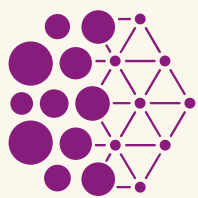




Quebec
artificial
intelligence
institute



Mila

Annual Report
From April 1, 2018 to March 31, 2019



Summary

1. Mission and values	4
<hr/>	
2. Messages from the leaders	6
<hr/>	
3. Mila in numbers	12
<hr/>	
4. The year in review	16
<hr/>	
5. AI talent	20
<hr/>	
6. Cutting-edge research	30
<hr/>	
7. Collaborative projects	34
<hr/>	
8. Socially responsible AI	46
<hr/>	
9. Financial information	48
<hr/>	
10. Board of Directors and management team	50
<hr/>	

Mission and values

1

Since 2017, Mila - Quebec Artificial Intelligence Institute has been a partnership between the Université de Montréal and McGill University, in close collaboration with Polytechnique Montréal and HEC Montréal. This non-profit organization brings together 450 people, including more than 300 leading AI researchers.

Our mission

Mila's mission is to be a global pole for scientific advances that inspires innovation and the development of artificial intelligence (AI) for the benefit of all.

Our cornerstones

AI talent

We are dedicated to attracting, training and retaining a diversified pool of talents recognized for their high expertise in machine learning.

Advanced research

We seek to achieve the highest levels of scientific leadership in the development of novel approaches in machine learning for AI.

Collaboration projects

We contribute to projects, platforms and partnerships in collaboration with a range of organizations to accelerate economic and social innovation.

Social influence

We want to stimulate a democratic dialogue on the potential of AI and the importance of its ethical and responsible development.

Our values

Mila values are the foundations on which our strategic vision is built and define the DNA of our Institute.



Messages from the leaders

2

Message from the Chair of the Board

My involvement in developing a strategy to put artificial intelligence at the heart of Quebec's development began after I met with Yoshua Bengio. From the beginning, he was able to tell me about the potential of this new science, as well as its challenges, with great honesty. His vision was clear, tangible and based on the values of openness, collaboration and transparency in research and development.

In recent years, artificial intelligence (AI) has grown at an extraordinary pace in Quebec, Canada and around the world. AI initiatives and decisions have accelerated thanks to the willingness and alignment of governments, academia and the business world.

In March 2017, the Government of Canada gave CIFAR the responsibility of coordinating a pan-Canadian AI strategy and establishing three centres of scientific excellence in AI in Canada: Mila in Montreal, the Vector Institute in Toronto and Amii in Edmonton. In its 2017-2018 budget, the Government of Quebec confirmed its commitment to create an AI cluster with a budget of \$100 million over five years.

It was in this context that I agreed in May 2017 to co-chair, with Guy Breton, Rector of the Université de Montréal, a steering committee responsible for proposing a strategy to the Government of Quebec for developing Quebec's AI ecosystem.

The first strategic direction was to ensure the growth and long-term viability of academic research in artificial intelligence in Quebec. For this reason, Mila - Quebec Artificial Intelligence Institute was incorporated in 2017, thanks to the joint efforts of the Université de Montréal and McGill University, with the participation of Polytechnique Montréal and HEC Montréal.

In the spring of 2018, we established Mila's new governance with the hiring of Valérie Pisano as President and Chief Executive Officer, the appointment of Yoshua Bengio as Scientific Director and the creation of the new Board of Directors.

The growth of Mila and AI has also helped attract some 30 companies to the metropolitan area, which have invested more than \$700 million.

As soon as it came into power, the new Quebec government reiterated its support for the AI development strategy. In its 2019-2020 budget, the Ministry of Economy and Innovation confirmed commitments totalling more than \$330 million, including \$32.5 million to support Mila's growth.

In the years to come, public investment will play a very important role in the development of a dynamic AI ecosystem, both by maintaining academic excellence and by providing social and economic benefits.

This report will present what has been accomplished and demonstrate that Mila's management and the entire team are firmly committed to implementing this new Mila and our collective vision for AI in Quebec and Canada.

On behalf of the members of the Board of Directors, I would like to express my sincerest gratitude to the governments of Quebec and Canada for their substantial and invaluable support in accomplishing our mission. I would also like to thank all the companies and institutions that have remained or become partners with Mila.

Finally, I would like to highlight the extraordinary commitment shown by Mila's team during this first year, and extend thanks to all the members of the Board of Directors for their generosity and contribution to the success of this project.

Pierre Boivin



Message from the President and CEO

I am very proud to present this first annual report from Mila.

Over the past year, we have the Mila's foundations by consolidating our talents in one place, recruiting an experienced team, developing strong partnerships and fostering scientific innovation.

Bringing several hundred researchers from four major Montreal universities together in one place was a major milestone in this year of structuring, and one of the factors that testify to the boldness and uniqueness of our model.

Today, Mila has the world's largest concentration of academic researchers in machine learning. To create this community of more than 300 highly talented people, some of whom are among the best known and most cited in the world, our new spaces aimed at fostering excellence, collaboration and the exchange of ideas.

In addition, to stimulate innovation and fuel the dynamism of our AI ecosystem, we also created spaces to host new emerging compagnies launched by Mila students, thanks to the Espace CDPQ | Axe IA, as well as the research and innovation laboratories of Mila partners companies. Finally, major gathering places, such as the Auditorium and the Agora, were designed to encourage meetings, discussions and debates within this vibrant community.

This first year was also a major year of growth. First, we were very successful in our efforts to retain and recruit top professors and researchers in AI, notably through the CIFAR's appointment of 14 research chairs in AI. We invested in the development of two teams crucial to achieving our mission: our team of applied AI researchers and our team specializing in innovation, development and technology. In addition to these leading experts, we had the privilege of welcoming a team of dedicated professionals with complementary talents, to ensure the smooth running of our organization and its activities with regard to finance, communications, event management and partnerships.

Finally, in addition to our work with the Government of Canada and Quebec's Ministry of the Economy and Innovation, we established key partnerships with a consortium of companies committed to Mila's success. Our existing partners reaffirmed their confidence in our researchers, while many new companies were inspired by the Mila project and chose to get involved. This network will undoubtedly accelerate our collective efforts in economic and social innovation, in addition to exploring new avenues of research.

In conclusion, I would like to congratulate Professor Joëlle Pineau of McGill University on receiving the Governor General's Award for Innovation, and Professor Yoshua Bengio on receiving the prestigious A.M. Turing Award

from the Association for Computing Machinery. This prize, considered the “Nobel in Computer Science,” was awarded jointly to him and his colleagues Geoffrey Hinton and Yann LeCunn, for their work on deep neural networks.

I am deeply grateful to the entire team for all our achievements in this first year. I am confident that we will continue to build on this momentum next year by implementing our strategic vision and taking advantage of the opportunities that we have developed. Thank you to my colleagues on the management team, to all the talented people who work at Mila, and to the Board of Directors for their contribution to our success.

Valérie Pisano



Mila

McGill

Université



Message from the Scientific Director

Our researchers were very active throughout the year, and we focused heavily on Mila's values to strengthen our teams, broaden the international reach of our researchers and expand scientific collaborations.

Attracting the world's best researchers is a complex task that requires special and ongoing consideration of several factors. The presence of a large group of recognized professors in a specialized field, who share the same values of academic freedom, open science, open-mindedness, cooperation, transparency, humanism, ethics and social conscience, gives Mila a distinctive identity.

The design of the new premises has encouraged the consolidation of complementary leading-edge knowledge and expertise in deep and reinforcement learning. The pooling of resources has made it possible to strengthen synergies between the research teams of partner universities, focus on the intersection of our two research areas and work on learning agents. This evolution is very important for basic research and its applications, as it encourages us to think more carefully about the potential negative consequences of certain scientific advances.

Mila's new spaces, combined with our commitment to AI for all and the organisational culture we are developing, have helped us recruit many new professors and associate professors. Their presence will allow us to significantly increase our overall capacity to recruit and mentor young researchers.

To expand the talent pool, we are collaborating with the Université de Montréal to launch two graduate programs at the master's level, one of which produced a first cohort of graduates in 2019. We also started an internship program to familiarize students with the challenges associated with deploying AI-based applications.

We also hope that the development of AI will benefit all by encouraging democratic dialogue on its potential and its ethical and responsible development. This commitment is attracting a growing number of researchers to Mila, people who will eventually pursue their careers with organizations that can improve quality of life, or whose projects are aimed at improving collective well-being.

A number of Mila's researchers contributed to designing the *Montreal Declaration for the Responsible Development of Artificial Intelligence*, which aims to guide the development of AI. During the year, dozens of our researchers put this commitment into practice by publishing scientific articles or engaging in research projects that pursue social objectives such as raising public awareness of the impacts of climate change, or improving treatments for certain cancers.

The presence of many Mila researchers at all major international AI scientific events throughout the year, as well as their numerous publications and awards, have greatly contributed to Mila's reputation on the national and international scene.

In the coming year, we will continue to recruit seasoned professors and student researchers in a targeted way, while maintaining the mentoring capacity of our high-calibre research professors. Our researchers will also participate in more projects with multiple partners and will continue to have an impact on the international scene. In the summer of 2020, the 16th edition of CIFAR's Deep Learning and Reinforcement Learning Summer School (DLRL Summer School) will be hosted by Mila in Montreal and will bring together about 300 researchers from around the world.

Yoshua Bengio

Mila in numbers

3

50

A community of professors, students and graduates from more than 50 countries.

260

Mila organized 260 workshops, seminars, presentations and conferences.

179

179 students (postdocs, doctorate, master's degree).

7000

Mila's researchers have earned nearly 7,000 media mentions in Canada and around the world.

40

More than 40 Canadian companies have benefited from technology transfer.

19

Nineteen companies, large corporations and start-ups from various sectors became new members of Mila.

2000

Nearly 2000 scholarships were awarded to students.

20

Of the 46 Canada CIFAR AI Chairs, 20 are Mila researchers.

41

The number of professors has risen substantially, reaching 41 at the end of the financial year.

300

An active community of more than 300 researchers.

100

Mila's researchers have published more than 100 articles at major conferences and in prestigious scientific publications.

90 000 ft²

In January 2019, faculty, staff and students from affiliated institutions moved into Mila's open and dynamic 90,000 square-foot space.

200

More than 200 organizations have benefited from Mila's financial support or services.

300

In January 2019, Mila hosted nearly 300 people from government, industry and the AI ecosystem for the inauguration of its new premises.

44

Researchers from Mila organized 44 seminars on machine learning.

174

Researchers from Mila conducted 174 reading group meetings covering a wide variety of topics to help advance science.

\$861M

861 million \$ of AI investments in Greater Montreal in 2018.

The year in review

4

Highlights of the year

After being recognized as a centre of excellence in AI by the Government of Canada's Pan-Canadian Artificial Intelligence Strategy, Mila was incorporated in July 2017. In early 2018, the Université de Montréal, McGill University, Polytechnique Montréal and HEC Montréal brought together their AI researchers to create a team of 180 people, including nine professors-researchers and 140 students.

April to July

In the spring of 2018, Mila developed a vision to help the organization get started and grow as a research institute and a catalyst for economic and social innovation. The plan resulting from this vision proposes to bring together, under the same roof, AI researchers from four university institutions (UdeM, McGill, HEC and Polytechnique), as well as create spaces for industry partners, initiate applied artificial intelligence activities and support the creation of new AI companies.

After choosing a building in Montreal's Mile-Ex district, Mila went into production mode in June 2018, when it hired its President and CEO, Valérie Pisano, appointed its Scientific Director, Yoshua Bengio, and created a Board of Directors headed by Pierre Boivin. The announcement of Mila's new address quickly attracted the interest of many players in the AI ecosystem, who chose to move into the same building or nearby, thereby contributing to the emergence of a genuine artificial intelligence district in Mile-Ex.

At the unveiling of the Quebec government's Strategy for the Development of Quebec's Artificial Intelligence Ecosystem in June 2018, major financial support for Mila's development was confirmed for a five-year period, with the aim of increasing its capabilities and deploying its unique model.

To create this bold model, it was necessary to put all the organization's elements in place, recruit the management team and talent specialized in applied AI, innovation, development and technology.

Bolstered by Mila's reputation and the global renown of its Scientific Director, an international recruitment campaign launched in the summer of 2018 helped strengthen the organization's core of leading professors and researchers. Mila also held a very successful open house in March 2019 to recruit high-calibre international student researchers. By the end of 2018-2019, the number of professors had grown from nine to 41, and the number of researchers from 140 to 306.

“ I came to work at Mila for the opportunity to work with the pioneers of deep learning such as Yoshua Bengio. I also appreciate the work environment, which I find to be cooperative and progressive. ”

Jian Tang

Assistant Professor
HEC Montréal
CIFAR Chair holder

August to December

On December 3, 2018, at the first annual meeting of the Pan-Canadian Artificial Intelligence Strategy, CIFAR announced the creation of 29 AI research chairs, 14 of which were awarded to Mila researchers.

Ministers from member countries of the G7 and heads of AI development also met on the sidelines of this conference to discuss a framework for AI development following the leaders' discussions at June's G7 Summit in the Charlevoix.

The Montreal Declaration for the Responsible Development of Artificial Intelligence was unveiled on December 4, the day after the launch of the International Observatory on the Societal Impacts of Artificial Intelligence and Digital Technologies. A number of Mila researchers participated in the discussions, which led to the drafting of the declaration and the creation of the observatory.

On December 13, Mila and the Caisse de dépôt et placement du Québec announced a partnership to promote the growth of AI technology companies. The creation of the Espace CDPQ | Axe IA gives young companies access to Mila's AI expertise, as well as the CDPQ's advice and network. In the spring of 2019, Mila welcomed the first nine companies for a period of 12 months.

January to March

In January 2019, the research professors and student researchers from the four partner universities affiliated with Mila, along with the entire Mila team, moved into the O Mile-Ex complex. The new premises were inaugurated on January 28, in the presence of Pierre Fitzgibbon, Quebec's Minister of Economy and Innovation, and more than 200 partners and stakeholders in the Quebec and Canadian artificial intelligence ecosystem.

On March 27, Yoshua Bengio, along with his colleagues Geoffrey Hinton of the University of Toronto and Yann LeCun of New York University, received the A.M. Turing Award, regarded as the "Nobel Prize" in computer science, from the New York-based Association for Computing Machinery (ACM), for his contribution to the conceptual foundations of artificial intelligence.

During the year, Mila renewed seven partnerships and signed 11 new agreements with major companies. For example, in March 2019 Samsung announced the creation of the SAIT AI (Samsung Advanced Institute of Technology Artificial Intelligence) Lab Montreal. This project is led by Simon Lacoste-Julien, a professor at the Université de Montréal and a member of Mila, and will focus on speech recognition, machine translation and natural language comprehension.

The corporate laboratories have also attracted plenty of interest, and companies began to set up shop there in late spring.



On March 27, 2019, the Association for Computing Machinery awarded Yoshua Bengio and his colleagues Geoffrey Hinton and Yann LeCun the A.M. Turing Award, regarded as the "Nobel Prize" in computer science, for the conceptual and technical breakthroughs that have made deep neural networks an essential component of computing.

Honouring Yoshua Bengio

Yoshua Bengio is a full professor in the Department of Computer Science and Operational Research at the Université de Montréal, founder and Scientific Director of Mila, Scientific Director of IVADO, Canada Research Chair in Statistical Learning Algorithms, Fellow and Co-Director of the CIFAR Machine Learning Program and co-founder of Element AI and Imagia, two leading companies in Montreal's AI ecosystem.

The quality of the translations produced by Google translate increased dramatically when Google switched from phrase-based translation to using recurrent neural networks with content-based soft attention. The fact that neural networks trained end-to-end are now the best way to do machine translation is the most significant incursion so far of deep learning into the heartland of symbolic AI and Yoshua played a major role in this development.

Geoffrey Hinton, CC, FRS, FRSC

Emeritus Prof., University of Toronto
VP and Engineering Fellow, Google
Chief Scientific Adviser, Vector Institute

Yoshua has made numerous outstanding contributions to machine learning. But some of his contributions have been far ahead of their time, and have had a very large and lasting impact. If I had to mention only four, it would be (1) generative adversarial networks (GANs), (2) discriminative learning for structured prediction, (3) neural language models, and (4) attention-based architectures for neural machine translation.

Yann LeCun, PhD

Silver Professor, New York University
Chief AI Scientist, Facebook

In addition to his many impactful contributions to technology, Professor Bengio is among the few who are close to answering some of the biggest questions in science: What is thinking? What is intelligence? What is awareness? How do we build intelligent machines? How do we harness intelligence to improve our planet and our society?

Nando de Freitas

Principal Scientist, ML Team Lead, DeepMind

Yoshua is an outstanding scientist of the highest caliber, driven by the ultimate goal to advance knowledge and thus help humankind. His influence on the field has been immense, both through his work and the research culture that he has nurtured in his lab.

Bernhard Schölkopf

Director, Max Planck Institute for Intelligent Systems
Member, Leopoldina

Yoshua has been a leader in the debates around the social impact of AI; in particular, with the Montreal Declaration for the Responsible Development of AI. He also plays a key leadership role in the scientific community. He has been instrumental in transforming the city of Montreal to a world-leading hub for Artificial Intelligence.

Neil D. Lawrence

Professor of Machine Learning
University of Cambridge

AI talent

5

The development of a dynamic artificial intelligence ecosystem requires a strong pool of high calibre researchers. Mila is working hard to develop a critical mass of leading researchers in artificial intelligence and expand the pool of professional talent available to companies and organizations.

In addition to mentoring student-researchers and training the next generation of AI leaders, Mila's professors-

researchers aim to achieve the highest levels of scientific leadership in the development of innovative approaches to machine learning.

In 2018-2019, recruitment efforts helped boost the number of faculty members from nine to 41. Fifteen of them are senior academic members, 18 are associate academic members and eight are industry members.



“ I’m a member of Mila because it’s a stimulating and welcoming research environment with an unparalleled number of passionate and talented students/researchers. ”

Hugo Larochelle

Adjunct Professeur, Université de Montréal
Director, Google Brain Montreal
Mila Associate Member

Equity, diversity and inclusion

Our institute is committed to promoting equity, diversity and inclusion in the various fields of its activities. This is reflected namely in our management, where women are strongly represented at all levels.

Mila currently has 3 women among its main academic members (Doina Precup, Joëlle Pineau, and Reihaneh Rabbany); they all hold CIFAR chairs. Over the next few years, the objective is to increase the representation of women within Mila, both among professors and students.

In addition, a committee dedicated to equity, diversity and inclusion issues, which will have the mandate of helping define a reference framework and preparing an action plan to promote an inclusive culture at Mila. This strategy complements the anti-harassment policy adopted by the Board of Directors in February 2019.



Main Academic Professors



Yoshua Bengio
Full Professor
Université de Montréal
Scientific Director - Mila
CIFAR Chair holder
2019 A.M. Turing Award

Yoshua Bengio received the A.M. Turing Award in March 2019 and is one of the most cited computer scientists in the world. His areas of expertise include deep learning, causality, recurrent neural networks, climate change, reinforcement learning, natural language processing and generative models.



Aaron Courville
Associate Professor
Université de Montréal
CIFAR Chair holder

Aaron Courville is conducting research on the development of models and algorithms for deep learning architectures, particularly the development of probabilistic models and inference methods, with applications that include computer vision and language processing.



Christopher Pal
Full Professor
Polytechnique Montréal, Element AI
CIFAR Chair holder

Christopher Pal's research focuses on artificial intelligence, computer vision, pattern recognition and machine learning with applications for computer graphics, natural language analysis and data mining.



Simon Lacoste-Julien
Associate Professor
Université de Montréal, Samsung
CIFAR Chair holder

Simon Lacoste-Julien's research interests include machine learning and applied mathematics, with applications for computer vision, generative models, machine learning theory, optimization and automatic processing of natural language.



Joëlle Pineau
Associate Professor
McGill University, Facebook
CIFAR Chair holder
Royal Society of Canada

Winner of the Governor General's Award for Innovation, Joëlle Pineau explores the development of new models and algorithms for planning and learning in complex and partially observable domains. She is also working on applying these algorithms to complex problems in the fields of robotics, health care, games and conversational agents.



Doina Precup
Associate Professor
McGill University, DeepMind
CIFAR Chair holder

Doina Precup is mainly interested in reinforcement learning, including AI applications in areas with social impact, such as health care. She is interested in machine decision making in situations of high uncertainty.



Pascal Vincent
Associate Professor
Université de Montréal, Facebook
CIFAR Chair holder

Pascal Vincent's research includes the basic computational principles that underlie the extraordinary ability to learn, understand and adapt to the environment that characterizes intelligence.



Guillaume Rabusseau
Assistant Professor
Université de Montréal
CIFAR Chair holder

Guillaume Rabusseau is particularly interested in tensor methods for machine learning, as well as designing learning algorithms for structured data using linear and multilinear algebra (e.g. spectral methods).



Laurent Charlin
Assistant Professor
HEC Montréal
CIFAR Chair holder

Laurent Charlin's research field include probabilistic models for decision making. A number of his contributions focus on these methods applied to recommendation systems.



William L. Hamilton
Assistant Professor
McGill University
CIFAR Chair holder

William L. Hamilton's research interests include machine learning, network science and natural language processing, with a special focus on graph learning and neural networks for graphs.



Ioannis Mitliagkas
Assistant Professor
Université de Montréal
CIFAR Chair holder

Ioannis Mitliagkas is focusing on large-scale statistical learning and inference problems, large-scale and distributed efficient algorithms, theoretical and data-dependent guarantees, as well as complex optimization systems.



Reihaneh Rabbany
Assistant Professor
McGill University
CIFAR Chair holder

Reihaneh Rabbany's research lies at the intersection of network science, data mining and machine learning, with a focus on analyzing real-world interconnected data and social good applications.



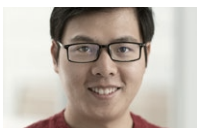
Jackie Cheung
Assistant Professor
McGill University
CIFAR Chair holder

Jackie Cheung and his group are conducting research on natural language processing to develop computer methods for understanding text and speech, as well as generate a language that is fluent and adapted to the context.



Blake Richards
Assistant Professor
McGill University
CIFAR Chair holder

Blake Richards is the 2019 recipient of the Canadian Association for Neuroscience's Young Investigator Award. His research aims to bring together experience and theory by testing hypotheses about brain learning derived from machine learning.



Jian Tang
Assistant Professor
HEC Montréal
CIFAR Chair holder

Jian Tang's research focuses include generative adversarial networks, neural network graphs, analysis of interconnected data, graph learning and molecular modelling.

Main industry professors and associate members

Main industry professors

Marc G. Bellemare

Adjunct Professor
McGill University, Google
CIFAR Chair holder

Fernando Diaz

Microsoft

Geoffrey Gordon

Adjunct Professor
McGill University, Microsoft Research
CIFAR Chair holder

Devon Hjelm

Adjunct Professor
Université de Montréal, Microsoft Research

Hugo Larochelle

Adjunct Professor
Université de Montréal, Google
CIFAR Chair holder

Nicolas Le Roux

Adjunct Professor
McGill University, Google

Danny Tarlow

Adjunct Professor
McGill University, Google

Associate members

Tal Arbel

Professor
McGill University

Mathieu Blanchette

Assistant Professor
McGill University

Marc-Antoine Dilhac

Associate Professor
Université de Montréal

Gregory Dudek

Professor
McGill University

Emma Frejinger

Associate Professor
Université de Montréal

Benjamin C. M. Fung

Associate Professor
McGill University

Jin L.C. Guo

Assistant Professor
McGill University

Xue Liu

Professor
McGill University

Guillaume Lajoie

Assistant Professor
Université de Montréal

Andrea Lodi

Full Professor
Polytechnique Montréal

David Meger

Assistant Professor
McGill University

Derek Nowrouzezahrai

Associate Professor
McGill University

Timothy J. O'Donnell

Assistant Professor
McGill University

Prakash Panangaden

Professor
McGill University

Liam Paull

Assistant Professor
Université de Montréal
CIFAR Chair holder

Michael Rabbat

Adjunct Professor
McGill University, Facebook

Derek Ruths

Adjunct Professor
McGill University

Alain Tapp

Full Professor
Université de Montréal

Frank Wood

Associate Professor
University of British Columbia
CIFAR Chair holder



Students from Canada and around the world

Mila's global reputation has attracted more than 110 new students, bringing the total to 248.

These new master's and doctoral students, as well as postdoctoral fellows, come from more than 50 countries around the world. Each of them brings and shares their scientific knowledge, passion and research skills, along with the richness of their languages and cultures. Here are some of them.

“ Mila offers an outstanding research environment, especially the critical mass of AI talent (young researchers, professors, visitors). I also appreciate that the mission is oriented towards basic research, education and AI for the benefit of all. ”

Joëlle Pineau

Associate Professor, McGill University
Director, Facebook AI Research Lab Montreal
Mila member



Sasha Luccioni
Canada
Postdoctoral Researcher
Université de Montréal

I work at Mila because it gives me the opportunity to apply the latest techniques in machine learning to make the world a better place. I love the fact that everyone is passionate about AI and wants to make a difference. It's really inspiring.



Akram Erraqabi
France
Doctoral Student
Université de Montréal

I chose to study at Mila because of the diversity of profiles and expertise available, as this offers an environment conducive to rewarding interactions. The Mila spirit is to research laboratories what the “start-up spirit” is to industry giants



Florian Golemo
Germany
Postdoctoral Researcher
Université de Montréal

One thing I really appreciate about Mila is that for every aspect of machine learning, from robotics to computer vision, there are many high-level professors who are experienced in these fields and happy to collaborate with motivated students.



Vincent Mai
Canada
Doctoral Student
Université de Montréal

Mila gives me the opportunity to learn and do research with world-renowned researchers in an open environment and in tune with my values.



Raymond Chua
Singapore
Doctoral Student
McGill University

I like Mila's open culture; everyone is accessible. There are also many reading groups and social events that help you learn and meet people who share the same ideas.



Charles C. Onu
Nigeria
Doctoral Student
McGill University

I chose to study at Mila because I have the opportunity to work with world-class professors, such as my advisor Doina Precup. Also because of Montreal: it's a beautiful city in many ways.



Yue Dong
Canada/China
Doctoral Student
McGill University

Mila offers me an outstanding environment to achieve my goal of becoming a researcher and an expert in natural language processing.



Victor Schmidt
France
Doctoral Student
Université de Montréal

I appreciate Mila for its academic excellence, as well as its ethical commitment to humanitarian causes.

Training programs

With its unique model, Mila contributes to the development of a stimulating research and innovation environment, as well as the creation of a thriving artificial intelligence ecosystem.

Mila welcomes interns, master's, doctoral and postdoctoral students from the Université de Montréal, McGill University, Polytechnique Montréal and HEC Montréal, all supervised by professors who are Mila members.

New programs

To expand the pool of professional talent for organizations and meet the needs of companies and institutions involved in developing and integrating artificial intelligence applications into their activities, the Université de Montréal, in partnership with Mila, has launched graduate programs with a professional vocation.

- **Professional Master's in Machine Learning**
The Professional Master's degree combines specialized training in machine learning with work experience in the industry.
- **Diploma of Higher Specialized Studies (DESS) in Machine Learning**
The DESS provides the basic knowledge required to implement advances in artificial intelligence based on machine learning, a specialized expertise in high demand.

Internship Fair

In the spring of 2019, Mila held its first Internship Fair at its new location. During this day of recruitment, about 50 students enrolled in the Professional Master's degree and the DESS came to meet the 20 or so representatives of Mila's corporate partners and Axe IA start-ups.

This very popular event, which helps retain talent in Quebec, enabled companies to discover the range of talent that is developing at Mila, while helping students explore the opportunities that their career path has to offer. Following the success of this first edition, Mila will hold two annual editions of the Internship Fair, in the spring and fall.



Deep Learning and Reinforcement Learning
Summer School Toronto

Machine learning schools

For a number of years, machine learning schools have played an important role in developing the Canadian artificial intelligence ecosystem. They encourage the next generation of AI researchers and help them build partnerships.

Since its beginnings, Mila has collaborated in organizing schools and events that have enabled hundreds of promising students from around the world, as well as Canadian professionals, to learn from the best AI researchers.

Schools co-organized by Mila

Deep Learning and Reinforcement Learning Summer School

July 25 to August 3, 2018

Organized in partnership with CIFAR, Vector Institute and Amii, the Summer School brought together more than 250 graduate students, postdoctoral fellows and industry professionals from more than 60 countries to explore the latest AI techniques, build research networks and identify opportunities for collaboration.

IVADO/Mila Deep Learning French School (3rd edition)

October 22 to 26, 2018

This edition brought together 350 computer science professionals, along with professors and students in science and engineering. They developed the theoretical and practical foundations needed to understand deep learning techniques, as well as deepened their knowledge of specific problems associated with implementing artificial intelligence projects in an industry environment.

School of Data Science and Healthcare (1st edition)

November 30 and December 2018

This first French-language school in data science and healthcare was co-organized by IRIC, IVADO and Mila. It was mainly aimed at health care professionals seeking to familiarize themselves with using data and its impact in the field of health care, existing concepts and methods in health care, the concrete applications of these methods in various health care fields, as well as ethical and legal issues.

Cutting-edge research



Thanks to its close ties with many universities and major industry players, Mila's scientific team, led by Yoshua Bengio, is making significant breakthroughs in basic and applied research, building on its recognized strengths in deep and reinforcement learning, as well as a culture that values freedom, discipline, transparency and collegiality.

During the year, the 15 senior academic members published about 100 peer-reviewed scientific papers, and about 30% of these papers involved co-authors from industry (compared to 14% in the previous year).

At the NIPS 2017 conference, held in Long Beach, California, Mila's affiliated researchers had 10 papers accepted. For the 2018 edition of this flagship event held in Montreal, this number rose to 17.

At the ICLR 2019 conference, held in New Orleans in May, 18 papers by Mila researchers were accepted, and one of them won the Best Paper Award for the article entitled *Ordered Neurons: Integrating Tree Structures into Recurrent Neural Networks*, presented by researchers Yikang Shen, Shawn Tan, Alessandro Sordani and Aaron Courville.

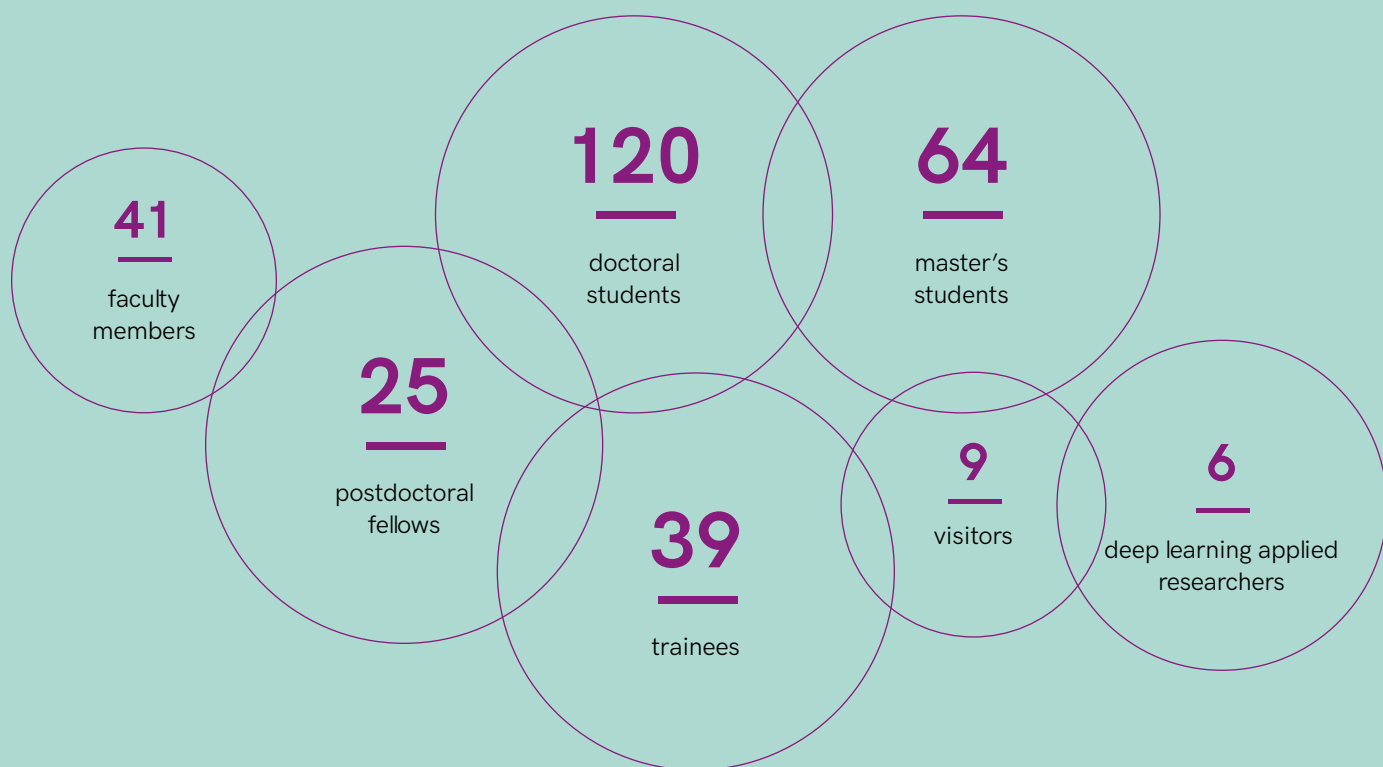


“ Mila is the best place to conduct interdisciplinary research because the focus is not only on research excellence, but also on critical thinking about the usefulness and impact of the results on society. ”

Emma Frejinger

Associate Professor, Université de Montréal
Mila Associate Member

At the end of last year, Mila had 306 researchers, or:



Awards and honours

Yoshua Bengio

- August 2018 - 50th Anniversary Medal of the Ministry of International Relations and La Francophonie
- March 2019 - A.M. Turing Award from the ACM (with Yann Lecun and Geoff Hinton)

Joëlle Pineau

- 2018 - Fellow, Association for the Advancement of Artificial Intelligence
- May 2018 - E.W.R. Steacie Memorial Fellowship (NSERC)

Blake Richards

- April 2019 - Ontario Early Researcher Award

Jackie Cheung

- June 2018 - Best Paper Award Association for Computational Linguistics

Canada-CIFAR Chairs in AI

Chair holders appointed in December 2018

- Yoshua Bengio, Université de Montréal
- Simon Lacoste-Julien, Université de Montréal
- Jian Tang, HEC Montréal, Université de Montréal
- Jackie Cheung, McGill University
- Hugo Larochelle, Université de Montréal
- Ioannis Mitlagkas, Université de Montréal
- Doina Precup, McGill University
- Blake Richards, McGill University
- Aaron Courville, Université de Montréal
- Joëlle Pineau, McGill University
- Christopher Pal, Polytechnique Montréal
- Marc G. Bellemare, McGill University
- Pascal Vincent, Université de Montréal
- Reihaneh Rabbany, McGill University



Innovation, development and technology

To support the scientific advances of its researchers and accelerate the evolution of machine learning, Mila offers advanced expertise in software engineering and research tool development, as well as training in new technologies. Our team of experts in innovation, development and technology work to ensure that researchers have access to state-of-the-art technologies that help them push the frontiers of knowledge. Here are some examples of projects completed or in progress.

Theano Python Software Library

Theano is a pioneering software platform for machine learning developed at Mila and recognized internationally as having fostered the democratization of AI research. Its use and widespread deployment has contributed to Mila's reputation and the excellence of its scientific work.

BabyAI Replicating a child's learning process

This research platform is designed to assess and explore methods allowing intelligent agents to discover and understand their environment through natural language conversations with a guide who helps them progress gradually progress to more complex tasks, inspired by the way children learn.

Diplomacy Negotiation game for dialogue

This technology platform, based on the game Diplomacy, aimed at examining dialogue systems, emerging language, sequencing of social dilemmas, imperfect information and the forming of coalitions. This research project, which requires a major amount of software engineering, is currently one of Mila's most important undertakings.

“ The Diplomacy project is one of the most significant research projects taking place at the present time within Mila. To be able to achieve this goal, engineering work is required to support building a game engine that allows for negotiation. ”

Aaron Courville
Associate Professor
Université de Montréal

Collaborative projects

7

Mila's partners

Relationships with partners have always played a major role in Mila's development. These partners are leaders in their industries, whether in Quebec, North America or the world. They can also be start-ups experiencing rapid growth, especially in AI. Over the past year, our number of partners increased considerably.

Mila's new organization offers companies and partners improved access to talent and the opportunity to be associated with a prestigious AI brand. They also have more access to tools and activities for communicating and sharing knowledge, as well as the opportunity to collaborate with research professors on their projects, or benefit from the services of our team of applied AI researchers.

At the end of the period, we had 19 formal partnerships with industry, and this number will rise in 2019-2020.



“ We are big believers in Professor Bengio’s mantra about using AI for good, and so we will collectively drive a mission of improving the safety of autonomous vehicles and robots, responsible accuracy of video surveillance, and improved experience with consumer computer vision applications. ”

Allan Benchetrit
Industry Partner
Algolux

adeptmind

 algolux

 Druides



Google

 Hydro
Québec

IBM Research AI

icentia™


imagia

keatext

 Logibec

 Microsoft

 NVIDIA

Panasonic®

 QUANTUMBLACK
A MCKINSEY COMPANY

SAMSUNG

stradigi AI

 SILICON VALLEY
community foundation®

Montréal 

Partners on March 31, 2019



Corporate laboratories

To foster synergy within the AI ecosystem, a dozen spaces have been created to welcome and accommodate teams of tenant partners.

This proximity to our partners encourages meetings, the exchange of ideas and collaboration, with a view to accelerating the development of knowledge and the progress of work, for the benefit of the companies.

First tenants of the corporate laboratories

- Hydro-Québec
- Imagia
- QuantumBlack
- Samsung
- Ville de Montréal

Samsung's new AI laboratory

In June 2019, Samsung, which has been collaborating with Mila researchers since 2014, announced the opening of its new AI laboratory at Mila. Led by Simon Lacoste-Julien, professor and member of Mila, the SAIT AI (Samsung Advanced Institute of Technology Artificial Intelligence) Lab Montreal will conduct basic research on speech recognition, machine translation and natural language understanding.

"This new laboratory is based on a unique model in the world, as it is a corporate laboratory that is embedded in Mila's academic ecosystem. All research carried out is conducted in open science with the objective of benefiting the society."

—
Simon Lacoste-Julien,
Associate professor

"The ecosystem of Mila has impressed me, not only the academic environment but also start-ups, technical talks, and various networking activities. Mila's students and professors enjoy debating and discussing many different points of view on ethics, and it's very stimulating."

—
Phong Nguyen
Industry Partner
Hitachi

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1
2/3
1/3



$(u + v)$
+ 2/3
9/16

1
2/3
1/3

$(u + v)$
+ 2/3
9/16

Applied research

Applied research is an important aspect of Mila's activities. During the year, strategic thinking helped assess the needs of companies and target Mila's contributions to maximize their impact. The objective was to contribute to projects, platforms and partnerships in collaboration with a large number of organizations, in order to accelerate economic and social innovation.

Mila is leveraging the growing interest of industry in basic open source research collaborations to create strategic partnerships aligned with its research activities and based on a vision of mutual enrichment.

These strategic partnerships with leading companies will contribute to Mila's mission and the development of the Quebec ecosystem. The installation of Samsung's AI laboratory in Mila's premises is a clear example of this.

Mila aims to use its expertise to help various types of organizations succeed in projects that:

- Accelerate the start-up of companies specializing in AI.
- Drive the digital transformation of large organizations.
- Develop technological platforms that are already very rich in data, in order to give them a competitive advantage.

Mila seeks to deploy a collaborative model with key players in the various ecosystems - start-ups, AI partners in Quebec, technology transfer and support for large companies - in order to catalyze efforts, capitalize on synergies and achieve shared success. It's a model that benefits everyone.

“ Mila is the perfect mix of fundamental research, applied research and tool creation, with a strong focus on doing it the common good. ”

Mirko Bronzi
Applied Research Scientist

Emergence and growth of start-ups

In recent years, the Quebec AI ecosystem has been especially favourable to the emergence and growth of companies, thanks to the presence of numerous incubators and accelerators, along with very active venture capital companies. Mila has introduced three programs to actively contribute to launching and developing AI start-ups.

Espace CDPQ | Axe IA

In partnership with the Caisse de dépôt et placement du Québec (CDPQ), Mila created the Espace CDPQ | Axe AI to support the development of AI projects in innovative sectors. A first cohort of nine start-ups was announced in December 2018. The researchers from these start-ups settled in the Espace CDPQ in the spring of 2019 and will have access to Mila's experts and researchers for a full year, so that they can pursue and accelerate their research work. Thanks to the CDPQ's sponsorship, the companies also benefit from expertise, advice, training and synergies, as well as links with Quebec's investment and guidance ecosystem.

Start-up supported by Mila

BIOS

In December 2018, this company supported by Mila announced a major investment and the opening of a new AI laboratory in Montreal, which is aimed at accelerating the development of a neural interface that combines advances in computer hardware, massive data and machine learning. BIOS is exploring a revolutionary approach to create an interface that will help develop new advanced treatments for the body's organs and nervous systems.



NextAI et Creative Destruction Lab

Mila is also involved in implementing the programs of NextAI and Creative Destruction Lab. These two programs, sponsored by HEC Montréal, support the growth of new AI companies based on their stage of development and the existence of a clearly defined product.

“ At Mila, I especially appreciate the interactions with excellent quality researchers, as well as the proximity to many young start-ups in the AI ecosystem, which makes it easy to collaborate. ”

Audrey Durand

Assistant Professor, Université Laval

Student start-ups

This program supports the emergence of new companies created by Mila students in connection with their research work. To help them in their projects, Mila offers accommodation on its premises, the assistance of its professors, access to laboratories, an official association with Mila, as well as links to key players who back them in their funding efforts and offer advice and guidance in developing their business plans.

Examples of Mila’s start-ups

- **Korbit AI**
Korbit aims to democratize education using private intelligent tutors that are powered by AI. Thanks to a system capable of tutoring students in many areas, Korbit helps them learn faster and better, giving instructors a better understanding of their students while allowing them to use a flipped classroom and mixed teaching approaches. Korbit’s team receives advice from a number of Mila professors, including Yoshua Bengio, Joëlle Pineau, Laurent Charlin and Aaron Courville



- **Lyrebird AI**
Lyrebird creates the most realistic artificial voices in the world. The company is making its speech recognition technology available to all and gradually introducing it, so that society can adapt to it and take advantage of its positive aspects while preventing potentially negative applications. The Lyrebird team is mentored by Yoshua Bengio and advised by several other Mila professors.



Giving life to the ecosystem

The clustering in a 90,000-square-foot space of more than 400 professors and student-researchers from the Université de Montréal, McGill University, HEC Montréal and Polytechnique Montréal, along with researchers from major companies, institutions and start-ups, creates a genuine ecosystem at the heart of Mila. When we add the partner companies that also occupy the O Mile-Ex complex and neighbouring buildings, this ecosystem gets even bigger and helps create a real AI district in Montreal.

AI organizations in the Mila neighbourhood

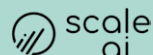
ELEMENT AI



Microsoft



THALES







Major gatherings

During 2018-2019, Mila was involved in organizing flagship events in collaboration with industry.

TechAide Montreal

To foster exchanges between academic researchers and members of industry, this initiative by OSMO, sponsored by Professor Hugo Larochelle, brings together the tech community to support Centraide and local non-profit organizations in the Greater Montreal area.

- April 17, 2018 – This first TechAide Montreal conference, which raised more than \$100,000, brought together nearly 400 researchers and industry members at the Rialto Theatre. Twelve researchers gave talks there, including several members of Mila.
- Novembre 28, 2018 – AI researchers competed against Ubisoft's best gamers while helping break the cycle of poverty and social exclusion in the Greater Montreal area by raising nearly \$15,000.
- January 25, 2019 – The TechAide Soccer Tournament brought together 15 teams from tech companies in the Greater Montreal area and raised nearly \$21,000 in donations.

Montreal AI Symposium 2018

28 août 2018

Plusieurs membres de Mila ont participé au Symposium IA Montréal qui a réuni plus de 600 experts et professionnels universitaires et industriels intéressés par l'apprentissage profond et les approches connexes.

World Summit AI Americas

April 10-11, 2019

Mila participated in the first edition of this summit, which gathered nearly 2,000 developers and researchers from 160 countries, who came to Montreal to learn from the brightest and most influential people in AI.

Scientific exchanges

During 2018-19, Mila organized approximately 260 workshops, seminars, presentations and conferences. These exchanges included scientific activities and open learning for students and industry members alike.

Reading groups

Presentations and discussions of scientific articles open to the entire Mila community.

Tea Talk

The Tea Talk program allows Mila researchers or guests to give high-level technical presentations and discuss them with colleagues. About forty Tea Talks are presented throughout the year.

Workshops

Focused presentations and discussions around an AI-related topic.

Partner conferences

Technical presentations organized by partners.

To fulfill its role and influence the political, social and ethical orientations of AI, Mila has a presence among the leading authorities of the Quebec and Canadian AI ecosystem, including:

- The Advisory Council on Artificial Intelligence created by Innovation, Science and Economic Development Canada
- Forum IA Québec, created by the Government of Quebec to implement a strategy to promote the growth of AI in Quebec
- The International Observatory on the Societal Impacts of AI and Digital Technology, a space for discussion and reflection for all players involved in AI

Since its founding, Mila has supported the socially responsible development of AI and emphasized the need to establish an ethical framework through the *Montreal Declaration for the Responsible Development of Artificial Intelligence*

Representatives from Mila will continue their targeted participation in certain major international forums (G7, World Economic Forum, UN, UNESCO) and will continue to organize AI workshops for the benefit of society at major AI conferences.

Projects with a social impact

Mila is already involved in numerous projects with a high potential for social impact and intends to contribute its expertise to address important societal challenges.

HighRes-net Project **Anticipating humanitarian crises with the Red Cross**

Preparing for and responding to humanitarian disasters, such as earthquakes, requires accurate and up-to-date mapping of affected areas. Low-resolution satellite images are inexpensive or free and frequently updated. However, they do not contain enough detail to identify evidence of climate change or human rights violations. Only high-resolution satellite images have such precision. However, the exorbitant cost of high-resolution satellite images is a major obstacle for NGOs. A team from Mila, led by researcher Kris Sankaran, collaborated with the American Red Cross to explore how machine learning techniques could be used to automate the production of accurate base maps using remote sensing data.

Climate Change Visualization Project

This project aims to raise awareness of the consequences of climate change by depicting the future. To do this, Mila's team, led by Yoshua Bengio, developed an interactive website and mobile application called ClimatePix to present the effects of climate change in an accurate and customised way using state-of-the-art techniques from AI and climate modelling. By producing accurate and realistic renderings, the goal of the project is to design an educational tool that will encourage people to change their behaviour.



Financial information



Mila – Quebec Artificial Intelligence Institute
March 31, 2019 and 2018

Abstract of Mila's financial statement

	2019	2018
ASSETS	\$	\$
Current		
Cash	6 441 339	—
Trade and other receivable	1 138 696	1 225 102
Prepaid expenses	89 382	—
	7 669 417	1 225 102
Long-term		
Guaranteed investment certificate, 2%	—	1 200 000
Tangible capital assets	9 007 384	—
	16 676 801	2 425 102
LIABILITIES		
Current		
Trade payables and other operating liabilities	3 400 953	265 102
Advance from a not-for-profit organization, without interest	1 200 000	1 200 000
Deferred revenue	376 785	—
	4 977 738	1 465 102
Long-term		
Deferred contributions related to tangible capital assets	2 954 062	—
Other deferred contributions	6 264 168	960 000
Lease inducements	2 238 114	—
	16 434 082	2 425 102
UNRESTRICTED NET ASSETS	242 719	—
	16 676 801	2 425 102

Mila – Quebec Artificial Intelligence Institute
For the year ended March 31, 2019
and the initial 255-day year ended March 31, 2018

	2019 (365 days)	2018 (255 days)
	\$	\$
Revenue		
Government grants	5 966 583	236 425
Research contracts	264 003	—
Industry sponsorships	194 465	—
Consulting fees	1 200	—
Interest income	48 241	6 710
Amortization of deferred contributions related to tangible capital assets	594 498	—
	7 068 990	243 135
Expenses		
Research	1 967 663	—
Research support, Innovation and computing power	878 733	24 623
Ecosystem projects and training	873 447	—
AI for humanity	56 758	—
General administration	1 416 438	218 512
Industry relationships and corporate laboratories	1 028 578	—
Amortization of tangible capital assets	604 654	—
	6 826 271	243 135
Excess of revenue over expenses and net assets, end of year	242 719	—

Board of Directors and management team

10

Board of Directors

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President
President and Chief Executive Officer – Claridge

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Chief Academic and Research Officer –
Polytechnique Montréal

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Associate – Inovia Capital

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McGill University

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Vice Rector, Research, Discovery, Creation
and Innovation – Université de Montréal

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Chief Executive Officer – Imagia

Josée Morin

Company Administrator

Michael Sabia

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de dépôt et placement du Québec

Marie-Josée Blais

Observer
Assistant Deputy Minister for Science and
Innovation – Ministère de l'Économie et de
l'Innovation du Québec

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President and CEO

Yoshua Bengio

Scientific Director

Danielle Langlois

Vice-President, Finance

Stéphane Létourneau

Vice-President, Partnerships and
Corporate Affairs

Émélie Brunet

Vice-President, Talent and Ecosystem

Joumana Ghosn

Director, Applied Research Team

Sacha Leprêtre

Director, Innovation, Development and
Technologies

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