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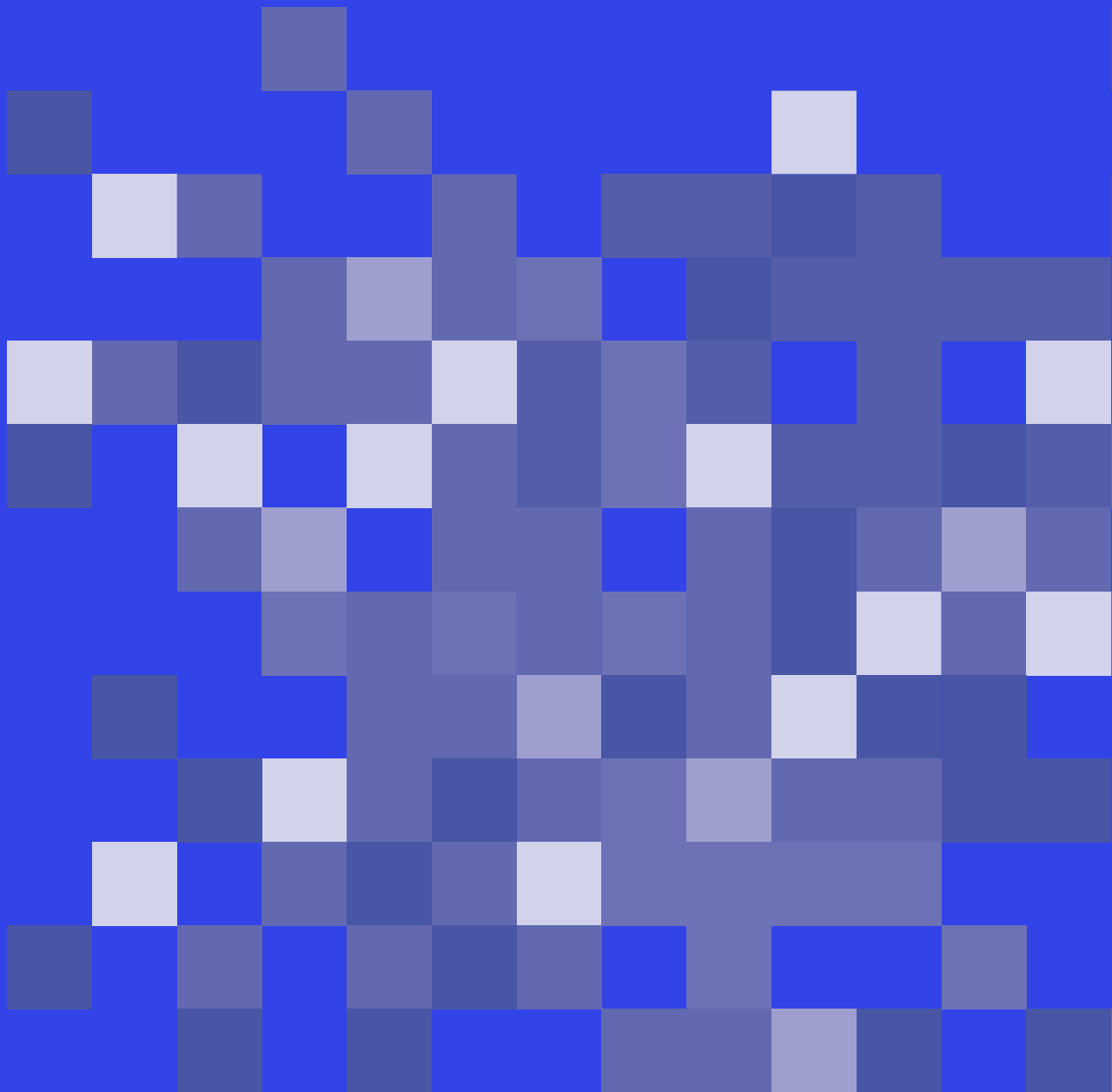
ONTARIO AI SNAPSHOT ↗

The state of the province's AI ecosystem in 2020-21

Produced by Deloitte on behalf of the Vector Institute



WELCOME

"Ontario's AI ecosystem is continuing to see major growth, and this is no accident. Through the provincial government's support to keep top AI talent and create jobs, as well as the work of collaborators in the business community, academia and organizations like the Vector Institute for AI - our AI ecosystem was able to respond effectively to the challenges created by the COVID-19 pandemic, and continued to grow in size and strength over the past year. Ontario also continues to see substantial funding for AI research and development activity - with over $2.1B in venture capital invested. In this year's snapshot we share data signalling why the world's largest companies are coming here to solve real-world problems with artificial intelligence and why highly skilled AI-talent are staying in the province. These positive signals should be our rallying call to continue to support this flourishing ecosystem and further position it for growth and success."

Garth Gibson, President and CEO
The Vector Institute for AI

"The insights presented in the Vector Institute's snapshot demonstrate that Ontario is delivering on what's needed for Canada to thrive in the next decade and beyond. With an estimate of over 5.5X yearly increase in spending AI R&D, the creation of 7,253 AI jobs and more than 212 companies investing in the province's AI ecosystem, Ontario is leading the way to improve commercialization of Canadian innovation and attracting investment in a sector where Canada can realistically lead. All of this shows promise of building a nation where our people and labour force are prepared for a fast-changing digital economy; Canadian businesses can have global, world-leading ambitions; and our society is more resilient to future challenges. This research should motivate business leaders, governments and all Canadians to recognise our opportunity to lead globally for a brighter future."

Anthony Viel, Managing Partner and Chief Executive
Deloitte Canada

INTRODUCTION

The Vector Institute is an independent, not-for-profit corporation launched in 2017 with the generous support of the Government of Canada, the Province of Ontario, industry leaders from across the country, and AI trailblazers at the University of Toronto. The vision of the Vector Institute is to drive excellence and leadership in Canada's knowledge, creation, and use of AI to foster economic growth and improve the lives of Canadians. Today the Vector Institute is a pillar of Ontario's AI ecosystem, sitting at the heart of the Toronto–Waterloo innovation corridor—a cluster that has added more technology jobs than graduates over the past five years than any other market in North America.[1]

We are committed to leading Ontario's efforts to build and sustain AI-based innovation, growth and productivity in Canada by focusing on the transformative potential of deep learning and machine learning. Together with our AI partners across Canada, we work with Canadian industry and public institutions to ensure they have the people, skills, and resources to be best-in-class in the use of AI. We support the country's AI innovation clusters and help startups grow to become Canadian-based global leaders. And we also strive to attract the best global talent focused on research excellence; our researchers and academic partners form part of a vibrant community of innovative problem solvers working across disciplines on both curiosity-driven and applied research.

As part of our ongoing leadership in the AI space in Ontario, the Vector Institute publishes an annual Ontario AI snapshot report in collaboration with Deloitte to report on the health of Ontario's AI ecosystem. This, our second Ontario AI snapshot report, covers the period from April 1, 2020 to March 31, 2021.

The Ontario AI snapshot tracks 10 metrics, covering areas such as AI job creation and retention, investment, application, and commercialization. These metrics serve as benchmarks for measuring the collective progress of governments, businesses, and institutions in further strengthening Ontario's AI ecosystem.

2020-21 SNAPSHOT: KEY INSIGHTS

Ontario's AI ecosystem responded nimbly and effectively to the challenges created by the COVID-19 pandemic, and continues to grow in size and strength. Ontario is creating and retaining more AI jobs, and the province's pipeline of AI talent continues to expand. Corporate and venture capital investment in Ontario AI is increasing, and R&D spending continues to grow. With more than half of business executives surveyed believing AI is strategically important to achieving their company's business objectives, it's clear that AI is playing an ever more pivotal role in the success of Ontario's economy. And the Vector Institute is proud to be a part of it all.

Read on to see the key insights from our 2020-21 Ontario AI snapshot.

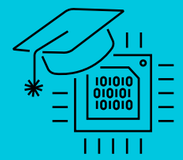
Ontario AI snapshot: The state of the province's AI ecosystem in 2020/21 | Key insights

7,253
AI jobs created
including 2,922 jobs paying more than $70,000 a year and held by highly qualified professionals

13,758
jobs retained

1,400+
new AI Masters' enrolments

700+
new AI Masters' graduates



212
unique investors directly investing in Ontario AI companies

$2.16 billion
in VC investment into Ontario AI ecosystem

13
companies relocated to the Ontario AI ecosystem

5.5X-6.3X
increase in R&D spending on Ontario AI

57%
have commercialized AI products/services

51%
say AI is strategically important

35
new AI companies established in Ontario

41
new AI-related patents filed

INDICATORS OF TALENT & JOB MARKET

Ontario is creating good, well-paying AI jobs

While recruitment of AI talent and employment levels for new AI grads both dipped between April and August 2020, as the pandemic swiftly expanded across the country and the globe, hiring rebounded later in the year. In 2020-21, an estimated 7,253 AI jobs were created in Ontario, almost double the number of reported jobs created in 2019-20 snapshot. As well, 13,758 jobs were retained in 2020-21, compared to 16,205 jobs retained in 2019-20.[2] Due to refinements in our research methodology, this year's figures may not be directly comparable to the previous year's analysis.

A substantial number of those new jobs are well-paying, too. According to our survey of business executives, 2,922 of the 7,253 AI jobs created in 2020-21 were both held by a highly qualified professional graduated from an AI-related program and considered to be well-paying positions, with salaries greater than $70,000 per year. In 2019-20, 1,602 jobs fell into this category.

At Scotiabank, finding the right AI talent is critical

There's a skill that teams at Scotiabank prize when recruiting top new graduates for AI-related co-ops and jobs to support the demanding and dynamic nature of AI work: finesse – a blend of competence, versatility, and communication skills – and it comes at such a premium that it's just as important as research credentials.

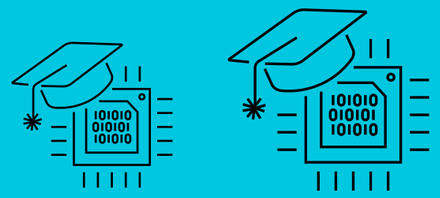
Luckily, Ontario is home to a growing pipeline of "finesse" AI talent. With 24 Vector-recognized AI programs across the province, Ontario is consistently producing what Dr. Yannick Lallement, Scotiabank's Director of Data Science & Machine Learning describes as "a high calibre of students. It's probably the highest I've seen in the different types of fields we look for."

Read the full story: https://vectorinstitute.ai/2021/05/26/how-scotiabank-seeks-out-top-ai-talent/

Ontario's supply of trained AI talent continues to grow

More than 1,400 students began their studies in AI-related master's programs in Ontario in 2020-21—and over 700 AI master's students graduated. Ontario had 950 students enrol in Vector-recognized AI master's programs during the 2020-21 academic year, while another 450 students were engaged in individual AI-related study paths—a total increase of 270 students from last year's report. These figures would likely have been higher, but some students deferred their studies because of the pandemic. In addition, 700 students graduated from Vector-recognized AI master's programs in 2020, compared to at least 302 graduates last year.

Enrolment in AI studies is growing



23.89% increase

Read more about Vector-recognised AI Master's programs:
https://vectorinstitute.ai/2021/05/10/newest-vector-ai-scholarship-recipients-join-growing-talent-pool-in-ontario/

"[During my Master's] I built up skill sets for developing reliable frameworks or mechanisms for data collection, learned multiple data engineering tools, and applied them in my work. But the most interesting thing for me during the co-op term was that I met a great team and great leaders."

Huicong (Ivy) Wu, MDA, University of Western Ontario

Huicong (Ivy) is a graduate from Western University's Masters of Data Analytics program with a specialization in AI, which is one of 24 programs across Ontario recognised by the Vector institute for producing graduates with competitive AI skills sought by industry.

Students and graduates at Vector

Vector's research community also grew by more than a hundred people in 2020-21. Today it comprises 617 individuals, including 136 faculty, 45 postdoctoral fellows, 245 PhDs, 101 master's students, and 90 undergraduate students.

Ontario AI snapshot: The state of the province's AI ecosystem in 2020/21 | Key insights

AI Master's Programs and Related Study Paths at Ontario Universities

Northern Ontario:
Lakehead University

Ottawa:
University of Ottawa

Kingston:
Queen's University
Smith School of Business

Southwest Ontario:
Western University
University of Guelph
University of Waterloo
University of Windsor

GTHA:
Ontario Tech University
Rotman School of Management
Ryerson University
Schulich School of Business
University of Toronto
York University

INVESTMENTS IN R&D AND BUSINESS

More investment is flowing into Ontario's AI ecosystem —and AI R&D

$2.16 billion in venture capital investments flowed into Ontario's AI ecosystem in 2020-21, an increase of $254 million from 2019-20.[3]

VCs aren't the only ones investing in Ontario AI. We also identified 212 unique corporate investors that made direct investments into Ontario-based AI companies—both private investments or minority stakes—in 2020-21, up from 166 such investors in 2019-20.[4] In addition, 13 companies relocated their offices or operations into the Ontario AI ecosystem in 2020, up from 12 in the previous year.

Venture capital investments in Ontario AI ecosystem are growing

$254 million increase

"At Linamar, AI means increased market share, a larger workforce, and higher wages. The widespread use of AI has contributed to Linamar's double-digit revenue and profit growth, and has supported a trend toward a larger workforce with higher wages due to the company's increased competitiveness."

Linda Hasenfratz, CEO, Linamar Corporation

Linamar is an advanced manufacturing company where the intersection of leading edge technology and deep manufacturing expertise is creating solutions that power vehicles, motion, work and lives for the future.

Ontario also continued to see substantial funding for AI research and development activity, supporting ongoing innovation that enables Ontario's business and economies to grow and thrive. We estimate median AI R&D spending in 2020-21 grew by a factor of 5.5 to 6.3 compared with spending in 2019-20. Due to refinements into our research methodology and the enrichment of QUID's market research database, this year's figures are significantly higher this year compared to our previous year's analysis.[5]

MARKET SIZE & AI ADOPTION

AI playing an increasingly pivotal role in Ontario business

AI is rapidly becoming an integral part of Ontario companies' business strategy. Over half (51%) of the business executives we surveyed report that AI plays a strategically important role in achieving their company's busines objectives or that their company has implemented a formal AI strategy within all business units. That's up from 44% in our previous snapshot.

In addition, more than half (57%) of Ontario companies have commercialized AI products or services, or use AI to deliver or sell their core products and services, compared to 53% last year.

New AI companies and ideas are flourishing in Ontario

Ontario's vibrant, growing AI ecosystem is proving fertile ground for entrepreneurs to found new AI businesses—and for researchers to turn their innovations into patents.

Thirty-five new AI companies were established in Ontario in 2020-21, up from 32 companies in 2019-20. These new ventures increase the critical mass of innovative, forward-thinking Ontario businesses harnessing AI to unlock new opportunities and economic growth and to address the myriad challenges facing Ontario, Canada, and the world. [6]

Over the same period, Ontario AI researchers filed 41 AI-related patents in 2020-21, compared to 55 patents filed last year. Patent filings are considered an important indicator of AI commercialization activity, along with venture capital investments, integration of AI research into products and processes, and other factors.[7]

"At GoldSpot, we believe that AI is essential for mature industries to overcome traditional barriers and optimize data usage. Together, we are driving towards a more economical, collaborative, and sustainable future. AI has enabled us to disrupt the resource exploration sector and unlock economic potential through machine learning."

Shawn Hood, Chief Technology Officer, GoldSpot Discoveries Corp.

GoldSpot is an Ontario-based company that is revolutionizing the global mineral exploration business. Using machine learning and proprietary imaging technology, GoldSpot is able to create new datasets from underutilized mining data, drill core images, and video. With fewer, smaller, and more expensive discoveries becoming the norm in the industry, GoldSpot uses data and AI to save time, money, and produce far more accurate results than ever before possible.

CONCLUSION

The data presented in our second Ontario AI snapshot suggests that despite enduring an incredibly challenging period in our history as the result of the COVID-19 pandemic, Ontario continues to make significant progress in building a thriving AI ecosystem. The Vector Institute is confident that ongoing collaboration and investment among Canadian businesses, the academic community, and public institutions will continue to benefit this flourishing AI ecosystem and position it for future growth and success.

To ensure that all Ontarians—and their fellow Canadians—can share in the transformational potential of AI, we urge the federal and provincial governments to commit to continuing sustained funding for AI ecosystems in Ontario and across the country, and this sustained funding call is based on the results achieved to date. We also encourage governments to work with industry and academia to develop policies and guidance to ensure AI algorithms produce fair, equitable outcomes.

OUR METHODOLOGY

The Vector Institute, together with Deloitte, employed a combination of research and external databases to obtain the information used for this report.

Modus Research was engaged to conduct a survey of 155 business executives and senior managers in enterprises operating in Ontario; the survey was carried out June 3–30, 2021. Participants and organizations were screened for their relevance to this survey from an established executive business panel developed by Modus Research in partnership with Deloitte.

All survey participants come from organizations that were either AI developers, offered AI services, used AI to drive their services, or have immediate plans to us AI to improve their services within the next year.

Additional market research was conducted using government patents databases and QUID, a company/industry research portal. Finally, some results were interpolated using data from Vector's Academic Partnerships team.

ENDNOTES

1. CBRE, Scoring Tech Talent: How Tech Labor Trends Inform Workforce Discussions & Influence Real Estate in 50 U.S. & Canadian Markets. https://www.cbre.us/-/media/cbre/countryunitedstates/us-research/major-reports/2021/scoring-tech-talent-media-folder/2021-scoring-tech-talent.pdf. Retrieved Aug. 31, 2021.
2. Twenty-three percent of executives surveyed reported their company created between 1 and 250 AI-related positions in 2020. Nineteen percent said they created between 1 and 15 AI roles; two percent reported creating between 20 and 50 AI jobs; and two percent reported creating between 100 and 250 AI roles. In terms of job retention, 32 percent of executives reported that their organization retained between 1 and 20 AI jobs in 2020; six percent said they retained between 25 and 100 AI jobs; and one percent said they retained between 250 and 500 AI roles. To estimate the total number of Ontario AI jobs created and retained, we used the midpoint of the ranges provided (i.e., 8, 25 or 175 jobs created; 10, 65, or 375 jobs retained), and multiplied this against the estimated 1,268 AI companies in Ontario.
3. We used the QUID market research database to estimate venture capital investments in Ontario-based companies made between April 1, 2020 and March 31, 2021. Search terms used: "Artificial Intelligence" OR "Machine Learning" OR "Data Science" OR "Natural Language Processing" OR "Image Recognition" OR "Computer Vision" OR "Deep Learning" OR "Analytics" OR "Health Informatics" OR "Big Data" OR "Quantitative Analytics" OR "Quantitative Computing" OR "AI" OR "ML" OR "DL" OR "NLP" OR "RL" OR "reinforcement learning." Search results were manually refined to bring investment figures closer to the true value. Dollar figures calculated using the average 2020 USD-CAD exchange rate of 1.3415.
4. We used the QUID market research database to estimate the number of unique investors that made direct investments into Ontario-based AI companies—private investments or minority stakes—between April 1, 2020 and March 31, 2021. For search terms used, see endnote 3.
5. We used survey data as well as QUID market research data to develop an informed estimate of Ontario AI R&D spending in 2020-21, both in terms of budgeted R&D spending and allocations of external funding towards AI research.
6. We used the QUID market research application to first identify how many companies operating in AI-related fields were founded in Canada between January 1, 2020 and May 31, 2021. For search terms used, see endnote 3. We then reviewed the result of this analysis manually to zero in on those companies with a presence in Ontario. To finalize our estimate, we weighted the results of our research based on the number of overlapping months between our QUID research period (January 1, 2019 to May 30, 2020) and the period covered by our report (April 1, 2019 to March 31, 2020).
7. We used the Canadian Intellectual Property Office's patent database to query relevant AI-related patents filed by Canadian inventors between April 1, 2020 and March 31, 2021, using a wide range of AI-related terms. Search terms used: "Artificial Intelligence" OR "k-nearest neighbor classifiers" OR "support vector machines" OR "classification trees" OR "back propagation" OR "data science" OR "image recognition" OR "health informatics" OR "big data" OR "quantitative analytics" OR "artificial neural networks" OR "Auto Encoders" OR "Naive Bayes" OR "Random Forest" OR "Generative Adversarial Network" OR "reinforcement learning" OR "Natural Language processing" OR "predictive analytics" OR "pattern identification" OR "pattern recognition" OR "natural language processing" OR "optical character recognition" OR "computer vision" OR "deep learning" OR "machine learning." To arrive at this year's figure, search results were scored and manually reviewed for AI relevancy.

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