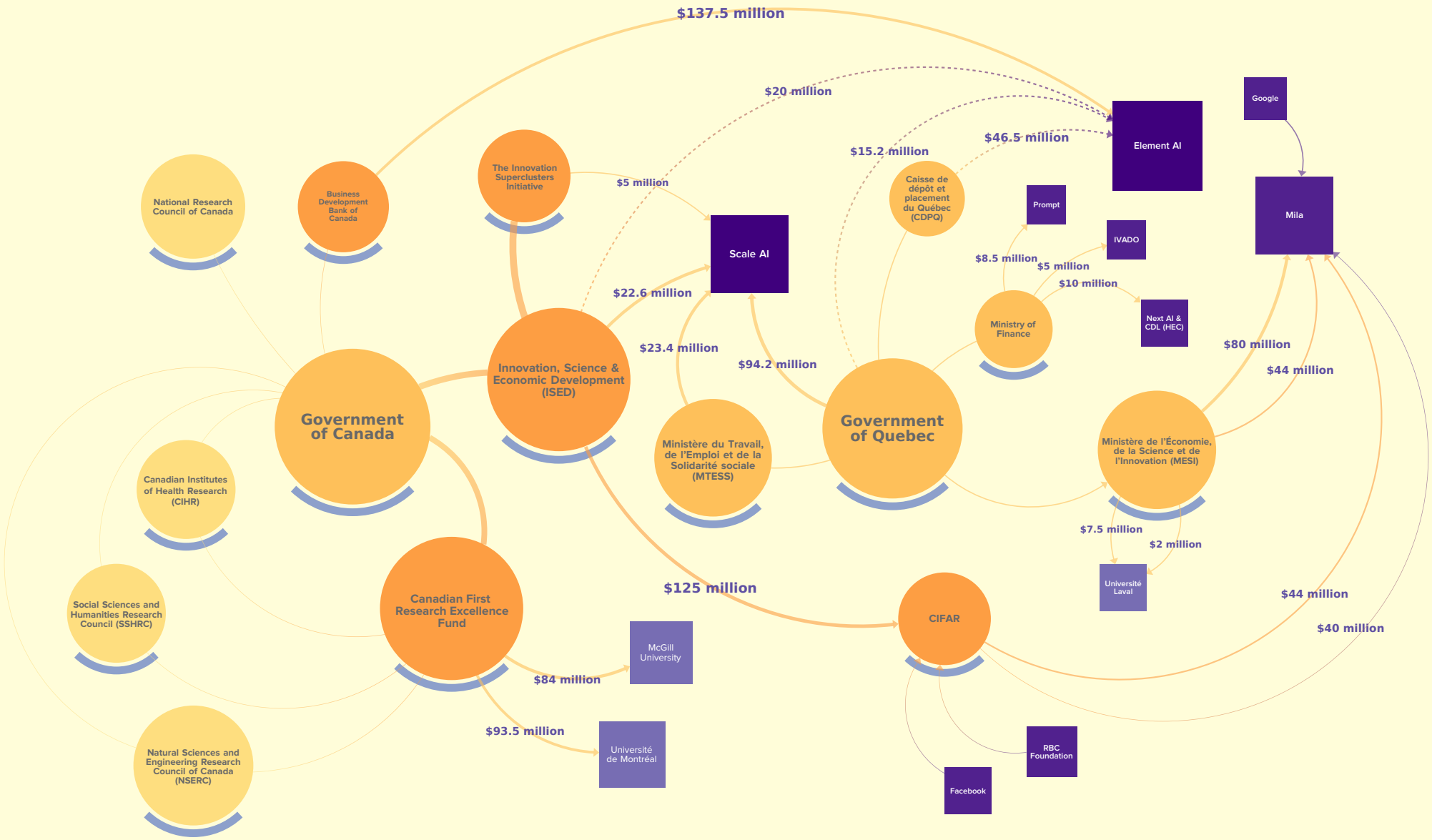
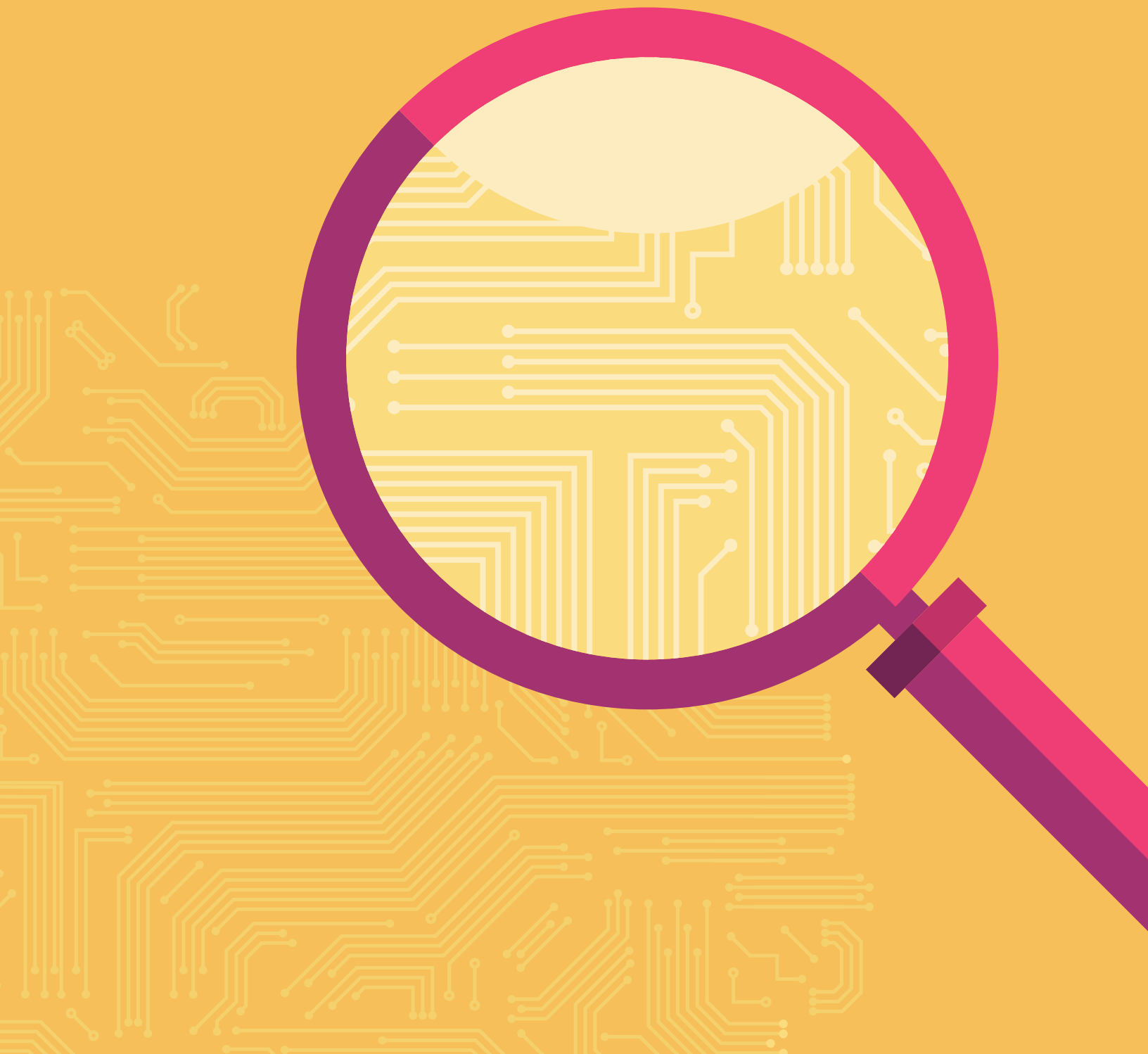


Figure 4. Government funding flows to the province of Quebec and Montreal. See Appendix 4 for detailed information on the public announcements.

MAIN FINDINGS



FINDING 01

Public investments in AI technologies primarily benefit the private sector

01

Public investments in AI technologies primarily benefit the private sector

Government funding for AI goes mainly to industry and academia adjacent to industry. Academia often acts as an intermediary between industry and government. Indirectly, these funds can still benefit for-profit organizations. The focus for academia in AI is on capacity building for the private sector — to do research in AI and train students to develop AI skills required by the workforce to support the economy. Currently, public investments are primarily in the startup scene, small tech companies and research institutions. Academia that secures funding usually receives it for engineering and computer science departments to do research, build algorithms and the technology itself. However, digital media scholar and interviewee Jason Edward Lewis (Concordia University) aptly questions: "Why are we still allowing governmental funding bodies to fund AI research that does not include critical considerations of cultural bias?"

Elsewhere in Canada, reports published on AI in Quebec focus on its positive economic benefits, but fail to cover economic and social risks connected to its ecosystem. Instead, the reports focus on the uncertainty of AI's economic impact, the wealth concentration by Big Tech (Google, Apple, Facebook, Amazon and Microsoft — also known as GAFAM) and "the lack of guaranteed access to knowledge generated by public investments."[93] One interviewee highlighted the "increasing reporting and common knowledge that more academics are being aligned with big tech, pushing for innovation, without thinking about human rights impact and governance. We're seeing the same in Canada too, not just in Silicon Valley."

Some interviewees noted that [AI] actors will leverage crises such as the pandemic to open the doors to government funding to further their agenda. This is also a big tech issue. One interviewee expressed concern: "before COVID-19, Amazon bought an entire city block in Vancouver. The small AI companies are horrified. They find it hard to compete with Amazon's access and availability to skilled labour." At the beginning of the pandemic, the federal government contracted Amazon Canada, where the company agreed to not make a profit on the deal. "When governments begin to use tech systems under these conditions, they often become entrenched infrastructures which are very difficult to remove," warns open government advocate, Bianca Wylie.[94]

[93] Gélinas, Joëlle, Lavoie-Moore, Myriam, Lomazzi, Lisiane, et Guillaume Hébert. Financer l'intelligence artificielle, quelles retombées économiques et sociales pour le Québec? *Institut de recherche et d'informations socioéconomiques.* 2019.
[94] Wylie, Bianca. "[Canada] Amazon and the pandemic procurement response." *In Data Justice and COVID-19: Global Perspectives.* 2020, 111.

The close dynamic between government and industry provides insight into the funding and investment processes behind AI. Sociologist Ruha Benjamin aptly writes that we "should consider how private industry choices are in fact public policy decisions."[95] Industry influence in technology is not new. We have seen historical patterns of government subsidies in Montreal's gaming industry. In 1997, the French company Ubisoft established a studio in Montreal due to the Quebec government's annual public subsidies and fiscal grants of $100 million, also financially supported by the Canadian government.[96] Private sector influence operates in more traditional industries like pharmaceuticals, oil, and tobacco. Big Tech is similar to Big Pharma, Big Oil, and Big Tobacco in the way it increasingly carries out lobbying activities to defend its interests.[97] This issue is amplified in that so much of AI resides in the private realm. Therefore it is worth questioning how the innovation economy is influenced by private interests and private power — and by extension, how AI public policy gets written.

It is worth questioning how the innovation economy is influenced by private interests and private power — and by extension, how AI public policy gets written.

"[AI investments] are government funding programs with contracts, so that's lobbying. Anybody has the right to petition for their industry. But the government should know that this industry isn't the same as subsidizing smallholder farmers," an interviewee who chose to remain anonymous pointed out. Tech lobbying differs from other forms of lobbying because of the lack of tech regulation. "Greater interest and concern are developing about the amount of tech lobbying of the Canadian government, and about the ethics of tech lobbying in a moment when the government is making a significant amount of public policy concerning technology," writes Meg Beretta.[98] Well-known tech companies like IBM and Microsoft are awarded the biggest procurement contracts by the government (Appendix 4) and are categorized as IT solutions companies. In fact, pre-qualified AI suppliers for the Canadian government offer more IT solutions and services than AI ones (Figure 3).

[95] Benjamin, Ruha. *Race after technology: Abolitionist tools for the new jim code.* John Wiley & Sons, 2019, 12.
[96] Cohendet, Patrick, Laurent, Simon and Chahira Mehouachi. "From business ecosystems to ecosystems of innovation: the case of the video game industry in Montréal." *Industry and Innovation* (2020): 1-31.
[97] Oremus, Will. Big Tobacco. Big Pharma. Big Tech? *Slate*. November 2017.
[98] Beretta, Megan. How is tech lobbying shaping federal policy? *Policy Options*. February 2019.

Public and private investments are currently promoted as AI for the common good,[99] yet the public only has the opportunity to comment on funding allocations after the fact (e.g. design decisions, allocation of spending, etc.). When the public has the opportunity to comment, such as in public consultations, the conversation is held in private buildings. In early 2020, the Office of the Privacy Commissioner held a consultation on the role of responsible AI in privacy.[100] The consultation only had two in-person (pre-COVID-19) events in Montreal that were hosted by StradigiAI, a company whose building policy requires the signing of a non-disclosure agreement (NDA).[101] Not only were there just two events to cover legislation that would affect the entire country, but public participation also required private NDAs.

"Civil society and communities should not be but are often absent in participating to set the AI agenda," noted interviewee Petra Molnar, associate director, Refugee Law Lab, Osgoode Hall Law School (York University). Digital rights organizations, public interest advocacy and Indigenous groups are on the margins of decision-making and policy-making. Interviewees recommended organizations and groups to have a greater role in these decisions. Interviewees recommended organizations and groups to have a greater role in these decisions. More specifically, organizations that work on digital inclusion: Digital Justice Lab, Citizen Lab, AI Impact Alliance, and Montreal AI Ethics Institute, initiatives like the Indigenous Protocol and Artificial Intelligence Working Group (Indigenous AI), as well as public interest advocacy organization Open Media, civic technology nonprofits Open North and Powered by Data, and think tank Centre for International Governance Innovation (CIGI).

While the government does not usually fund advocacy, it does sometimes fund civic engagement and does carry out public consultation. Still, interviewees have noticed that there is a missing public advocacy voice in the AI discourse. "The AI conversation is centered on economic development and the business model – companies are accountable to the shareholders. Money matters more than anything else. Where is the money going? Where is the citizen voice?" asked an anonymous interviewee.

[99] Montreal International. Montréal: Artificial intelligence serving the common good. n.d.
[100] Government of Canada, Office of the Privacy Commissioner of Canada. Consultation on artificial intelligence. November 2020.
[101] AI Ethics: Québec and Canada AI privacy legislations (Part 1) [of 2]. February 24 - 25, 2020. Montréal, Canada.

FINDING 02

Even though Canada has federal AI policy, there is no national government AI strategy

02

Even though Canada has federal AI policy, there is no national government AI strategy

In the global arena, Canada is perceived to have a best practices-informed AI policy. However, Canada has no standalone national government AI strategy. The government's AI policy is found under Canada's Digital Government IT strategy. It is true that Canada was the first to have a national AI [research] strategy with a specific focus on research and academic development. Led by CIFAR, the pan-Canadian AI [research] strategy is supported financially in part by big tech (Facebook) and a commercial bank (RBC) alongside government (Government of Canada and ISED), which reflects the government-industry-academia connection. The $125 million investment received for the pan-Canadian AI [research] strategy over five years is small in comparison to international competitors. One interviewee noted that "Canada's poor track record commercializing research can cause concern." The track record of ADM systems and their use in government has also been questioned. For example, Petra Molnar and Lex Gill's report on Immigration, Refugees and Citizenship Canada's use of ADMs "raise[s] crucial constitutional and administrative law issues, including matters of procedural fairness and standard of review" in the cases of refugee and immigration applications.[102]

There are also many questions around varying jurisdictional regulations of AI. The ADM Directive is only legally binding for federal government department and agency AI products created in-house or outsourced to be built by private suppliers — a legal framework for the federal government, but not subnational governments. In Quebec, the Ministry of Health and Social Services made it mandatory for youth protection services to use an AI software that "sometimes generates reports contradicting the clinical judgment of the worker, who often spends fifteen hours meeting the child, parents and professionals." In one case, the software wrongfully predicted the urgency of care with no further human intervention that resulted in the death of an infant.[103]

Skepticism was expressed by interviewees on what inclusive governance of AI looks like when the federal government only has guiding principles without meaningful explanations. There are ongoing challenges around the way the Algorithmic Impact Assessment (AIA) has been deployed and committed to. Interviewee Ashley Casovan, executive director (AI Global), also an architect of the AIA, noted that 80% of the feedback on the user experience of the AIA was based on existing rules. Yet

[102] Molnar, Petra and Lex Gill. Bots at the gate: A human rights analysis of automated decision-making in Canada's immigration and refugee system. *University of Toronto's International Human Rights Programme and the Citizen Lab at the Munk School of Global Affairs and Public Policy.* September 2018.
[103] Turbide, Pasquale. Quebec youth protection agency's problematic software played role in toddler's death, report finds. *CBC.* November 2019.

participants were aware that TBS policies need to be changed to increase adoption and use. The adoption of the AIA in other levels of government could be appealing, because there is a lack of internal funding in sub-national governments to create their own AI policy. Some municipal governments think forking the AIA would be a good strategy, but there is no clarity on how the AIA could be implemented in various jurisdictions. Consequently, interviewees feared that well-meaning efforts like the AIA could be perceived as merely a rubber-stamping exercise. “If an AIA does not have a meaningful way to be accountable, to have oversight, for redress, who gets to set an agenda against what matters?” interviewee Petra Molnar (York University) asks. What we have now are AI products created by and for industry that are self regulated with internal ethics frameworks.

What we have now are AI products created by and for industry that are self regulated with internal ethics frameworks.

AI and data governance depends a lot on a broader regulatory framework (e.g. privacy, connectivity, intellectual property, criminal law) and needs to be addressed as a macro-level analysis, too. The AI ecosystem should be understood, regulated, developed within the larger tech ecosystem. For example, AI-branded companies at smart city expos try to sell controversial devices and services to municipal governments. There is an overlap in these agendas and some of the problems are quite similar.

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FINDING 03

Companies linked to human rights abuses can pre-qualify as government AI suppliers

03

Companies linked to human rights abuses can pre-qualify as government AI suppliers

The use of AI technologies can cause significant harm, including breaches to our fundamental freedoms. And yet, the Government of Canada fails to exclude companies that are linked to human rights abuses from becoming vendors. For example, the AI pre-qualified supplier list includes at least one company with a known track record of causing or contributing to human rights abuses — Palantir Technologies Inc.. Palantir's software programs created for the U.S. Department of Homeland Security (DHS)'s Immigration and Customs Enforcement (ICE), ICM and FALCON, enabled the government "to identify, share information about, investigate, and track migrants and asylum-seekers to effect arrests and workplace raids. There is a high risk that Palantir contributed to human rights harms through the ways the company's technology facilitated the ICE operations."[104] It is also vital to note that Palantir's software facilitated the efficiency and effectiveness of activities born out of state, which is arguably where the primary fault lies.

> **The Government of Canada fails to exclude companies that are linked to human rights abuses from becoming vendors.**

To this extent, responsible AI tools are insufficient for facilitating accountability in companies. For example, a company's commitment to the Government of Canada's AIA is encouraged, but is not legally binding or enforceable. As of November 2020, out of a total of 89 pre-qualified suppliers, only 45 companies committed to the AIA, or 51%. Ironically, Palantir committed to the AIA and met its criteria, because of the company's internal ethics framework. "You can have companies like Palantir apply as Palantir Canada—'this is us as a company here in Canada and not anywhere else. We can meet the [AIA] objectives.' It's difficult to have anything nuanced in the measurable objective criteria on capacity and competency [of the AIA]. That in general was meant to be a one-size-fits-all, but not a stage of procurement," shared interviewee Ashley Casovan (AI Global).

Also worth noting are companies who actively promote responsible AI (e.g. AI explainability, human rights frameworks) like Element AI, did not yet commit to the AIA, but were chosen by the federal government as pre-qualified suppliers for nearly two years. What is the government's commitment to following up with pre-qualified companies beyond the initial stage of contact? In the case of Palantir, what does an AIA commitment mean to companies who simultaneously self-govern their ethics and cause harm? More questions are raised around the internal ethical frameworks

[104] Amnesty USA. Failing to do right: The urgent need for Palantir to respect human rights. September 2020, 4.

of companies and private regulation. Corporations maximizing profits for their shareholders is nothing new. However, governments partnering with a company linked to human rights abuses should cause concern. Renata Ávila, international human rights and tech lawyer, warns that "human rights safeguards and accountability are not expressly written into the contracts a company signs with a government, even if it offers its services as a donation, there is room for abuse, especially when collecting personal data."[105]

Corporations maximizing profits for their shareholders is nothing new. However, governments partnering with a company linked to human rights abuses should cause concern.

There is detailed evidence of human rights and Canadian Charter of Rights and Freedoms violations that are at risk of being breached when law enforcement, in particular, uses ADM.[106] Interviewees also noted that the AIA needs to be updated to include more specific, nuanced questions that go beyond binary answers. One AIA may not be enough. Interviewee and tech policy expert, Sarah Villeneuve suggested the importance of having "AIAs that are context and sector specific – an AIA for health is different than for transportation – the type of criteria we use for each one matters." Interviewee Rob Davidson, responsible technology advocate, added that Canada needs a seperate AI strategy in government, with an associated national data strategy, beyond Canada's Digital Charter.

AIAs have the potential to demystify algorithms and cut through the hype associated with AI technology. If the government wants people to understand why the AIA could be an impactful tool, public education is needed, especially when so much trust is put in AI production. The creation of an AIA agency could also be beneficial.[107] The rhetoric suggests the inevitability of AI production for the innovation economy, but in reality the AI economy is a gamble, resulting in unjust tradeoffs — playing with human lives.[108] Since academic research involving human subjects is required to undergo ethics review, from a human rights perspective, we can require a similar review process for the use of ADM.

[105] Ávila Pinto, Renata. Tech Power to the People! Democratising Cutting-edge Technologies to Serve Society. *Stiftung Entwicklung und Frieden/ Development and Peace Foundation.* March 2020.
[106] Robertson, Kate, Khoo, Cynthia and Yolanda Song. To Surveil and Predict: A Human Rights Analysis of Algorithmic Policing in Canada. *Citizen Lab, Munk School of Global Affairs & Public Policy and the University of Toronto's International Human Rights Program, Faculty of Law.* September 2020.
[107] Munro, Daniel. Governing AI: Navigating Risks, Rewards and Uncertainty - *Public Policy Forum*. January 2019.
[108] Metcalf, Jacob and Kate Crawford. "Where are human subjects in big data research? The emerging ethics divide." *Big Data & Society* 3, no. 1 (2016): 2053951716650211.

FINDING 04

Concentrations of power provide advantages to a handful of entities

04

Concentrations of power provide advantages to a handful of entities

A few provinces and a handful of entities primarily benefit from public investments in AI. Financial resources, data, and technologies are concentrated in a handful of universities and affiliated research nonprofits, startups, and international (big) tech companies.

First, there is a concentration of funding in Quebec ($472.2 million), British Columbia ($361.8 million), and Ontario ($196.1 million) seen through the allocation of federal government grants and (mostly) contributions. This comes as no surprise since these provinces have heavily invested in AI solutions and services. CIFAR is funded by all three provincial governments, as well as Alberta and the federal government. Given this, it is surprising that Alberta has not received as much funding ($35.9 million). To date, no territories were awarded AI-specific federal government grants and contributions and no companies are headquartered in Canadian territories.[109] Therefore, AI federal government funding is not really pan-Canadian.

At a closer look, 66% of pre-qualified AI suppliers have headquarters in Canada, and 33% located abroad (Figure 3). Even though Montreal is an AI research powerhouse, only 10% of companies are headquartered in Quebec. Although Quebec, and more specifically Montreal, has a comparatively smaller number of AI vendors, it is still the hub of advanced AI R&D in Canada. The majority of the pre-qualified AI suppliers in Canada come from Ontario, since Toronto is a hotbed of AI startups.

Second, interviewees noticed a funding trend in universities, where the majority of AI investments go to specific universities and specific institutes and departments (e.g. computing science, engineering, cybersecurity). The majority of federal government AI grants and contributions are funded by research institutions: the National Research Council of Canada, Natural Sciences and Engineering Research Council of Canada, and Canadian Institutes of Health Research. Looking at Quebec, AI funding announcements went primarily to Université de Montréal, McGill University, and to Université Laval (Appendix 2).

[109] The territories represent only 0.33% of the population. Based on population, we might expect $3.6 million of the $1.1 billion, but taking into account the composition of their economies, this is not the case.

The lines between public and private interests become increasingly blurred with new formations of public-private partnerships and the revolving door phenomenon.[110] The revolving door tends to benefit private interest and is often associated with corporate capture, "by which an economic elite undermines the realization of human rights and the environment by exerting undue influence over domestic and international decision-makers and public institutions."[111] [112] This also manifests in the relationship between industry-focused R&D and academia, more broadly seen as the privatization of universities.[113]

The lines between public and private interests become increasingly blurred with new formations of public-private partnerships and the revolving door phenomenon.

Institutionalized innovation and intellectual property (IP) pools play a key role. Entities are organized as incubators or accelerators built to support start-ups, often found in the public sphere as part of public universities under non-profit legal status. Therefore, it is important to ask whether research ethics practices and conflict of interest policies are sufficient mechanisms to ensure that universities serve their purpose as public institutions. The issue of accountability, funding, and national security is further complicated by researchers and their geographical flows. IP resides in the minds of the researchers and in entities. Historical international networks of researchers make it almost impossible to bound research to a nation state, a tension that may not be resolved.

Third, notable investments have been made to produce a 'Made in Canada' AI that federal government departments and agencies across the country can procure and use. However, the AI ecosystem in Canada is composed of many foreign actors, especially investors. Over one third of pre-qualified AI suppliers are international, frustrating the purpose of government (and Canadian taxpayers) investment in AI (Figure 3). It is worth highlighting that the federal government still pre-qualifies international suppliers, instead of their subsidiaries incorporated in Canada.[114] Much of the AI industry is focused on applied AI, and the client base is not always in Canada. For example, AI companies based in British Columbia are servicing US

[110] Alfonsi, Carlotta. "Taming Tech Giants Requires Fixing the Revolving Door." *Kennedy School Review* 19 (2019): 166-170.
[111] ESCR-Net - International Network for Economic, Social & Cultural Rights. Corporate Capture: Definition and Characteristics. n.d.
[112] Tyllström, Anna. "More Than a Revolving Door: Corporate lobbying and the socialization of institutional carriers." *Organization Studies* (2019): 0170840619848014.
[113] Saltman, Kenneth J. "Artificial intelligence and the technological turn of public education privatization: In defence of democratic education." *London Review of Education* (2020).
[114] Presumably the parent company submitted for qualification, in order to be able to subcontract to whichever subsidiary was relevant/ available to the specific contract. Typically a parent company would submit in such cases, unless the buyer gave advantages to local suppliers.

clients in Washington State, and Silicon Valley. “We [Canadian firms] are cheaper and that’s our competitive advantage,” stated an interviewee. There are also many concerns around IP, what gets made, and what actually stays in Canada, including potential IP loss and brain drain.[115] Interviewees were particularly concerned over data ownership and IP. In addition, the migration of Science, Technology, Engineering, and Mathematics (STEM) talent to the US, instead of retaining IP by Canadian companies in Canada, is a perceived threat to the innovation economy.

Prior to the acquisition by Google, North Inc. was heavily funded through grants by the Canadian government when it was under independent ownership. In fact, the $20 million grant that ISED awarded North Inc. puts it in the top 10 entities to receive government contributions (Appendix 3). This can be seen as the government indirectly subsidizing Google’s research. A similar more recent acquisition took place in November 2020 when Element AI, one of Canada’s most promising AI companies — also in the top 10 — was purchased by Silicon Valley company ServiceNow Inc, originally for an undisclosed sum, and later reported at $230 million.[116] Element AI’s CEO announced on Twitter: “Our companies will now join forces to make the world of work, work better for people.”[117] Yet ServiceNow’s press release “Use of Forward-Looking Statements” sections shows that the use of Element AI’s technology or the retainment of even its key employees remains uncertain, with no further responsibility from the company.[118] This makes us wonder if Element AI was bought out for people, not for its products, which means that the buyer did not value its products. $20 million awarded earlier this year as a contribution (Appendix 3) was returned to the federal government, alongside $45.6 million for the Caisse de dépôt et placement du Québec (CDPQ) and $15.2 million for the Quebec government, “roughly the amount they invested in the first tranche of the 2019 financing.”[119]

[115] Note that federal government contracts do not publicly provide details of the IP status of the product or services they are providing.
[116] Silcoff, Sean. Element AI hands out pink slips hours after announcement of sale to U.S.-based ServiceNow. *The Globe and Mail.* November 2020.
[117] Gagne, Jean-François. Twitter. November 30, 2020.
[118] ServiceNow. ServiceNow to Acquire AI Pioneer Element AI. November 2020.
[119] Silcoff, Sean. Element AI sold for $230-million as founders saw value mostly wiped out, document reveals. *The Globe and Mail.* December 2020.

These acquisitions reflect ongoing patterns of creating business models that appeal to big players. Business models of AI companies show the way research investments translate into operations and real-world use. Also noteworthy is that "both governments and corporations have made substantial investments in AI R&D, but there is no formal reporting of such data for the development of AI metrics."[120]

AI acquisitions reflect ongoing patterns of creating business models that appeal to big players.

The way AI is procured, built and operates beyond Canadian borders is important. Even if Canada is not a tech empire, there is a responsibility for the government to award contracts to (tech) companies in accountable and sustainable ways, to avoid digital colonialism.[121] Small tech can be just as discriminatory as big tech. For example, AggregateIQ, a British Columbia-based, federal government-funded startup, helped Cambridge Analytica interfere in Nigeria's election in 2007 and was funded by the federal government.[122] [123] Governments should not be investing in companies that do harm.

[120] Grove, Hugh, Clouse, Mac, Schaffner, Laura and Tracy Xu. "Monitoring AI progress for corporate governance." April 2020.
[121] Mills, Alan, Sambuli, Nanjira, Varon, Joana and Renata Ávila Pinto. Digital colonialism: A global overview. *Journal* of Governance & Regulation, 9(1), 8-17.. May 2016.
[122] York, Geoffrey. Cambridge Analytica parent company manipulated Nigeria's 2007 election, documents show. *The Globe and Mail.* March 2018.
[123] Blatchford, Andy and Joan Bryden. AggregateIQ, firm tied to Facebook data scandal, got $100,000 in federal funding in 2017. *The Globe and Mail.* April 2018.

Conclusion

Canada is marketing itself as an innovator and leader on the global stage, by using AI as the new driver to support the innovation economy. Canadian governments are investing heavily in AI technology: first in industry and second in research institutions that support design, deployment and implementation of AI products. The reality is that government — and by extension the public — is funding a big unknown.

In Canada, we have seen foundational policy inputs that are creating transparency within AI, such as the Directive on ADM and the AIA, as well as publicly available funding streams based on open government-led proactive disclosure grants and contributions, and contracts. Yet to date, tools like the AIA are not fixing fundamental and systemic issues in government and corporate power structures. If the government funds companies, it needs to keep them accountable, as it is accountable to the public. If we want public interest AI, we need access, alongside public scrutiny and independent oversight over the mechanisms and practices of public investments and their relationships. Public accountability of both government and companies is needed when building, procuring and using AI technologies.

This is a call to share ideas and recommendations (policy and beyond) on how the public can reclaim the innovation economy discourse — and to imagine an innovation economy for the people.

Appendices

Appendix 1: Methodology

The methodology included desk research: web content analysis of public documents and datasets (e.g. government press releases, government grants and contributions, government contracts, presentation slides). Desk research was complemented by participating at public events and meetings, and conducting research interviews. Stakeholder identification and outreach were carried out through existing contacts, their recommendations, and snowball sampling. From March to June 2020, the author conducted 53 semi-structured research interviews. The broader interview theme was the governance of AI in Canada. Interview questions asked to identify challenges, opportunities of AI, as well as (key) ecosystem players, government funding, public policy, and regulatory futures within the space. Interviewees included government officials, industry researchers and analysts, legal practitioners, nonprofit practitioners, human rights advocates, and academics working in or adjacent to the AI landscape. Interviewees were also asked to suggest other persons that should be interviewed. All research interviews were conducted under a research protocol approved by McGill University's Research Ethics Board. The data was de-identified within a week after interview completion. Identifiable data (e.g. participant information) will be kept as a hard copy, separate from the interview data and stored for one year in a secure filing cabinet. The non-identifiable digital interview notes will be stored for one year on a password locked computer. Personal contact information collected in this interview will remain confidential and will not be shared with anyone. Only the researcher (author) has access to it. The researcher will only share non-identifiable information with her team at the Centre for Interdisciplinary Research on Montreal, McGill University.Note that the report covers events and announcements up until and including December 2020.

There are three funding sources analyzed in the report:

1. Government grants and contributions
    - AI-specific grants and contributions with keywords
    - Open Data Portal: https://search.open.canada.ca/en/gc/

2. Government contracts
    - Total value and number of contracts procured to the 89 pre-qualified AI suppliers.
    - Open Data Portal: https://search.open.canada.ca/en/ct/

3. Government public announcements
    - Public announcements are commitments that can include grants and contributions, as well as government contracts.
    - There are no databases for public announcements. They were found on Government of Canada departments and agencies (e.g. ISED, TBS, Infrastructure Canada), and Quebec Government (e.g. Ministry of Finance, Ministry of Economy and Innovation), and web search (e.g. technology magazines, Medium articles)

As part of the open government movement for greater transparency and accountability, the Government of Canada proactively discloses contracts of $10,000 or more. Canada's open data portal allows the public to search and download these government contracts. The website (open data portal) also allows you to search and download grants and contributions.

There are two ways to download federal government contract data from the Open Data Portal. First, by searching the company name.[124] Second, by downloading all of the contracts available from the portal.[125] We found discrepancies between these two datasets namely the amount of contracts, and the column headers. The total contracts dataset was the most complete as it included contracts from companies, where in the company name search resulted in zero contracts. In the end, we used the total contracts dataset for analysis.

The AI grants and contributions were downloaded as a series of CSV spreadsheets including aforementioned keywords, cleaned for duplicates and combined to form one large dataset. The dataset includes a total of 1,307 grants and contributions from September 2007 to June 2020. Note that some grants and contributions are valid until the year 2047.

The AI ecosystem dataset is built using the Treasury Board of Canada Secretariat's pre-qualified AI supplier list, the author's landscape analysis, research interview insights, industry research conducted by Element AI, "Canadian AI ecosystem" map,[126] the AI Inventory and Canada.ai project. The company types are based on OpenCorporates data and classification.[127] The dataset was created by myself and Elissa Kayal. The entities are categorized by: entity name, entity type,[128] sector (public or private), HQ (headquarter) location, website URL, and other locations (cities and/or countries the company operates in). The entity type is defined by the legal corporate classification of OpenCorporates' database, which highlights that the Canadian AI ecosystem is globally linked.

[124] Government of Canada, Open Data Portal. Search Government Contracts over $10,000.
[125] Government of Canada, Open Data Portal. Proactive Disclosure - Contracts.
[126] Henderson, Peter and Yoan Mantha. 2019 Canadian AI Ecosystem. Jean-Francois Gagné personal website.
[127] Open Corporates.
[128] The corporations are based on OpenCorporates company type classification, where available.

Appendix 2: Public announcements for AI funding in Quebec

Another source of information regarding government funding of AI is found in government press releases, government strategy reports and public announcements. When funding is approved at federal and provincial levels, a public announcement is made detailing the recipient(s) and the industry or initiative being funded. The funds may cover single or multiple recipients over usually multiple years. The table below is an example of public announcements regarding AI funding from the Government of Canada and the Quebec government. Note that this total includes two contributions that are a combination of public and private sector funding announcements, primarily funded by the government.

	Source	Recipient	Value	Year	Project / Product description
1	Government of Canada (CIHR, SSHRC and NSERC) - Canada First Research Excellence Fund	McGill University	$84,000,000	2016	From the $900 million Canada First Research Excellence Fund to pursue their AI-related research, including improving brain health. Source.
2	Government of Canada (CIHR, SSHRC and NSERC) - Canada First Research Excellence Fund	Université de Montréal	$93,500,000	2016	From the $900 million Canada First Research Excellence Fund to pursue their AI-related research to accelerate innovation in data science. Source.
3	Government of Canada (via CIFAR)	Mila	$40,000,000	2017	For the Pan-Canadian Artificial Intelligence Strategy over five years. Source.
4	Business Development Bank of Canada (BDC) **	Element AI	$137,500,000	2017	Element AI has raised $137.5 million Series A funding round from a group of investors including Intel, Microsoft, National Bank of Canada, BDC, NVIDIA, and Real Ventures ** Breakdown of the funding unknown. Source.
5	Quebec Government - Ministère de l'Économie, de la Science et de l'Innovation (MESI)	Mila	$100,000,000	2018	For the creation of a provincial-wide AI cluster over five years. Source.
6	Government of Canada (The Innovation Superclusters Initiative)	Scale AI	$230,000,000	2018	For the AI-Powered Supply Chains Supercluster, a public-private co-investment and innovation hub.
7	Quebec Government	Scale AI + IVADO Labs laboratory	$60,000,000	2018	To "initiate projects that combine machine learning, operations research and data science, affirming Canada's leadership in the industrial application of these leading-edge technologies." Source.

8	Quebec Government - Ministry of Finance	Next AI and CDL (HEC)	$10,000,000	2018	$10 million toward Next AI and Creative Destruction Lab, initiatives of HEC Montreal, over the next five years. Source.
9	Quebec Government - Ministry of Finance	To Be Announced	$5,000,000	2018	To build a Centre of Excellence for the Global Partnership on AI in Montreal — Organisation mondiale de l'intelligence artificielle (OMIA). Source.
10	Fonds de recherche du Québec (FRQ), Ministère de l'Économie, de la Science et de l'Innovation	Université Laval	$2,000,000	2018	To create OBVIA — international observatory on the societal impacts of artificial intelligence and digital technologies. Source.
11	Quebec Government - Ministry of Finance	Industry	$12,500,000	2018	"To improve the state-of-the-art computing infrastructure available to the Quebec AI field and other sectors." Source.
12	Quebec Government - Ministry of Finance	Industry	$1,000,000	2018	"To have applied mathematical science leveraged to support AI-related fields in Quebec." Source.
13	Quebec Government - Ministry of Finance	IVADO	$5,000,000	2018	"To carry out a Canada First research project on big data, as well as to increase the state-of-the-art computing power available to researchers." Source.
14	Quebec Government - Ministry of Finance	Prompt	$8,500,000	2018	"To support collaborative AI research projects through Prompt." Source.
15	Fonds de recherche du Québec and the Quebec Government - Ministry of Economy and Innovation	Université Laval	$7,500,000	2018	"To support the International Observatory on the Societal Impacts of Artificial Intelligence and Digital Technologies."
16	Quebec Government - Ministry of Finance		$15,000,000	2018	"To promote digital appropriation by players in the tourism industry." Source.
17	Quebec Government - Ministry of Finance		$23,000,000	2018	"To the Quebec Industrial Research Center, to ensure the transition of manufacturing companies to Industry 4.0)." Source.

18	Quebec Government - Ministry of Finance		$47,000,000	2018	"To increase the graduation rate in key fields, such as science and applied mathematics, for the development of AI in Quebec." Source.
19	Government of Quebec + CDPQ	Element AI	$60,800,000	2019	"Element AI raised Series B $200 million in funding; collective investment by the Quebec government, CDPQ, and McKinsey."Source. A recent publication (December 2020) revealed the exact public investment amounts that the Government will be receiving back after Element AI's acquisition: Government of Quebec: $15.2 million CDPQ: $46.5 million. Source.
20	Quebec Government	Scale AI	$30,000,000	2019	"No clear date, source or project found." Source.
21	Quebec's Ministère du Travail, de l'Emploi et de la Solidarité sociale (MTESS)	Scale AI	$23,400,000	2019	"To contribute to the Development of Quebec's Artificial Intelligence Talents." Source.
22	CIFAR	Mila	$44,000,000	2019	Funding from CIFAR as a partner in the development and implementation of the Pan-Canadian Artificial Intelligence Strategy. Source.
23	Quebec Government - Ministry of Economy and Innovation	Mila	$80,000,000	2019	"Mila will receive a contribution of $80 million over five years from the Ministry of Economy and Innovation of the government of Quebec." Source.
24	Government of Canada (ISED)	Scale AI	$22,600,000	2020	"To fund 10 AI projects that will support Canadian businesses." Source.
25	Quebec Government	Scale AI	$4,200,000	2020	"To fund 10 AI projects that will support Canadian businesses". Source.
26	Government of Canada (ISED)	Element AI	$20,000,000	2020	Government of Canada contribution. See Appendix 3.
			$1,166,500,000		**Total**

Appendix 3: Top 10 funded entities for AI-related government contributions

	Entity	Value	Project/Product Description	Duration	Awarding department / agency
1	SCALE.AI [operates as Scale AI]	$229,765,127	"Based in Quebec, the AI-Powered Supply Chains Supercluster (Scale AI) will bring the retail, manufacturing, transportation, infrastructure, and information and communications technology sectors together to build intelligent supply chains through artificial intelligence and robotics. This supercluster will help Canadian small and medium-sized businesses scale up and help ensure Canada is a globally competitive export leader."	5 years 2018-03-15 to 2023-03-31	Innovation, Science and Economic Development Canada (ISED)
2	AbCellera Biologics Inc.	$175,631,000	"The project is in direct response to Canada's fight against COVID-19 and Canada's ability to respond to future pandemics. It will enable the rapid discovery of antibody therapies to treat and prevent COVID-19 and establish a Good Manufacturing Practice antibody production facility for Canada's long-term emergency preparedness."	27 years 2020-04-14 to 2047-04-30	ISED
3	10793574 Canada Association (Digital Technology Supercluster)	$152,843,759	"Based in British Columbia, the Digital Technology Supercluster will use bigger, better datasets and cutting-edge applications of augmented reality, cloud computing and machine learning to improve service delivery in the natural resources, precision health and manufacturing sectors. Employing digital technologies will save time and money and improve the health and lives of Canadians."	4.5 years 2018-07-16 to 2022-12-31	ISED
4	CAE Inc.	$150,000,000	"Project Digital Intelligence will enable CAE to transform its training platforms by leveraging the latest digital technologies including Artificial Intelligence, Cloud Computing, Big Data, and Augmented/Virtual Reality."	7 years 2016-04-01 to 2023-03-31	ISED

5	Université de Montréal	$28,068,600	“Data Serving Canadians: Deep Learning and Optimization for the Knowledge Revolution.”	4 years 2018-08-03 to 2022-07-31	Canadian Institutes of Health Research
6	The Governing Council of the University of Toronto	$25,000,000	“The funding will help Creative Destruction Lab (CDL) gain insight into the success of start-ups. The research project using artificial intelligence (AI) tools will facilitate CDL supporting business ventures that harness emerging technologies such as AI, clean tech, energy, health, smart cities and space and quantum technologies.”	1.5 years 2018-10-31 to 2020-06-30	ISED
7	North Inc.	$24,000,000	“Support the company’s next-generation product development, which combines cutting-edge technology and artificial intelligence within a traditional eyewear frame.”	1.5 years 2018-11-08 to 2020-06-30	ISED
8	North Inc.	$24,000,000	“With this project, North planned to expand its existing facility and implement advanced testing, assembly and production systems. The investment also aimed to support the company’s next-generation product development by combining cutting-edge technology and artificial intelligence within a traditional eyewear frame.”	20 years 2020-06-10 to 2040-05-31	ISED
9	Element AI Inc.	$20,000,000	“Advancement of fundamental artificial intelligence (AI) research to accelerate the commercialization of next generation AI decision-making tools allowing organizations to harness the power of their data to make optimal, explainable, and trustworthy decisions.”	6.5 years 2020-06-10 to 2040-05-31	ISED
10	MindBridge Analytics Inc.	$14,500,000	“Extensible Artificial Intelligence (AI).”	3.5 years 2019-04-01 to 2022-12-31	ISED

11	Governing Council of the University of Toronto	$10,000,000	“The project is to support industry adoption of transformative AI technologies to contribute to a skilled and made-in-Ontario innovative economy through strategic growth and expansion of the SOSCIP consortium.”	3.5 years 2019-04-01 to 2022-12-31	Federal Economic Development Agency for Southern Ontario
12	University of British Columbia	$8,000,000	“The purpose of the agreement is to create a modular robotic discovery platform that will be capable of synthesising new materials, testing their properties, and to determine new material configurations using machine learning in order to accelerate the development of new materials for energy applications.”	2018-05-28 Spanning more than one fiscal year.	Natural Resources Canada

Appendix 4: The total value of contracts of pre-qualified AI suppliers

The table below represents the total value of contracts the 89 pre-qualified AI suppliers have (or have had) with the Government of Canada. The table includes the total contract value, as well as the original and amended value. The year of the first contract and the year of the most recent contract is disclosed. It is sorted in descending order: from the company has been awarded the largest total value to the company with the lowest total value.

Company name	Total Contract Value	Total Original Value	1st Contract (Year)	Recent Contract (Year)
IBM Canada Ltd.	12,282,637,141.63	8,900,733,618.91	2002	2020
Calian Ltd.	3,001,610,511.43	1,035,110,366.85	2004	2020
Microsoft Canada Inc.	2,739,524,402.21	1,065,051,640.08	2004	2020
Thales Canada Inc.	1,837,086,402.17	1,001,730,835.96	2004	2020
CGI Information Systems and Management Consultants Inc.	1,213,548,890.70	419,821,710.94	2003	2020
Northern Micro Inc.	826,236,872.24	436,022,141.78	2004	2020
PricewaterhouseCoopers LLP	648,660,563.47	343,435,252.82	2004	2020
Accenture Inc.	499,839,305.92	126,151,728.18	2004	2020
SAP Canada, Inc.	425,171,141.44	218,182,197.15	2004	2020
Fujitsu Consulting (Canada) Inc.	411,262,304.37	124,045,615.21	2004	2020
Cistel Technology Inc.	343,383,908.78	153,572,453.28	2005	2020
Donna Cona Inc. / Mastech Infotrellis Inc. in Joint Venture	334,903,336.75	177,113,403.38	2004	2020
Sierra Systems Group Inc.	277,932,698.59	84,642,831.88	2005	2020
ipss inc./ ServiceNow Canada, Inc. in Joint Venture	213,684,533.47	98,257,980.79	2006	2020
Open Text Corporation	213,464,980.76	126,807,358.64	2004	2020
Deloitte Inc.	199,512,024.97	124,061,606.65	2004	2020
Ernst & Young LLP	177,807,816.95	92,697,888.23	2004	2020
KPMG LLP	168,035,343.99	77,154,021.62	2004	2020
BMC Software	131,638,391.25	90,459,297.02	2004	2020
SAS Institute (Canada) Inc.	110,043,662.30	48,953,959.70	2004	2020
Hitachi Consulting Canada Corporation	105,441,434.32	53,686,965.64	2004	2020
Systemscope Inc.	72,223,787.64	28,088,479.51	2004	2020
Mcafee Canada ULC	57,874,592.70	46,540,478.07	2004	2018
Thomson Reuters Canada Limited	44,362,179.66	19,214,167.36	2008	2020
McKinsey & Company Canada	33,027,010.80	27,814,038.30	2011	2020
Hitachi Vantara Inc.	31,808,658.62	25,836,412.60	2017	2020
Oproma Inc.	9,313,196.97	5,979,864.02	2006	2020
Menya Solutions Inc.	8,509,727.64	1,726,628.64	2008	2019
Solana Networks Inc.	5,919,509.59	4,452,931.12	2007	2019
OODA Technologies	5,052,889.52	985,085.12	2015	2018

Effigis Geo-Solutions Inc.	4,656,448.56	3,670,720.50	2012	2020
SFU	4,571,396.97	3,222,705.43	2005	2020
Alithya Group Inc.	4,541,292.88	2,207,576.57	2017	2020
GlobVision Inc.	3,994,498.22	1,800,041.80	2009	2019
Amazon Web Services Inc.	3,699,176.74	3,606,212.54	2012	2020
Xtract Ai Inc.	3,514,611.00	3,454,768.50	2019	2019
Larus Technologies Group	2,965,128.38	22,289.25	2007	2019
MindBridge Analytics Inc.	2,301,530.40	2,054,481.88	2018	2020
Korah Limited	1,449,186.40	1,015,539.00	2017	2019
Idlewyld Analytics and Consulting Services, Sysabee, and the DAVHILL Group in Joint Venture	1,190,011.40	1,179,451.40	2014	2019
Beam Me Up Labs Inc. (BMU)	1,169,641.25	1,169,641.25	2018	2020
Palantir Technologies Inc.	997,434.00	997,434.00	2019	2019
Blue J Legal Inc.	513,747.91	512,814.89	2019	2020
Elevated Thinking	440,691.04	440,691.04	2019	2020
Lixar I.T. Inc.	417,312.75	414,600.75	2017	2020
IMRSV Data Labs Inc.	404,392.82	404,392.82	2019	2019
Avaya Canada Corp.	338,509.38	140,418.92	2005	2016
Global Spatial Technology Solutions Inc. (GSTS)	319,771.92	165,403.75	2014	2019
SageTea Inc.	274,600.17	274,600.17	2017	2019
Advanced Symbolics Inc.	227,614.58	227,614.58	2018	2020
Element AI Inc.	186,554.65	186,554.65	2017	2020
Sightline Innovation Inc.	61,195.89	61,195.89	2017	2017
ThinkData Works, Inc.	49,720.00	49,720.00	2017	2018
The Funding Portal Inc.	41,810.00	41,810.00	2017	2017
NuEnergy.ai	37,029.57	949.62	2017	2017
Solutions GeoLearn Inc.	32,464.38	32,464.38	2018	2019
Horoma Ai Inc.	24,978.32	24,978.32	2017	2017
DataPerformers Company Inc.	24,916.50	24,916.50	2019	2019
Wirespeed Networks Inc.	24,860.00	24,860.00	2018	2018
Stradigi AI	24,719.63	24,719.63	2018	2018
Cognitive Scale Inc.	22,000.00	22,000.00	2018	2018
Sametrica	16,950.00	31,640.00	2016	2016
vLex Canada	16,424.43	16,424.43	2020	2020
	26,468,067,840.99	**14,985,854,591.91**		

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