ABOUT CIFAR

CIFAR is a Canadian-based global charitable organization that convenes extraordinary minds to address the most important questions facing science and humanity.

By supporting long-term interdisciplinary collaboration, CIFAR provides researchers with an unparalleled environment of trust, transparency and knowledge sharing. Our time-tested model inspires new directions of inquiry, accelerates discovery and yields breakthroughs across borders and academic disciplines. Through knowledge mobilization, we are catalysts for change in industry, government and society. CIFAR’s community of fellows includes 20 Nobel laureates and more than 400 researchers from 22 countries.

CIFAR is supported by the governments of Canada, British Columbia, Alberta and Quebec, Canadian and international partners, as well as individuals, foundations and corporations.
TABLE OF CONTENTS

5 Executive Summary
8 Introduction
12 Theme Area 1: The Future of Work
14 Theme Area 2: Data Governance
16 Theme Area 3: Regulatory Innovation
18 Conclusion
CIFAR’S AI & SOCIETY PROGRAM

The AI & Society program at CIFAR brings together experts from across sectors, including academia, industry, law, ethics, healthcare, and government, to engage in in-depth discussions on some of the most important and timely challenges that AI is posing to society. These dialogues deliver new ways of thinking about issues and drive positive changes in the development and deployment of successful, beneficial and socially responsible AI technologies.

The AI & Society program is the fourth pillar of the CIFAR Pan-Canadian AI Strategy, a $125-million investment by the Government of Canada in Canada’s leadership in machine learning and training. CIFAR receives additional support for the strategy from Facebook and the RBC Foundation.

THE CANADA-U.S. AI WORKSHOP & SYMPOSIUM WAS HELD IN PARTNERSHIP WITH:

Innovation, Science and Economic Development Canada

U.S. Consulate General in Toronto
Panelists examine the role of policy in promoting economic growth between Canada and the U.S.

Pictured: Jennifer Miller (Innovation, Science and Economic Development Canada) with panelist John Weigelt (Microsoft Canada).
Artificial Intelligence (AI)-enabled technologies are poised to make a global impact. AI technologies today are being used to predict and diagnose diseases, accelerate the discovery of new materials, and streamline organizational processes such as hiring, production, and distribution. The introduction of such technologies, and their rapid deployment across all sectors, invites significant societal challenges that must be addressed in a way that fosters economic innovation and protects the interests of Canadians and Americans.

Canada and the United States (U.S.), in addition to sharing a border, have many shared interests and values that bind the two countries together, creating natural opportunities for collaboration on issues that impact both their citizens and economies. In the spirit of collaboration, CIFAR forged a partnership with Innovation, Science & Economic Development Canada and the U.S. State Department to explore innovative approaches to public policy that could support the development of competitive AI strategies, while mitigating potential societal risks.

As a result of the partnership, CIFAR convened a private workshop and public symposium on January 15–16, 2020. At a time when new regional initiatives in both the east and the west are emerging to promote cross-border trade and economic development, this first-of-its-kind symposium was timely. It convened an impressive group of cross-sector experts to explore the unique opportunities and challenges of AI-supported technologies, and to identify areas for actionable Canada–U.S. collaboration moving forward. The event also brought together Canadian and U.S. experts from industry, government, civil society, and academia to examine opportunities and to address solutions for potential issues such as privacy, safety, and equity.

Three themes emerged from the closed workshop that were particularly relevant to the cross-border nature of this unique Canada–U.S. gathering: the future of work, data governance, and regulatory innovation. When discussing these themes, participants agreed that Canada and the U.S. were at a critical juncture requiring immediate action. The group set out to test and develop innovative new approaches to stimulate economic innovation while protecting the citizens of both countries.

Across all three themes, it was agreed that there was a need for the private sector, government, academia, and civil society to work together to stimulate new ways of thinking, and challenge the “business as usual” approach. Participants noted that high-level discussions of ethical frameworks, while previously useful, do not address sector-specific cases. The consensus was clear that sectors should develop sandboxes, or isolated testing environments, that enable leaders to experiment and take small, calculated risks. Experimenting with sandboxes would provide government and industries the ability to safely explore best practices and strategies that could be implemented. Actionable projects that involve cross-border collaboration would ensure that these applications are suitable in the Canadian and U.S. contexts.

Participants developed the following recommendations to address these concerns:
FUTURE OF WORK

Both countries have a high demand for talented and skilled AI professionals while also sharing concerns about labour market disruption. Private firms have found effective ways of upskilling their staff, and opportunities exist to share these programs more. Approaches to address these challenges include:

- Establishing social safety nets to protect workers who face labour disruption; providing incentives for workers pursuing retraining programs that are made available through subsidies and EI support.
- To address the skills gap and ensure greater consideration for ethics, academic institutions can update standard curricula to include ethical values for software engineers and data scientists, and include basic AI skills in other programs, like business administration.
- Public agencies and small companies can work with large technology corporations to make educational and certification programs available to all workers to promote upskilling and retraining for technical competencies.

At a time when new regional initiatives in both the east and the west are emerging to promote cross-border trade and economic development, this first-of-its-kind symposium was timely.

DATA GOVERNANCE

Data governance plays an important role in harnessing the opportunities that new technologies bring. How firms and governments collect, use, and deploy data will need to be considered carefully with respect to ethical principles, including privacy and equity. The ideal state of data governance was characterized by open data, accessible at different levels of detail for a wide range of groups, and underpinned by a framework of trust.

- Governments and public agencies can begin by establishing data trusts for sectors that do not collect personal data, such as natural resources and agriculture. This can demonstrate the gains from AI applications without compromising on privacy, and develop best practices for applying these methods to more sensitive sectors, like healthcare.

REGULATORY INNOVATION

Coordinated regulatory frameworks need to be established to help both countries manage the risks and harness the opportunities that AI presents.

- Governments should experiment with regulatory options in simulated environments, or “sandboxes”, to assess practical risks before implementing them in practice.
- Regulatory regimes tend to be slow-moving, rigid, and overly complex for the current pace of technological advances. New models for regulatory reform should be considered to address these shortcomings in the longer term.

We must cultivate public trust in technological advancements and the ability to address societal concerns, while enabling innovation and market potential. In order to achieve this, policymakers were encouraged to continue working together with civil society, industry, technical experts, and members of the public in addressing the complex considerations that technological advances raise. This report outlines the main challenges, strengths, opportunities, and solutions that were discussed in each of the three main themes over the course of the private workshop and public symposium.
Panelists and speakers at the Symposium emphasized the importance of industry and government working together to safely explore best practices and strategies that could be to promote economic innovation in AI.

Pictured: Karen Bhatia (NYC Economic Development Corporation)
Canada and CIFAR have a rich history of supporting research and innovation in AI. Many of the advances in machine learning today are a direct result of breakthroughs made in the understanding of neural networks and their potential for deep learning in machines. CIFAR launched one of the first AI research programs, Artificial Intelligence, Robotics & Society (founded in 1983). In 2004, CIFAR launched the Neural Computation & Adaptive Perception program (NCAP), led by world-renowned AI researcher Geoffrey Hinton. In 2017, the Government of Canada appointed CIFAR to develop and lead a $125-million Pan-Canadian AI Strategy, the world’s first national AI Strategy.

The CIFAR AI & Society Program, a key pillar of the CIFAR Pan-Canadian AI Strategy, brings together experts from across sectors, including academia, industry, law, ethics, healthcare, and government, to engage in in-depth discussions on some of the most important and timely challenges that AI is posing to society.

Canada and the U.S. have a unique relationship that is bonded by shared values and a rich history of collaboration. Given the global nature of the societal challenges posed by AI, including privacy, ethics, accountability, and the great promise it holds in delivering positive societal benefits, it is crucial that Canada and the U.S. collaborate together and examine solutions for economic prosperity. Canada and the U.S. already hold valuable partnerships that enable the flow of goods, products and services between the two countries, but in order to remove the barriers to economic innovation, it is essential for both countries to explore how the future of AI-enabled technologies will impact the citizens they serve, and to put into action tactics that will fuel rather than inhibit innovation.

On January 15-16, 2020 CIFAR’s AI & Society Program partnered with Innovation, Science & Economic Development Canada and the U.S. Consul General in Toronto to host the Canada-U.S. AI Symposium on Economic Innovation. The event consisted of a full-day private workshop for Canadian and American experts from industry, government, civil society and academia to explore innovative approaches to public policy that could support the development of competitive AI strategies, while mitigating potential societal risks.

Canada and the United States have many opportunities for collaboration in AI that could have a positive impact on the citizens and economies of both countries.

Greg Stanford (U.S. Consulate General in Toronto), Dr. Alan Bernstein (CIFAR) and Jordan Zed (Innovation, Science and Economic Development Canada).
CIFAR hosted a private, in-person workshop which was attended by 20 Canadian and American experts from industry, government, civil society and academia. Participants attended two plenary sessions to engage the group in the opportunities and challenges that Canada and the U.S. face in fostering economic growth with AI-enabled technologies:

- **Effective AI Industrial Strategies to Promote Regional Development** (led by John Weigelt, Microsoft Canada and Karen Bhatia, NYC Economic Development Corporation);
- **Supportive Policy Environments for Promoting AI Industrial Growth and the Development and Deployment of Beneficial and Socially Responsible AI** (led by Gillian Hadfield, University of Toronto and Jane Fountain, University of Massachusetts Amherst).

The workshop participants broke out into groups in the afternoon to explore priority areas for harnessing AI technologies within three key themes: the future of work, data governance, and regulatory innovation. Participants identified opportunities and potential roadblocks to deploying AI technologies within the context of these themes. The workshop concluded with a list of recommendations for addressing such roadblocks, identifying potential strategies for deploying AI technologies into the economy, and examined promising opportunities for cross-border collaboration between both countries.

The events of the public symposium include:

- CIFAR CEO & President Dr. Alan Bernstein opened the public event, with welcome remarks from Director General Jordan Zed, Innovation, Science & Economic Development Canada and U.S. Consul General in Toronto Greg Stanford. The remarks set the stage for open discussions around AI and its implications for society.
- The University of Toronto’s Gillian Hadfield delivered a keynote presentation, AI Policy and Innovation.
- Jennifer Miller (Innovation, Science and Economic Development Canada) moderated a panel on the topic, AI Policy and Economic Growth. The panel discussion invited experts Jane Fountain (University of Massachusetts Amherst), Trooper Sanders (Benefits Data Trust) and John Weigelt (Microsoft Canada).
- A second panel, AI Policy and Responsible Innovation, was moderated by Sara Jordan (Virginia Polytechnic Institute and State University) and featured Karen Bhatia (NYC Economic Development Corporation), Yong Suk Lee (Freeman Spogli Institute for International Studies), Marc-Étienne Ouimette (Element AI, Canada).
- The event concluded with closing remarks from Vice-President, Engagement & Public Policy Rebecca Finlay (CIFAR).
This report summarizes the discussions that took place over the course of the Symposium, including insights and recommendations participants generated through their discussions.

Three primary themes emerged as particular areas for future collaborations: the future of work, data governance and regulatory innovation.
THEME AREA 1

THE FUTURE OF WORK

Industry leaders, governments, civil society and academia are all being affected by changing demand for skills as a result of the deployment of AI. Both Canada and the U.S. have growing foundations of AI expertise.

Canada has three national AI centres of excellence that work in close collaboration with CIFAR through the Pan-Canadian AI Strategy: Mila in Montréal, Amii in Edmonton, and the Vector Institute in Toronto. The national AI institutes work in collaboration with a dozen academic universities and hospitals in Canada, attract world-class international talent, and are growing the capacity for AI expertise in Canada. The U.S. is home to some of the world’s largest technology corporations, such as Google, Amazon, and Facebook, as well as leading research universities, all of which train and enable innovation.

Both countries are seeking better ways to stimulate the exchange of ideas and talent, and foster collaboration that will benefit both sides of the border. Canada and the U.S. share the common objective of fuelling commercialization through innovative research. This requires the continuous flow of talent and ideas between countries, in particular between Canada and the U.S. International collaboration between research and industry is considered critical to generating economic growth and further technological advancements that will benefit all citizens.

While both countries have access to world-class experts in research and development, there are gaps in the labour market for the skills and experience needed to apply AI tools to existing products and business operations. These skills include data analytics, data management, and machine learning. Access to these skills could have a profound impact on the application of AI tools in industry, as they hold great promise for increasing efficiency and streamlining business operations. Large corporations have addressed the skills gap by developing training programs for their employees; however, this remains a gap for smaller companies and public-sector institutions. The shortage of skills presents an opportunity for displaced workers whose jobs are disrupted by technology. Companies might consider retraining these workers with the technical skills necessary to either augment their current tasks or support the creation of new tasks and roles.

A comprehensive response to the effect of AI-enabled technology on the labour market needs to address three key issues:

1. The first is how to bring together private firms, governments, and non-governmental organizations to address the growing number of labour force transitions. Workers at both entry- and mid-career levels need to retrain and keep up with technological changes. Those that do not retrain may be at risk of displacement. Large tech firms have been proactively retraining and upskilling their staff in-house. These processes could inform public retraining programs. Retraining programs need to be physically, financially, and practically accessible to workers. Programs could be enabled through subsidy programs and other social safety nets, to encourage workers to pursue retraining.
2. Firms and governments need to work together to attract and to retain top talent. This requires addressing issues with immigration agencies to seamlessly facilitate the exchange of talent and cross-border collaboration. Small- and medium-sized enterprises face many barriers to accessing the specialized talent they need to harness new technologies.

Professionals on both sides of the border face practical obstacles to international collaboration as a result of restrictive immigration policies and visa processes. Changing immigration processes is politically challenging, but would allow firms and experts to work with cross-national teams, increase efficiency, and encourage closer relationships between the two countries to promote product development and job growth. Governments need to coordinate efforts to support the movement of talent between Canada and the U.S. more quickly and efficiently to boost productivity.

3. Finally, governments and other actors must ensure that productivity gains are equitably distributed. Technological disruption of work may lead to mass unemployment, either temporary or permanent. This could result in more people requiring access to adequate social support. Universal basic income was presented as a theoretical solution, but broadening the availability of educational and training opportunities can be effective and practical in the short-term.

Firms that partner with government and non-profit organizations can explore ways to hire outside of traditional catchment areas, and recruit people from well-tailored training programs in areas like cloud computing and cyber security. The aforementioned training and reskilling programs can also be effective at mitigating long-term labour disruption.

The shortage of skills presents an opportunity for displaced workers whose jobs are disrupted by technology. Companies might consider retraining these workers with the technical skills necessary to either augment their current tasks or support the creation of new tasks and roles.

Educational institutions can play an important role in educating data scientists and software engineers by inserting ethical values into standard curricula, and including basic AI skills in other programs, like business administration. This would serve to address the broader AI skills gap while ensuring AI practitioners are conscientious of ethical considerations as they continue to deploy AI.

At this time, policymakers need to ensure educational institutions have the support and resources they need. Funding educational programs is one way to ensure the public is not left behind by the rapid pace of technological change. Such programs support the government in developing social safety nets and create economic incentives for reskilling.
AI requires large datasets to uncover patterns, from which it can extrapolate to make predictions and recommendations. As a result, many technologies need to draw on a variety of large-scale data sources which may include personal or sensitive information. This presents a challenge as individuals may not be willing to consent to the use of their information, or may not be aware that their information is being collected, or how it may be used or shared. As a result, Canadians and Americans are growing increasingly concerned about their privacy and expect governments and companies to take greater measures to protect it.

Fostering economic growth through the development and deployment of AI tools will require firms and governments to address concerns about privacy, access to, and the use of personal information. To ensure privacy concerns do not inhibit technological development, these ethical concerns apply to both Canada and the U.S. and need to be addressed to support growth in this area.

Ensuring integrity in machine learning practices and identifying human biases in datasets are also key ethical considerations for deploying AI. However, there were concerns raised about the extent to which addressing these biases is possible or necessary. Many existing human decision-making processes involve making judgements and using heuristics that can result in inequitable outcomes. There are a number of tools that can be used for auditing AI-enabled technologies for fairness of outputs. The challenge with such tools is they each operationalize “fairness” differently and do not necessarily align effectively with existing legal definitions of fairness. Therefore, it is important to consider the effect of AI on potential inequities, but to be conscious of these limitations, and to consider the inequities of our current practices.

In light of these growing concerns, government representatives and industry professionals from both Canada and the U.S. should have the mutual goal of advancing leadership in AI in a way that reflects the shared values of both countries. A framework of shared principles based on these values needs to be developed to address growing concerns about the implications of AI on privacy. Building public trust and developing a framework for responsible AI practices can serve to overcome roadblocks to progress while protecting the rights and privacy of Canadians and Americans.
Ensuring integrity in machine learning practices and identifying human biases in datasets are key ethical considerations for deploying AI.
Questions about data governance relate to a broader topic facing society: how can regulations keep up with the fast-paced changes that result from AI and other emerging technologies? Canada and the U.S. each have strong foundations in research, development, and commercialization, all crucial components for promoting AI-based economic growth. These countries also need to develop effective, flexible regulatory frameworks for adapting AI-powered processes to industrial activities. Regulators in both countries need to find ways to enable both industries and civic actors to apply AI both for industrial growth and to social issues.

To capitalize on AI’s potential, Canada and the U.S. need to overcome difficulties in coordinating AI policy responses, and to consider how the principles of fairness and privacy should be encouraged or enforced in practice. Responses need to ensure that applications are developed in ways that take into account privacy, security, and equity. This will build public trust in AI and address growing public concerns about how AI will impact citizens, such as the use of algorithms to determine credit scores and automated welfare administration tools. Public perceptions of AI affect not only available markets for new products, but also the permissibility of social and state applications.

Developing applications without thoughtful regulation may lead to public backlash, which can push governments into enacting ineffective and rushed regulation, and issues being addressed retroactively. Instead, governments, industry, and civil society need to work together to develop effective regulatory strategies to mitigate the risks and maximize the opportunities that AI presents.

Jurisdictions are concerned with a globally harmonized approach to regulating AI, or are afraid of regulating incorrectly, which has led to delayed action. And yet, governments are under immense pressure to take action and to regulate the use of AI-enabled technologies in this space. Phased regulations are a possible solution to this dilemma, which would allow regulators to address emerging issues experimentally.

Policy sandboxes, simulated environments for experimentation, are one approach to testing regulatory mechanisms safely. This approach could identify risks and problems before moving forward with formal regulation. Sandboxing can also be used to test products and services before they are deployed, particularly by public bodies.¹

It is important to incorporate public consultations into these processes to identify areas of public concern and build trust. Though sandboxing can delay commercialization and deployment of AI products, it is necessary for maintaining public trust and safety. It is important to address industry specific use cases, to avoid talking about sandboxing and AI policy in the abstract, and to focus on tangible regulatory issues.

¹ This is currently in practice by the New York City Economic Development Corporation.
Another option is to move from AI principles to regulation while maintaining flexibility. It is important to avoid enacting too many regulatory standards that prohibit or restrict the application of AI. Before moving forward with regulatory standards, there are a number of other options for ensuring that the development of new AI applications align with shared values and principles. Non-regulatory approaches could include:

- Developing sector-specific policy guidance or frameworks that would allow each sector to develop a unique set of guidelines for applying AI effectively and safely.
- Granting waivers and exemptions to enable pilots and sandbox trials of AI applications prior to enacting regulations.
- Consulting with industry groups during the framework development to share best practices and ensure that regulations do not inhibit economic opportunities.
- Employing voluntary consensus standards, under which firms hold themselves accountable to publicly-announced standards to promote responsible AI deployment.
- Establishing independent standards-setting agencies, who can regulate individual industries more efficiently than governments.
- Establishing private sector conformity assessment programs, under which private firms are contracted to monitor companies and ensure they are following government or independently-set standards.

Regulation is known to be slow to develop and difficult to implement, which presents the need for regulatory reform.

1 This is currently being done in the United Kingdom through the Office for Artificial Intelligence, which is a joint entity under the Departments for Digital, Culture, Media & Sport and Business, Energy & Industrial Strategy.

2 Finally, developing relevant, non-burdensome policy regulations can also be done through the establishment of designated AI offices that work alongside government agencies, so that they have access to the specialist knowledge needed to address AI questions related to their policy areas.
CONCLUSION

Policymakers, civic advocates, technical experts and industry actors alike urge that AI cannot create economic growth and positive societal benefits without some form of intervention.

Countries need to work together to take an active role in shaping how best to design and deploy new AI tools in a way that is both effective and responsible. The implications of AI in various policy areas need to be addressed using cross-border, consensual principles as a foundation. To ensure that we can develop effective guidelines for deploying AI in Canada and the U.S., sectors need to come together to shape effective processes developing, regulating and deploying new technologies.

This report is intended to stimulate actionable recommendations to inform future collaborations. CIFAR looks forward to working with our partners at Innovation, Science and Economic Development Canada and the U.S. Consul General in Toronto, as well as the participants from both days of the symposium to identify solutions that will inform future cross-border, cross-sector networks focused on responsible and beneficial AI solutions.
FURTHER READING

1. Deloitte Canada: *Canada’s AI Imperative*
2. CIFAR Pan-Canadian AI Strategy
3. Scoping the OECD AI Principles: Deliberations of the Expert Group on Artificial Intelligence at the OECD
4. White House Executive Order on Maintaining American Leadership in Artificial Intelligence
7. Virginia Eubanks: *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*
10. Organisation for Economic Cooperation and Development: “Automation, skills use and training”

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