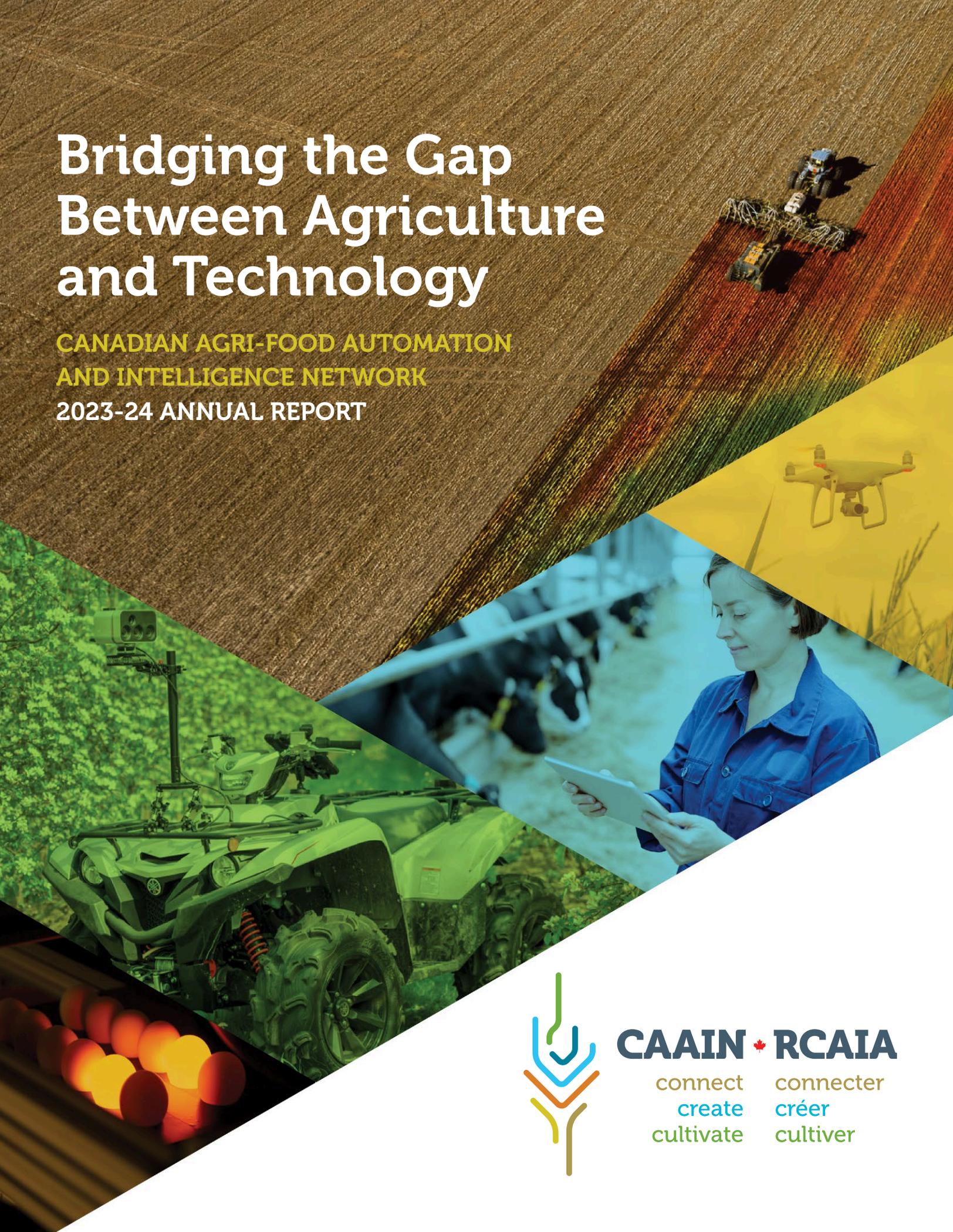# Bridging the Gap Between Agriculture and Technology

CANADIAN AGRI-FOOD AUTOMATION
AND INTELLIGENCE NETWORK

2023-24 ANNUAL REPORT

CAAIN ★ RCAIA

connect   connecter
create   créer
cultivate   cultiver

CAAIN · RCAIA

connect   connecter
create   créer
cultivate   cultiver

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CANADIAN AGRI-FOOD AUTOMATION AND INTELLIGENCE NETWORK
2023-2024 ANNUAL REPORT

Our Vision

We are Canada's leading AgTech innovation network.

Our Values

Community
Accountability
Respect
Excellence

SHAREHOLDERS

Marco Coppola
Rollie Dykstra
Hubert Lau
Patrick Machacek
Ian Potter

BOARD OF DIRECTORS

Laura Kilcrease (Chair)
Stuart Cullum (Co-chair)
Micheline Ayoub
David Bailey
JoAnne Buth
Bethany Deshpande
Cornelia Kreplin
Chris Paterson
Robert Saik
Deb Stark
Fred Wall
Rickey Yada

TEAM CAAIN

Darrell Petras
CEO

Tracy Bowers
Executive Assistant

Garson Law
Program Manager

Patience Palmer
Program Manager

Julie Thibeault
Finance Manager

Eric Morin
MarComm Manager

Ryan Furtas
Knowledge & Networks

Preeti Choudhary
Accounting Coordinator

Lakota Bowers
Administrative Assistant

Message From the Chair

Agriculture may be the oldest industry in human history. We've always sourced or produced food to sustain our life and community. It's also a sector that sees continual change and evolution and technology has been a major factor. Multi-million-dollar farm equipment, drones that monitor growing conditions, and AI-powered cameras that document animal health show how far the agriculture sector has come.

Be thankful that our agri-food sector continues to evolve in lockstep with the need to feed our country and the world.

The Canadian Agri-Food Automation and Intelligence Network (CAAIN) exists to support such progress, extending beyond our nation's farmers and encompassing Canada's entire agri-food industry. And just like the sector, CAAIN is transitioning. We are approaching our fourth year of funding the development of emerging agtech with a clear focus on the future of food production.

Across Canada and beyond, agriculture is facing multiple challenges. Climate change is impacting soil and related growing conditions from coast-to-coast. Rising input costs and supply chain disruptions challenge profitability and create additional logistic concerns. In the face of these issues, bringing innovative technologies to market in this vital industry remains as important as when we launched CAAIN.

The global population is forecast to reach more than nine billion people by 2050. Canada has 14 trade agreements with 51 countries related to agriculture, providing access to markets that are home to billions of people.

With its tri-part focus on automation and robotics, data-driven decision-making and the validation and demonstration of emerging knowledge and technology, CAAIN is bridging the divide between agri-food companies and technology firms. Agri-food producers and primary processors are seeking proven technologies to modernize operations during these uncertain economic times. But they need trusted facts and data. This is why CAAIN is engaged in development of smart farm networks that can validate and demonstrate innovative products destined for domestic and international markets. This work will continue in the next year.

On behalf of the board of directors, I want to thank Cornelia Kreplin for putting her retirement on hold and agreeing to serve as interim CEO this past year. This prepared the organization for the arrival of our new CEO, Darrell Petras, who joined us in August 2023. He brings a stellar background in the technology and innovation sector, anchored by deep agricultural roots and passion for the sector. Through Darrell's leadership, we look forward to continued funding from the Government of Canada and evolving our mandate of research and innovation that drives increased precision, productivity, and value for agricultural producers and primary food processors.

In 2024 we will be working with the Government of Canada on the next evolution of CAAIN. Our board looks forward to these discussions and to providing guidance and direction for the future. We will continue to connect, create, and cultivate support for innovators, agri-food producers and entrepreneurs who are helping Canada's agri-food sector advance its global standing.

Laura J. Kilcrease, C.M.A., MBA
Board Chair, Canadian Agri-Food Automation and Intelligence Network

Message From the CEO

Joining CAAIN in August 2023, I knew I would be working with agricultural innovation leaders—within CAAIN and through its network and partners. The reality has far exceeded my expectations. My team is a critical element of our current success, and several of our 35 funded projects have concluded successfully, while the rest show great promise. Our approach to building a community, supporting technologies while activating private capital, and driving the adoption of innovation through smart farms, advances innovation from prototype to the cusp of commercialization. In short, we are a necessary part of the agtech ecosystem.

In my first six months as CEO, CAAIN's brand has grown significantly as we continue gaining recognition for leadership in the digital agriculture space.

Our accomplishments over the past year include finalising agreements with our 2023 Open Competition and Livestock Innovation Program recipients. We will invest more than $5.8M in 11 new initiatives with footprints in seven provinces. What's particularly important is the range of agricultural areas they touch on, everything from smart barns to beekeeping. As a result, CAAIN's support will continue its broad-based relevance, effectively impacting the lives of Canadians from coast to coast to coast.

The 2023-24 fiscal year also saw us host our first solo in-person event, launching a new series we call CAAIN Presents. This inaugural session, The Future of Agriculture: An Evening with McKinney and McConnell, sold out, attracting over 250 of Canada's leading agri-food professionals and leaders. The fireside chat and reception that followed drew rave reviews, and overnight our reputation grew more than we could have hoped.

Also of note in 2023-24 are the eight projects that wrapped up their funded activities, joining three projects that were completed in fiscal 2022-23, and a fourth that ended in 2021-22::

- The Olds College-led *Evaluation and Improvement of Economic, Environmental and Logistical Benefits of Autonomous Agricultural Equipment Operation for Broad Acre Crop Production*
- JCA Industries' *Agricultural Autonomous Controls Framework*

- MatrixSpec Solutions'
  - *Optimizing Hyper-Eye: An Integrated Solution for Assessment of Fertility and Gender of Pre-incubated Eggs*
  - *Development of Automated Smart Device for Pork Marbling Assessment*
- VeriGrain's™ *Development, Validation, and Commercialization*
- Farm Health Guardian's *Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture*
- Grain Discovery's *Field to Glass - The Next Generation of Barley Traceability*
- SoilOptix: *Advancing Processes to Predicting Soil Organic Carbon*

The completion of their excellent work was balanced by the addition of the 11 2023 projects noted above, meaning we continue to push the agricultural innovation envelope.

I believe 2024 will see us take even greater strides, as we build a stronger CAAIN program offering and develop new collaborations with public- and private-sector organisations. Success breeds success, and we look forward to building on our excellent track record by growing our network, funding more projects, and fine-tuning our smart farm program. I hope you'll join us as we continue to advance agricultural technology in Canada.

Darrell Petras, P.Ag.
CEO, Canadian Agri-Food Automation and Intelligence Network

CAAIN's Core Functions

CAAIN has become the necessary nationwide agtech hub connecting the agri-food and technology sectors.

Many farmers have brilliant ideas of how to improve primary agriculture but lack the technological know-how to take their ideas from concept to reality.

Similarly, Canada is home to extraordinary technical professionals—software and app developers; mechanical, electrical, electronics, and civil engineers—who are unaware that the technology they are creating might have relevance to the agri-food sector.

By providing farmers and tech professionals the means and opportunity to connect and collaborate, CAAIN is facilitating the growth of a robust agtech sector that will improve outcomes for farmers in Canada and around the world. And never has there been a greater need for global agricultural innovation.

We also fund research into technological solutions to the agri-food sector's most important challenges, as well as supporting innovation that takes advantage of sectoral opportunities to improve profitability and productivity and enhance environmental sustainability.
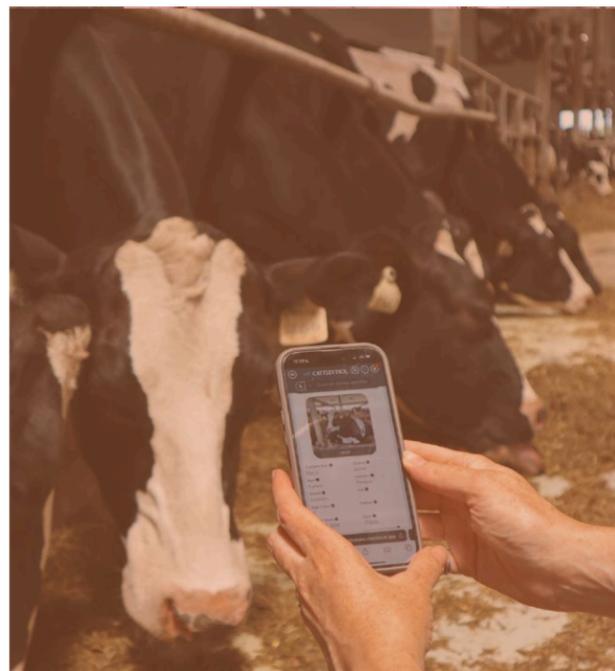
Our efforts make possible the development of extraordinary innovation with the potential to impact the nation economically, environmentally, and socially.

Growing CAAIN's Network

CAAIN's network portal membership stood at 490 as of March 31, 2024.

In early February, we hosted a sold-out in-person event that served as a lead-in to the popular annual FCC-led Future of Food conference. CAAIN Presents: The Future of Food—An Evening with McKinney and McConnell, attracted over 250 of Canada's leading agri-food sector professionals. Planning is already underway for a 2025 CAAIN Presents event.

CAAIN's social media footprint continued to expand, with LinkedIn followers surpassing 2,300 and the Twitter/X feed connecting with 750 individuals and organizations.

CAAIN's weekly summary of the latest agri-food stories, "News Vine," is sent to a weekly audience of over 1,000 agtech sector stakeholders.

COMPLETED PROJECTS

One of our two core functions is to support the development of promising agtech that shows the ability either to solve a Canadian agri-food challenge or to improve the sector by seizing an opportunity.

Over the past three-and-a-half years, we have run seven funding competitions, and distilled hundreds of funding applications into 35 outstanding projects to which we have committed over $32M of Government of Canada money, while activating almost $70M in private-sector funding, bringing the aggregated total value of our portfolio to roughly $100M.

Of these 35 projects, 12 have run their course, and the results have been nothing short of spectacular.

Automation & Robotics
COMPLETED PROJECTS

Artificial Intelligence (AI) Development for Autonomous Agriculture Application
COMPLETED IN 2022-23

Led by **Raven Industries**, the project team advanced the OMNiPOWER™ Platform by researching and creating various software and AI functions to advance the performance of an autonomous platform designed to carry traditional farm equipment such as seeders and sprayers.

Agricultural Autonomous Controls Framework
COMPLETED IN 2023-24

Led by **JCA Technologies**, this project applied an autonomous framework on which to build customized machines, thereby helping OEMs overcome the innovation barrier impeding the development and adoption of their technology.

Development of Automated Smart Device for Pork Marbling Assessment
COMPLETED IN 2023-24

Led by **MatrixSpec Solutions**, this project developed an upgraded prototype of Marbling Meter, a proprietary automated loin chop marbling assessment tool.

Optimizing Hyper-Eye: An Integrated Solution for Assessment of Fertility and Gender of Pre-Incubated Eggs
COMPLETED IN 2023-24

Led by Montreal-based **MatrixSpec Solutions Inc.**, the Hyper-Eye project uses a non-invasive blend of hyperspectral imaging, artificial intelligence, and machine learning to determine the fertility and gender of pre-incubated eggs.

Evaluation and Improvement of Economic, Environmental and Logistical Benefits of Autonomous Agricultural Equipment Operation for Broad-Acre Crop Production
COMPLETED IN 2023-24

Olds College tested the Raven Industries' OMNiPOWER™ Platform in real-world conditions to demonstrate and validate its viability in Western Canadian agronomic conditions.

Artificial Intelligence (AI) Development for Autonomous Agriculture Application

Major Benefits

Economic
Reduced costs (labour, inputs, fuel, damaged equipment and property), enhanced productivity, increased profitability

Environmental
Decreased fuel use, thereby reducing GHG emissions

Social
Created skilled jobs in the agriculture and technology sectors

Top Ecosystem Impacts

Developed new technologies for machine learning, computer vision, and autonomous navigation

Filed of two provisional patents
- Multi-machine co-ordination in autonomous agricultural operations
- Augmented human interaction with autonomous agricultural vehicles

Created of 12 commercialization agreements

HQP Positions

- 6 maintained
- 3 created

Work Integrated Learning (WIL) Opportunities

- 20 months of student internships

Academic Collaboration

- University of Regina
- Olds College

$1,507,408
CAAIN Investment

$4,152,732
Total Project Value

"

CAAIN supported our business and our project from its humble beginnings, straight through material changes to our business in the form of multiple acquisitions. Having a partner like CAAIN, one willing to adapt alongside us to changing environments, allowed us to grow and evolve without introducing further obstacles or disruptions to our projects. While our CAAIN project has concluded, we will always value their contributions to our business and their continued efforts to support other businesses and academic institutions in their journeys to maintain Canada's position as a global leader in agriculture and agtech.

Marco Coppola, Project Lead, Artificial Intelligence (AI) Development for Autonomous Agriculture Application

"

Data-Driven Decision-Making

COMPLETED PROJECTS

Automating Traceability, Creating a Digital Manifest, and Providing Transport Assurance Via Generic Data Enablers

COMPLETED IN 2021-22

Led by **Transport Genie**, this project will introduce accessible, scalable technology offering simple, integrated tracking and reporting to the Canadian live-haul transportation industry.

GeoAI Framework for Automating Manual Observation Associated with Wheat Production (Phase 1)

COMPLETED IN 2022-23

Led by **Super GeoAI Technologies**, a team of agri-food companies and academic institutions employed diverse technologies to develop a geospatial artificial intelligence (GeoAI) platform proof-of-concept that automates manual wheat-production observations. The ultimate project goal is to create and market a scaled-up, all-in-one cloud platform that automates grain grading, increasing the productivity, profitability, sustainability, and competitiveness of Canadian grain producers.

VeriGrain's products are based on leading-edge technologies and require a substantial amount of product development and customer field testing. The CAAIN funding allowed us to accelerate the development process and expand the scope of the development, which resulted in a product with broader capabilities.

Ken Jackson, Project Lead, VeriGrain™ Development, Validation, and Commercialization

VeriGrain™ Development, Validation, and Commercialization

COMPLETED IN 2023-24

Led by **Alpha Phenomics**, this project evaluated and validated the use of various new technologies to provide accurate, real-time assessment of cattle growth, body fat, carcass composition, and industry-specific information on the health and wellbeing of cattle. Advancing the beef industry's development, value, and use of automation, blockchain, and artificial intelligence should increase and improve sector-wide data collection and sharing, which will optimize production and minimize waste and loss.

Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture

COMPLETED IN 2023-24

Led by **Farm Health Guardian**, this project will compare features and capabilities of existing technologies to identify a cost-effective sector-wide technological solution capable of generating real-time track-and-trace data to mitigate the effects of disease outbreaks in the livestock and poultry industries.

The Utilisation of 3-D Real-Time Multispectral Cameras to Identify the Liveweight, Optimal Slaughter Weight and Carcass Weight in Pre-Slaughter Cattle

COMPLETED IN 2022-23

Led by **Farm Health Guardian**, this project will compare features and capabilities of existing technologies to identify a cost-effective sector-wide technological solution capable of generating real-time track-and-trace data to mitigate the effects of disease outbreaks in the livestock and poultry industries.

Field to Glass - The Next Generation of Barley Traceability

COMPLETED IN 2023-24

Led by **Grain Discovery**, this project seeks to build an end-to-end digital system that uses blockchain technology to trace Canadian-grown malt barley through every stage of the value chain.

CAAIN's support of Grain Discovery marked a pivotal moment in the company's trajectory, serving as the cornerstone of our success. This infusion of capital not only enabled the crucial development of our innovative platform but also laid the groundwork for scaling our operations and reaching a broader market. The funding's significance cannot be overstated; it was a catalyst that propelled us from a concept to a competitive force in the agricultural technology sector.

Rory O'Sullivan, Project Lead, Field to Glass – The Next Generation of Barley Traceability

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Thanks to the invaluable support from CAAIN, SoilOptix® has been able to pioneer groundbreaking advancements in high-resolution carbon mapping, harness the power of soil sensor data across diverse soil types, and develop cutting-edge automated systems and infrastructure. This funding has not only propelled our research forward but has also paved the way for transformative solutions in agriculture and environmental sustainability. Together, we're cultivating a brighter, more data-driven future for our planet.

Zach Harmer, Project Lead, SoilOptix®: Advancing Processes to Predicting Soil Organic Carbon

SoilOptix, Advancing Processes to Predicting Soil Organic Carbon

COMPLETED IN 2023-24

This project will quantify Soil Organic Carbon (SOC) by using topsoil mapping technology that uses the natural emission of gamma radiation from the ground along with standard soil sampling practices within agriculture to build high resolution soil nutrient, texture and other property maps.

Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture

Major Benefits

Economic

Farm animal diseases take significant financial tolls that this project will mitigate. For example:

- Porcine reproductive and respiratory syndrome costs +/- $184M per year in Canada
- Porcine circovirus associated disease cost Canada $562M over 5 years, including $150M in lost farm revenue, and $268M in increased veterinary and recovery expenditures
- Foot and mouth disease outbreak would cost Canadian producers $38B to $5B
- The current outbreaks of highly pathogenic avian influenza have cost the US government roughly $661M with the slaughter or more than 58 million birds; poultry farmers have lost more than $1B

Social

The stress felt by producers and processors is significant, as is the decreased consumer confidence associated with challenges affecting the agri-food value chain

Academic Collaboration

- University of Guelph

The support from CAAIN made it possible for Farm Health Guardian to test and develop our biosecurity technology with farmers and food companies across Canada. The software and hardware technologies we developed during this project are applicable for both boosting biosecurity to prevent disease, and for a much faster response when it does occur.

Rob Hannam, Project Lead, Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture

$136,545
CAAIN Contribution

$393,794
Total Project Value

Smart Farm Network Update

CAAIN continues to develop a system of diverse smart farm networks that will demonstrate the latest agtech in a range of agroclimatic regions, effectively allowing farmers from across Canada to determine that value of adopting the innovations. The farms will be linked by an online application CAAIN has commissioned, and which we will seek to commercialise as a means of collecting and synthesising data.

In December 2023, CAAIN launched a competition inviting interested organisations to join the smart farm network of networks. CAAIN is using the Pan-Canadian Smart Farm Network as a template for its own smart farm network development. Final decisions will be rendered in June 2024.

We are so grateful for CAAIN's financial support towards the development of the Pan-Canadian Smart Farm Network. The network connects smart farms in Canada, all with different operational models and expertise, but all with the same goal: accelerate the development and adoption of ag tech and best practices to improve productivity and sustainability of crop and livestock production in Canada. CAAIN helped us build a connection among smart farms, researchers, producers, industry partners, and stakeholders across four provinces in Canada — and we are just getting started.

Dr. Joy Agnew, Vice-President of Research at Olds College of Agriculture & Technology & Principal Investigator for the Pan-Canadian Smart Farm Network

Results
BY THE NUMBERS

35
Projects Funded

$32M
Committed

$100M
Total Project Value

$15M
Partner Cap Ex

$26M
Partner R&I Investment

100+
Project Partners

500
Network Members

3,200+
Social Media Followers

7
Funding Competitions

$1.2M
Commercialization Revenue

156
HQP Jobs Created / Maintained

29
Work Integrated Learning Positions

Looking Forward

In the fall of 2023, CAAIN staff reached out to ISED to look at how to build on the momentum we have created in our first four years of operation. Our hope is to continue building our network while increasing the support we provide to the brilliant Canadian innovators and entrepreneurs developing much needed agricultural technology.

In addition to leveraging the momentum we have generated, we are proposing to add additional services, making us a provider of comprehensive tools used to drive technology development and adoption in Canada. These include:

- Offer our project management services to third parties
- Develop and market an online communications platform
- Advisory services
  - Use our project track record to attract even more private-sector investment
- Deliver a software solution that will address a data aggregation gap in the agtech marketplace
- Take a greater role in smart farm activity while reaching more commercial farmers

Appendices

Automation & Robotics

Feasibility of an Autonomous Solution for Optimized Application of Livestock Manure

Led by **Haggerty AgRobotics Co.**, this project will design, test, and document the Raven OmniPower autonomous farming system to apply liquid livestock manure in bare/standing fields to enhance efficiency and demonstrate a marketable made-in-Canada solution for handling high volumes of livestock waste.

Project ANT: An Innovative Approach to a Fully Autonomous Greenhouse Mobility Platform

This project aims to validate the design of the ANT logistics mobile platform to solve the complex technical challenges in using multiple classes of robots that cooperate to efficiently delegate tasks and efficiently relocating tools around a greenhouse.

Autonomous Tractor Kit for Enabling Autonomous Farm Implement Operation

Mojow is developing the Eye-Box™ Autonomous Tractor Kit for Enabling Autonomous Farm Implement Operation, allows for the conversion of conventional tractors to autonomous tractors or can be integrated into ready-to-market farm machinery, such as Barnstorm's swarm capable autonomous tractor, to enhance their functionality.

Mojow is thankful for timely support from CAAIN to develop intellectual property and thoroughly test our technology on customer farms to ensure robust and repeatable field applications. We also appreciate CAAIN's providing access to its network and for facilitating cross-promotional opportunities.

Owen Kinch, Project Lead, Autonomous Tractor Kit for Enabling Autonomous Farm Implement Operation

Using Automation, Data and Insights to Improve Meat Quality and Safety

Led by Ontario-based **P & P Optica**, this project seeks to connect the practices of pork producers and processors to the quality of meat produced. This will be done by integrating a wide variety of variables from the plant, the farm, and publicly available sources using artificial intelligence (AI) and machine learning algorithms and analytics to identify predictive and prescriptive trends that will optimize production and improve the quality and safety of meat products in Canada.

Development of an Automatic Pork Quality Grading (APoG) System for Sustainable Pork Production

This project seeks to develop an automatic pork quality grading (APoG) system using hyperspectral imaging, machine learning, and deep learning for online multidimensional pork quality trait assessment of entire pork loins.

Integration, Optimization, Field Validations of BHF Agrobot, and Development and Validation of its Electric Weeding and Precision Agrochemical Application Technologies

This project seeks to develop, validate, and demonstrate an autonomous agricultural robot that can eradicate weeds with high voltage electricity and data-driven precision agrochemical application.

Smart In-Ovo Sexing: Enhancing Performance of the Hyper-Eye System

The project will advance the Hyper-Eye system towards commercialisation by enhancing its performance. The project partners will identify and remove egg samples that are incorrectly positioned or that are of low quality. The detection protocols will be integrated into the Hyper-Eye technology to achieve consistent, high-performance operation, making it increasingly compatible for hatchery use.

CAAIN has played a crucial role in MatrixSpec's mission to advance AI applications in the agri-food sector. Their commitment to funding and supporting innovative projects has allowed us to develop cutting-edge solutions like Hyper-Eye and Marbling Meter, which significantly enhance productivity and sustainability in the poultry and meat industries. The support from CAAIN has been essential in helping us bring these advanced technologies to the field. We deeply appreciate our partnership with CAAIN and the opportunities it has created for us to make a positive impact on the industry.

Dr. Michael Ngadi, Project Lead, Smart In-Ovo Sexing: Enhancing Performance of the Hyper-Eye System

ONGOING PROJECTS AT A GLANCE
Data-Driven Decision-Making

Advancing Agronomy Through Hyperlayer Data Collection and Analytics

Led by **Olds College**, this project's overarching goal is to collect data and develop a robust repository of different, validated, high-resolution, geospatial agronomic datasets. These will then support the ensuing development of field- and site-specific decision-making tools to reduce risks, ensure cost savings, and optimize production for farmers.

Precision Ranching for Improved Reproductive and Grazing Efficiencies

Led by **Lakeland College**, this project will use sensing technology to identify and evaluate location, activity, temperature, and behaviours that determine cattle fertility.

Harvesting Automation: Reducing the Requirement for Highly Skilled Labour During the Harvest of Broad-Acre Cash Crops

This project aims to automate much of the functionality of **MacDon Industries'** combine headers, freeing farmers for more important tasks, and increasing their overall productivity and profitability.

Without the support of the CAAIN funding and resources, I would not have collaborated with all the companies currently engaged in our research project. Their network has allowed our institution to obtain cross-provincial support and explore novel technologies for livestock management with promising results for future improvement of production efficiencies. CAAIN presents a unique model for research collaboration that I was surprised to see works very well to attract other research partners.

Susan Markus, Project Lead, Precision Ranching for Improved Reproductive and Grazing Efficiencies

Automation and Scalability of SWAT MAPS to Advance Canadian Agriculture

Led by **Croptimistic**, this project will see academic and on-farm researchers, industry players, and smart farm staff collaborate to expand SWAT MAPS's capacity and develop scalable analytics and agronomic validation solutions supporting the widespread adoption of precision agriculture.

Commercialization of IOT and AI for Carcass Cooling to Improve Meat Profitability, Quality and Food Safety

Led by **mode40**, this project will make use of a Meat Quality Management (MQM) System using Artificial Intelligence, mobile technology, and smart sensors for real-time adjustment of the carcass-cooling process.

Through CAAIN's program, our key research project received critical funding, enabling us to secure vital resources and accelerate progress towards achieving its groundbreaking goals. This invaluable support significantly enhanced our ability to bring this project to fruition.

Cameron Bergen, Project Lead, Commercialization of IoT and AI for Carcass Cooling to Improve Meat Profitability, Quality and Food Safety

F3: Farm to Factory to Farm - Pea Protein Quality and Traceability

Led by **PIP International**, this project will build a detailed vendor management and data connecting exchange mechanism between farm, flour mill, and a pea fractionation facility to create an ag-tech circular ecosystem that connects farms to the factory and back to the farms.

CAAIN's support has unlocked the opportunity for PIP to delve into the unknowns of traceability and supply chain monitoring from our farms to our facility. When our project is finished the data and analysis collected will springboard PIP and our partners into incorporating a broader reach traceability program and allow us to scale up the technology developed.

Christine Lewington, Project Lead, F3: Farm to Factory to Farm: Pea Protein Quality and Traceability

Integrated Real-Time Nitrogen Guidance System for Optimizing Canadian Prairie Agriculture: The Automated Nitrogen Recommendation Algorithm

This project will combine knowledge from agricultural science, data science, and AI to develop a nitrogen recommendation algorithm to help Canadian growers improve nitrogen management.

Data-Driven Decision-Making

GeoAI Platform for Automatically Digitizing and Modernizing Wheat Grain Grading (Phase 2)

This project aims to leverage deep learning, machine vision, geospatial, and high-performance computing technologies to digitize grain grading and automate the laborious manual observation required for wheat production.

> *CAAIN's funding and ongoing invaluable support have been vital to SGA's success. Without this backing, SGA's remarkable achievements might have remained untold. CAAIN's endorsement, funding, and the meticulous evaluations and invaluable guidance from CAAIN's reviewers and committee served as a lifeline for SGA at a critical time in 2021 when its future was uncertain. The AI algorithms developed through the CAAIN project are central not only to the Grain Grading initiative but also to SGA's broader research and development efforts in developing AI-powered tools to automate a wide spectrum of labor-intensive tasks in agriculture. CAAIN's network and sustained support have been pivotal in bringing our AI-powered AgTech products to market.*

Weiping Zeng, PhD, Project Lead, GeoAI Platform for Automating Manual Observation Associated with Wheat Production

Prescriptive Beekeeping: Leveraging Artificial Intelligence to Automate the Management of a Beekeeping Operation to Maximize Honeybee Colony Survival Rates and Business Profitability

The objective of this project is to develop, deploy, and test a data-driven tool leveraging artificial intelligence that will automate the management of commercial beekeeping operations in a field setting.

On-Farm Direct Measurements to Validate Traceability and Develop GHG Monitoring Tools for Canadian Dairy Producers

This project will enable the **EcoFarm** to further differentiate itself in the market as a supplier of sustainable dairy products. By building this integrated data-capture system, the company will be able to advertise its reductions in greenhouse gas emissions directly to consumers. Additionally, the funding provided by CAAIN will allow the EcoFarm to conduct feed, product, and animal analysis beyond what is currently routine for the farm. This data will provide insights into performance and efficiency of the operation from sustainability and GHG perspectives.

Creation of a Dairy Management, Modelling, and Collaborative Framework System to Facilitate Predictive and Data-Driven Decision-Making in Canada

CATTLEytics is developing a groundbreaking strategy to place Canada as a leader in dairy data systems. They are providing a much more powerful and intuitive replacement for existing dairy management software solutions, and have a vision and a plan to create a collaborative, intelligent dairy framework.

> *The deep commitment of CAAIN to advancing the dairy industry and their support of CATTLEytics has been foundational to what we can accomplish in the near future. Not only are we assisting dairy farmers in assembling their best 'team' of cows, solving difficult staff communication and scheduling issues, and creating forward-thinking economic models, but we are also fostering an ecosystem of innovation by engaging the next generation of Canadians who are familiar with both farm life and technology. Together, we aim to develop remarkable solutions to challenging agricultural issues in Canada. We are grateful for their support and eagerly anticipate contributing to the broader team that propels Canadian dairy technology onto the world stage.*

Shari Van de Pol, DVM, Project Lead, Creation of a Dairy Management, Modelling, and Collaborative Framework System to Facilitate Predictive and Data-Driven Decision Making in Canada

Data-Driven Dormant Apple Tree Pruning and Tree Vigour Models to Improve Farm Outcomes

Vivid Machines' system combines modern deep learning and computer vision approaches with state-of-the-art edge processing technology, providing accurate, plant-level, large-scale assessment of specialty crops in real time, in the field.

> *Working with CAAIN has enabled Vivid Machines to fund the use of top machine learning and engineering talent to solve critical problems in agriculture. One of the challenges we're focused on solving with the help of CAAIN is enabling more precise pruning of apple trees in dormancy through better instructions using bud data, which results in higher-quality fruit less prone to disease. The other is providing an understanding of tree volume, which enables a much better understanding of the target crop load per tree, reducing labour requirements by focusing efforts where they're needed. Having the ability to address these two issues will significantly help grower profitability, reduce food loss by increasing quality, and enable Vivid Machines to become a leading provider of precision agriculture products globally.*

Jenny Lemieux, Project Lead, Data-Driven Dormant Apple Tree Pruning and Tree Vigour Models to Improve Farm Outcomes

Smart Farms/Validation & Demonstration of Emerging Agtech

Pan-Canadian Smart Farm Network Development

Led by Alberta's **Olds College**, this project will use a growing network of smart farms across Canada to provide geographically-diverse, real-world validation of the latest agricultural technology.

Application of Artificial Intelligence (AI) Technologies for Improved Welfare and Productivity in Commercial Sow Barns

The objective of the proposed project is to apply AI to improve resilience and sustainability of the Canadian sow barns.

Smart Barn Technology for Swine Disease Prevention, Enhanced Biosecurity & Rapid Response

This project will develop "smart barn" technologies, where swine producers and their veterinarians can effectively prevent diseases, strengthen bio-security, and enhance disease response capabilities.

Smart Barn for Sustainable Swine Husbandry

This project will focus on automation of barn control system adjustments, based on real-time IoT data and trend analysis of data records, to optimize the barn environment for animal welfare and productivity while reducing personnel-hours required to maintain optimal rearing environments.
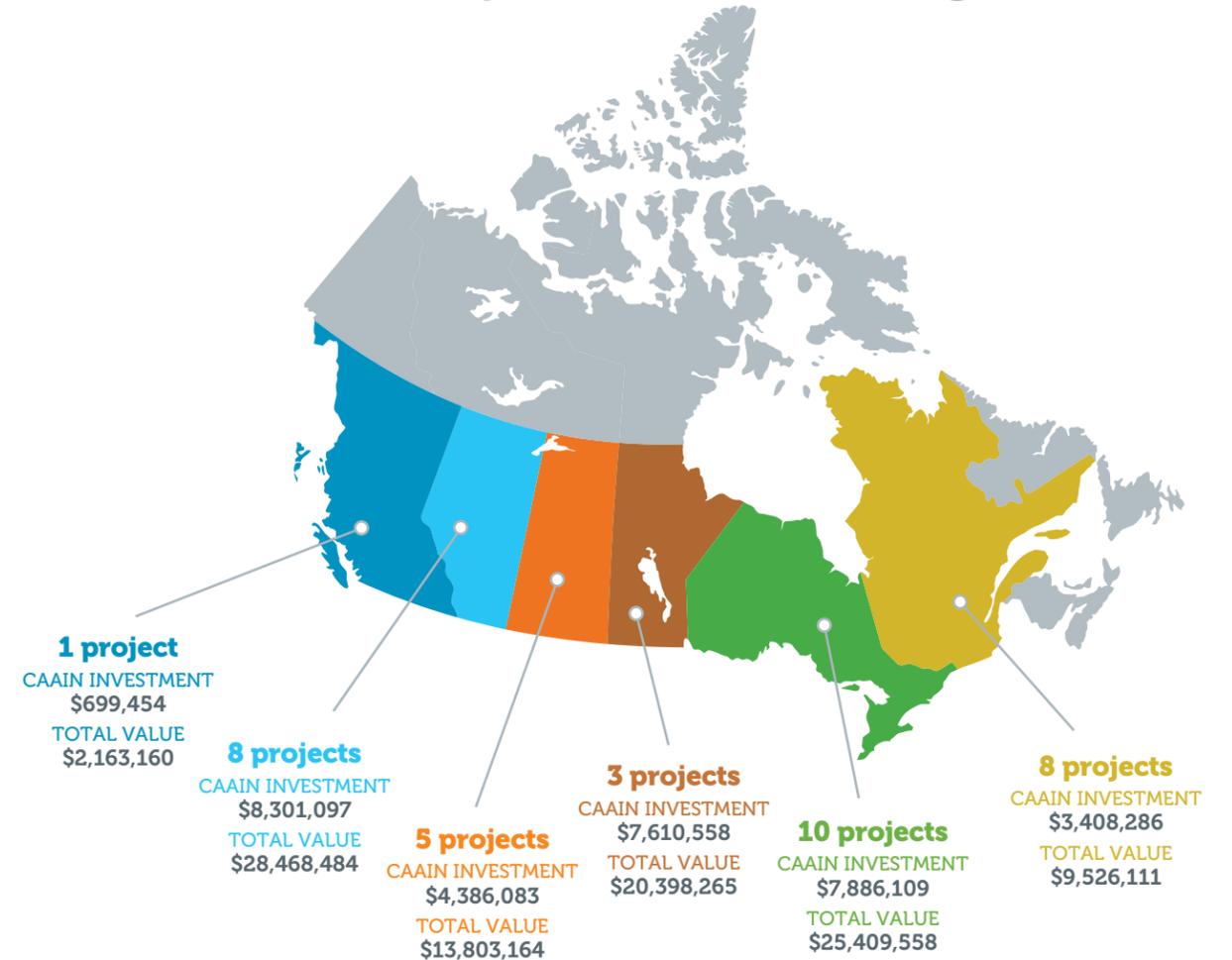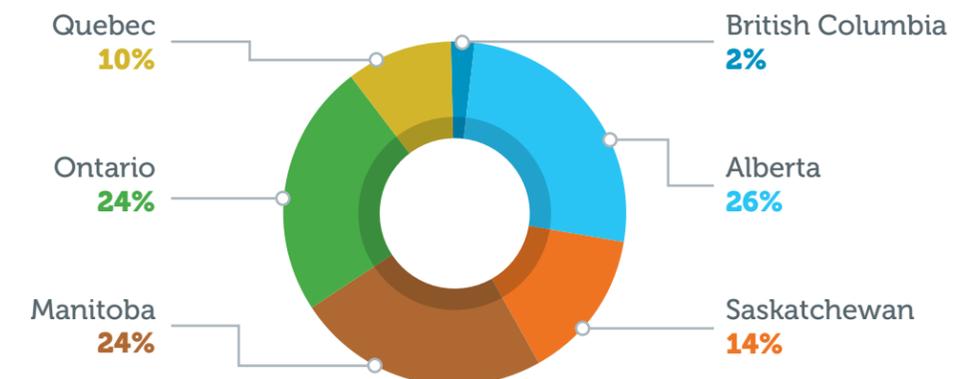
CAAIN Program Funding Summary

Program Status	Program Name	Projects	CAAIN $	Industry $	In-Kind	Project Management (4%)	Eligible Not Supported & Ineligible Costs	Total Project Value
In progress	2020 CLOSED	9	$14.3M	$13.4M	$5.3M	$0.5M	$4.2M	$39.9M*
In progress	2021 OPEN	7	$3.0M	$4.6M	$2.8M	$0.3M	$1.2M	$11.9M
In progress	2022 OPEN	6	$5.6M	$8.4M	$0.5M	$0.6M	$3.0M	$18.1M
In progress	Beef & Pork Primary Processing	2	$3.5M	$5.2M	$0.6M	$0.4M	$1.3M	$11.0M
In progress	Livestock Innovation	5	$2.1M	$3.1M	$0.6M	$0.2M	$0.6M	$6.6M
In progress	2023 OPEN	6	$3.8M	$5.7M	$1.1M	$0.4M	$1.3M	$12.3M
TOTALS		**35**	**$32.3M**	**$40.4M**	**$10.9M**	**$2.4M**	**$11.6M**	**$99.8M**

* Includes $2.2M contribution of funds from public programs

Geographic Distribution of Project Funding

1 project
CAAIN INVESTMENT
$699,454
TOTAL VALUE
$2,163,160

8 projects
CAAIN INVESTMENT
$8,301,097
TOTAL VALUE
$28,468,484

5 projects
CAAIN INVESTMENT
$4,386,083
TOTAL VALUE
$13,803,164

3 projects
CAAIN INVESTMENT
$7,610,558
TOTAL VALUE
$20,398,265

10 projects
CAAIN INVESTMENT
$7,886,109
TOTAL VALUE
$25,409,558

8 projects
CAAIN INVESTMENT
$3,408,286
TOTAL VALUE
$9,526,111

Aggregated Project Investment by Province ($)

Quebec **10%**
British Columbia **2%**
Ontario **24%**
Alberta **26%**
Manitoba **24%**
Saskatchewan **14%**

Photos courtesy of:

CATTLEytics Incorporated
Centre de développement du porc du Québec
Croptimistic Technology Inc.
ecoation Innovative Solutions Inc.
Farm Health Guardian
Grain Discovery Corp.
Haggerty AgRobotics
JCA Industries
Lakeland College
MacDon Industries Ltd.
MatrixSpec Solutions Inc.
mode40 Ltd.
Mojow Autonomous Solution Inc.
Nectar Technologies Inc.
Olds College
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PIP Lethbridge Inc.
Raven Industries, Inc.
SoilOptix Inc.
Super GeoAI Technology Inc.Transport Genie Ltd.
VeriGrain Sampling Inc.
Vivid Machines Inc.

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