Fast Forward

SOSCIP

SMART COMPUTING FOR INNOVATION

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About SOSCIP

Launched in 2012, SOSCIP's mission is to pair industry with academic researchers and advanced computing tools to fuel innovation in Canada. SOSCIP is a ground-breaking collaboration between Ontario's research-intensive post-secondary institutions, IBM Canada Ltd., Ontario Centres of Excellence (OCE) and dozens of small- and medium-sized enterprises (SMEs) across the province. SOSCIP is supported through significant funding from the federal government (FedDev Ontario), the Province of Ontario, IBM Canada and others.

Pictured from L-R: Paloma Zimmer, Sedef Akinli Kocak, Krista Davidson, Jillian Dempsey, Jennifer MacLean, Amy Hackney, Natalia Mykhaylova, Andrew Jones. Missing from picture: Tatiana Lomasko.

Message from the Executive Director

SOSCIP is unique as Canada's only R&D consortium using data science to drive innovation

When SOSCIP first embarked on its mission of providing industry-academic partnerships with advanced data science tools to foster innovation, we were very much sailing through uncharted territory. The connection between "big data" and economic growth was new, and many companies were hesitant to invest in data strategies to drive growth. By providing easy and affordable access to data science experts and technologies, SOSCIP has helped to turn that tide, and we now see widespread interest in adoption of data science tools for company advancement. From automation and advanced manufacturing to real-time sensors, artificial intelligence, and the Internet of Things, companies of all sizes and at all stages recognize that the data they collect can provide meaningful insights and tangible product outputs and improvements.

As increasing numbers of companies begin to leverage data science tools and expertise to drive growth, SOSCIP's mission is even more relevant. By providing a single point of contact to world-class researchers, SOSCIP brings together the necessary expertise, talent, and access to funding needed to build and support research partnerships that address unique industrial challenges, all bolstered by powerful advanced computing platforms. SOSCIP's ongoing project support ensures that our partnerships overcome any obstacles over the course of a project, and it has allowed us to build a reputation for excellence and a proven track record of success in innovation.

Supporting innovation in Ontario is a huge undertaking. SOSCIP could not have facilitated the company growth and adoption of data science technologies we have without investment from the Federal Economic Development Agency for Southern Ontario (FedDev Ontario), the Province of Ontario, IBM Canada Ltd., Ontario Centres of Excellence (OCE), Mitacs, NSERC, and our 15 academic institution members. We could not deliver these exciting outcomes without the expertise of our technical, administrative, and operations teams. I want to recognize and applaud all our supporters, partners, and members for their continued support of SOSCIP.

Jennifer MacLean
Executive Director, SOSCIP

Message from the Co-Chairs

Supporting SOSCIP is an investment in Canadian innovation

Since its inception in 2012, SOSCIP has seen increasing demand for its services. Starting with 20 collaborative R&D projects across seven academic member institutions, SOSCIP has grown to support over 100 flourishing projects involving 15 universities and colleges in Ontario and dozens of industry partners. The consortium has played a vital role in bridging the innovation divides among industry, academia, and government, and facilitating high-impact outcomes and company growth that will be vital to building a sustainable, vibrant economy within Ontario and Canada.

Translating ground-breaking research to the commercialization of new products and services is just one metric of SOSCIP's success. SOSCIP has helped our students gain access to real-world challenges and provided exceptional experiences to help launch their careers.

Through partnerships, SOSCIP has assisted researchers and leading companies of all sizes to prosper in unexpected ways. In addition to developing ground-breaking technologies that will transform the lives of Canadians, companies are growing the skills of their own employees while benefitting from the expertise provided by academia. They are solidifying promising new partnerships and building a reputation as world leaders through data science. This report will examine profiles that demonstrate meaningful examples of these outcomes, including the creation of new jobs, the launch of innovative start-ups, new and augmented technologies that are disrupting the market, and the development of next-generation talent. The SOSCIP collaborative model has shown great success for our institutions and partner companies, and it is one whose impact we will continue to see for many years to come.

Professor Vivek Goel
Vice-President, Research & Innovation
University of Toronto
Co-Chair, SOSCIP Board of Directors

Professor John Capone
Vice-President (Research)
Western University
Co-Chair, SOSCIP Board of Directors

What We Do

Based in Ontario, SOSCIP is unique as Canada's only R&D consortium using advanced computing to drive industry innovation. SOSCIP's mission is to bring together industrial partners and academic researchers and provide them with sophisticated advanced computing technologies to solve social, technical and business challenges across sectors and drive economic growth.

Access to leading-edge technology

- Sophisticated computing infrastructure
- Specialized software
- Dedicated technology experts

Research partnership expertise

- Streamlined access to talented academic experts
- Collaboration building and partnership support
- Access to research funding programs and grant application support

A high performance combination you won't find anywhere else...

Cloud Analytics	BlueGene/Q	Large Memory System	Agile Computing (FPGA)	GPU	IBM Watson
• Complex data analysis • Streaming and real-time analytics • Data mining and text analytics • Image processing	• Massive parallel processing • Molecular modeling and drug discovery • Simulation and modeling • Computational fluid dynamics	• Fast in-memory databases • Genomics and bioinformatics • Medical records analytics • Engineering simulations	• Image and video processing • Signal processing • Data security • Machine and deep learning	• Artificial intelligence • Structured and unstructured data analytics • Image and video analytics • Molecular dynamics	• Natural language processing • Visual recognition • Internet of Things • Conversation and tone analysis

Our Impact

SOSCIP helps companies and academic institutions…

Commercialize new products and services

Improve business processes

Increase sales

Create new jobs

Grow companies

We deploy next-generation talent…

500
More than 500 post-doctoral, graduate and undergraduate students are gaining valuable data science skills solving real-world industrial challenges.

60%
Over 60% of our graduates move into positions at high tech Canadian firms.

We empower industry…

275
SOSCIP projects have resulted in the creation of 275 new positions across 120 leading-edge Canadian companies.

150
SOSCIP has engaged more than 150 industry personnel in collaborative R&D projects.
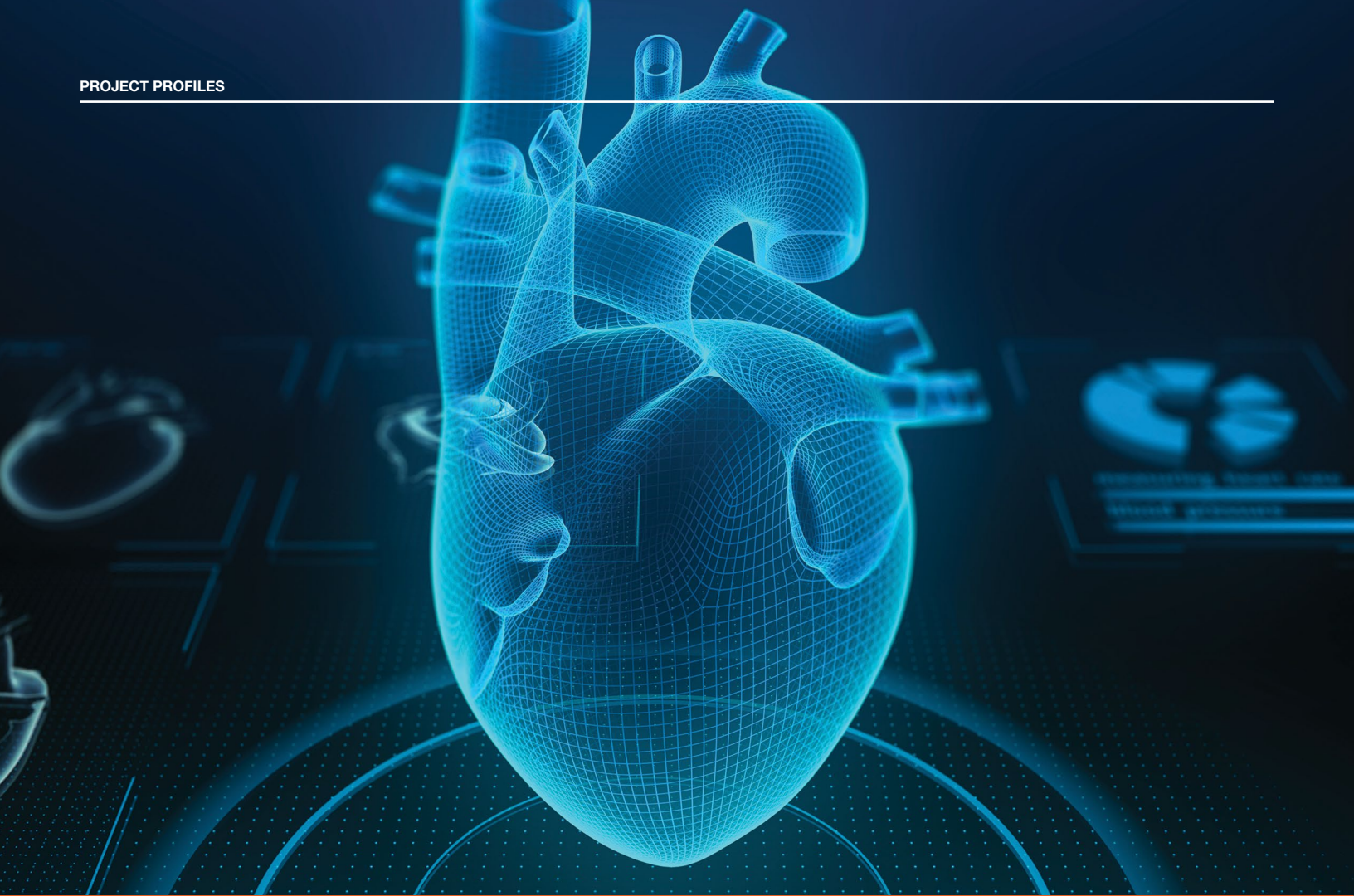
We are building an ecosystem…

145
SOSCIP has supported 145 collaborative R&D projects, over 90 of which are currently active, with many more in development.

200
SOSCIP has connected more than 200 Canadian companies with new data science partnership opportunities.

* Figures reflect annual growth from 2012.

Health Tech

Toronto-based start-up Analytics 4 Life is using artificial intelligence to advance a new form of medical imaging to help physicians diagnose heart disease

ANALYTICS 4 LIFE®

One of SOSCIP's first projects, Analytics 4 Life, is developing a digital diagnostic imaging tool that translates millions of intrinsic signals from the heart. The non-invasive device does not entail the radiation or heart rate acceleration that can be found in existing technologies used to detect coronary artery disease, which is its initial disease focus. The test is designed to deliver information directly to the patient's doctor for interpretation in a single visit via a secure web portal.

Analytics 4 Life recently completed enrollment for its 2,622-subject clinical trial, and results, which will support its U.S. regulatory application, are expected to be released in the coming year. The company has since expanded to multiple office locations across

Ontario and holds seven issued U.S. patents, with 33 more U.S. and international applications pending. It was recently named one of 2017's Fierce 15 medtech companies.

Post-doctoral fellows: Ali Khosousi and Paul Grouchy

| Healthier Lives | Company Growth | Job Creation | New Technology | Building Data Science Skills |

Studio 1 Labs delivers proof of concept for intelligent bed sheet

STUDIO 1 LABS

A collaboration between Studio 1 Labs and the University of Waterloo has led to an intelligent bed sheet that monitors patient health, detects sleep apnea, and puts valuable data in the hands of doctors. Using fabric sensors, the device collects patient data such as heart rate, respiration, movement, and other factors traditionally monitored with multiple devices. Studio 1 Labs' device looks and feels like regular linen and is non-invasive; it's also been scientifically validated for accuracy through clinical testing.

Project support and partnership building with SOSCIP has been critical in providing the computing power to process data, required by clinical standards, that is collected by the device. "SOSCIP was crucial in providing the data and computing infrastructure for our company to achieve clinical value and scientific value with 'smart' capability," explains Managing Director Edward Shim. "With the help of our partners we were able to build a validated medical device within an accelerated timeline."

Studio 1 Labs will provide a medical device at the affordable cost of a consumer device; this will be implemented in long-term care by summer 2018.

Academic institute: University of Waterloo
Academic lead: Plinio Morita
Post-doctoral fellow: Yevgeniy Davletshin

| Healthier Lives | Company Growth | New Technology | Building Data Science Skills | New Start-up |

Toronto-based Cyclica is using AI to support enhanced drug discovery

The discovery of a new therapeutic drug can take up to 14 years, and typically costs $2.5 billion. But Cyclica, a Toronto-based company, is looking to change that. Cyclica aims to accelerate drug discovery through predictive analytics — namely its signature in-house bioinformatics platform, Ligand Express™.

With access to SOSCIP's Cloud Analytics Platform, Cyclica was able to develop new technology that offers the pharmaceutical industry insight into how different people respond to therapeutic drugs at a genetic level. To date, the company has experienced tremendous growth, and raised $4.65 million in funding. SOSCIP's computing resources have had a significant impact on Cyclica's R&D pipeline, leading directly to the development of a new prototype for predicting genetic variants associated with drug response.

These new predictive models are on track for release in Q1 2019 and are expected to drive demonstrable value to Cyclica in the form of sales and partnership agreements, based on early customer/prospect feedback.

Post-doctoral fellow: Soroush Samadian

Healthier Lives **Company Growth** **New Technology** **Building Data Science Skills** **Industry Disruptor**

London researchers develop state-of-the-art automation tool for mitigating potential large-scale radiation events

Unthinkable as it may be, radiation exposure is a substantial and devastating risk for which many countries around the world must be prepared. Radiation in high doses has ionizing properties that can cause death to living tissue if left untreated. From nuclear plant accidents to devastating acts of bioterrorism, large-scale radiation exposure has global implications. A team of researchers from Western University is collaborating with London-based biotechnology company Cytognomix to mitigate these risks through automation technologies using SOSCIP's Blue Gene/Q supercomputer.

The team has developed a revolutionary software tool called Automated Dicentric Chromosome Identifier (ADCI), which automates the dose estimate of gamma and x-ray exposures. The tool could replace time-consuming and manually laborious testing. "An expert may be able to count the number of abnormal chromosomes in two samples [people] per day. With the software, we can automate 4,400 samples an hour," explains Professor Joan Knoll. In addition to that, the user-friendly software can estimate the exact dosage of costly and limited life-saving drugs needed for

treatment. "In any sort of nuclear emergency, we need to be able to determine the dose [of radiation] that a person received within a few days," explains Peter Rogan, president of Cytognomix and Canada Research Chair for Genome Bioinformatics.

The software has been sanctioned by the World Health Organization and the International Atomic Energy Agency. The team is poised to generate major international interest at the upcoming EPRBioDose 2018 International Conference in Munich, Germany.

Academic institute: Western University
Academic lead: Joan Knoll
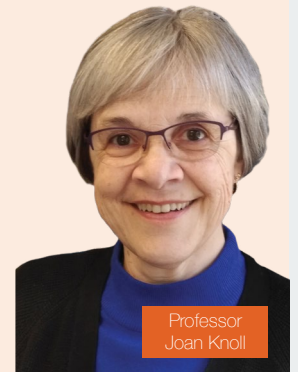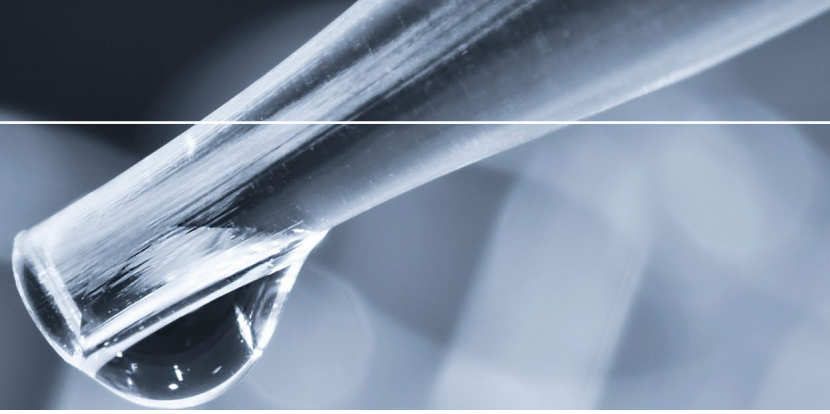**Post-doctoral fellow:** Shaimaa Ali

Healthier Lives **New Technology** **Building Data Science Skills**

Professor Joan Knoll

University of Waterloo start-up launches mobile app that detects *E. coli* in drinking water

Grintex
A High Technology Systems Company ..... your partner in growth

A team of researchers at the University of Waterloo is launching a start-up called Blue-AI as a result of their SOSCIP project. Professor Sushanta Mitra (executive director for the Waterloo Institute for Nanotechnology at the University of Waterloo) and his team have developed a mobile app that detects the presence and concentration levels of *E. coli* in drinking water.

The application, Mobile Water Kit (MWK), enables real-time monitoring and could reduce widespread illnesses associated with traditional and timely testing methods. Users can upload a photo to the mobile app, which uses machine learning to identify *E. coli* through the surface color present on the image. "The idea of the

Professor
Sushanta Mitra

start-up is to empower communities with access to AI technology through their mobile phones," said Professor Mitra. The application can even predict patterns of potential outbreaks. The start-up will explore machine learning detection with other diseases and illnesses, such as malaria.

Academic institute: University of Waterloo
Academic lead: Sushanta Mitra
Post-doctoral fellow: Naga Siva Gunda

Healthier Lives | New Technology | Building Data Science Skills | New Start-up

Wearable sensor technology will improve quality of life for patients with Parkinson's disease

MDDT
Movement Disorders Diagnostic Technologies

A Western University professor of neurology is transforming the assessment and treatment of mobility disorders such as Parkinson's disease with sensor technology. Like many diseases, Parkinson's has multiple and varied effects on patients. While one patient may experience stiffness in one part of the body, another may experience shakiness. No two patients experience the same symptoms in the same locations, or even to the same degree, making it an incredibly challenging illness for physicians to treat.

Dr. Mandar Jog, assistant scientific director of the Lawson Health Research Institute, and his team have developed a wearable multi-sensor system that precisely measures motor symptoms in patients with Parkinson's. The system records multiple symptoms from the patient wearing the device and provides an objective measurement that matches the specific patient's symptoms profile. "We're building machine-learning algorithms that will help doctors understand individual differences in symptoms and thereby deliver customized treatment to their patients," explains Dr. Jog, who, along with Jack Lee, is the co-founder of MDDT, a start-up that develops real-world

diagnostic technologies for assessing neurological disorders. The project is quickly picking up steam with other investors, and has had seven accepted publications in peer-reviewed academic journals. Dr. Jog anticipates the technology will be on the road to commercialization by the end of the year, and expects the tool to be useful in the assessment and recording of patient data for other diseases and conditions, such as stroke and multiple sclerosis.

Academic institute: Western University
Academic lead: Mandar Jog
Post-doctoral fellow: Sima Soltani

New Technology | Healthier Lives | Industry Disruptor | Building Data Science Skills | New Start-up

York researcher building miniature computers to measure DNA for the Canadian Food Inspection Agency

A collaboration between York University and the Canadian Food Inspection Agency (CFIA) will revolutionize DNA analysis important to monitoring the Canadian food supply and support real-time identification of harmful biological agents.

Associate Professor Sebastian Magierowski of the Department of Electrical Engineering & Computer Science at York is building a high-performance miniature device made from reconfigurable silicon chips that can analyze DNA within samples in a matter of minutes. The device will enable mobile measurements that can reduce the time necessary for DNA analysis from days to minutes and reduce its cost from thousands to just dollars. "Industry will have a competitive solution that will accelerate the sequencing process. This tool will enable CFIA to respond quickly to potential microbial threats to the food supply in Canada."

The collaboration provides the CFIA with the opportunity to use academic expertise to create scientific innovations for Canadians.

"This project with York University is an example of how CFIA scientists are working in collaboration with leading researchers and academics. Together, we are developing new cost-effective and innovative solutions using DNA sequencing to help the CFIA keep Canada's food supply safe by identifying threats quickly and accurately," says Dr. Dele Ogunremi, research scientist at the Canadian Food Inspection Agency.

Academic institute: York University
Academic lead: Sebastian Magierowski
Post-doctoral fellow: Karim Hammad

| Healthier Lives	New Technology	Industry Disruptor	Enhanced Collaboration	Building Data Science Skills

UOIT researcher performing large-scale simulations for nanoparticle drug delivery technology

Can sweetcorn provide a natural means of drug delivery in the body? Completely uniform in size, nanoparticles produced by sweetcorn are also completely biodegradable, water soluble, cheap to produce, and edible, making them ideal for several applications ranging from drug delivery to cosmetics. This use of sweetcorn nanoparticles is part of a proprietary technology called PhytoSpherix® being harnessed by Guelph biotechnology company Mirexus Inc.
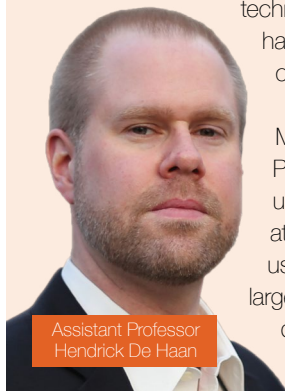
Mirexus is collaborating with Assistant Professor Hendrick de Haan to better understand the nanoparticles at the atomistic scale. Professor de Haan is using SOSCIP's GPU Platform to perform large-scale simulations to elucidate the detailed structure of the particles and generate fundamental insight into

Assistant Professor Hendrick De Haan

their nature in order to develop novel uses of this nanotechnology. "This nanomaterial is very innovative. The research project lays the groundwork for the development of unique applications such as drug delivery. Because of the natural characteristics of the nanoparticles, they show potential to bind with drugs and deliver them into the body's system naturally and without possible toxicities," says Professor de Haan.

Academic institute: University of Ontario Institute of Technology
Academic lead: Hendrick de Haan
Post-doctoral fellow: Mohammad Hassan Khatami

Healthier Lives	Industry Disruptor	New Technology	Building Data Science Skills

The Green Future

University of Guelph and Greenland Consulting research team develop unique web-based watershed management tool

Assistant Professor Prasad Daggupati and Greenland Consulting are using SOSCIP's Cloud Analytics Platform to build a web-based tool that will help improve the health of aquatic systems.

Potential beneficiaries include the Lake Erie basin, which is experiencing an increasing frequency of phosphorus-induced algae blooms. The team will build a hydrological modelling system capable of simulating large watersheds at high resolution to identify pollutant sources. The research tool could be instrumental in supporting the Ontario and Canadian governments in achieving their commitments to a 40 per cent reduction in phosphorus in Lake Erie by 2025.

"The system will make this information accessible to everyone from government to urban planners and researchers," says Professor Daggupati, of Guelph's School of Engineering. "Users will be able to see spatially what is happening and take appropriate actions." The research will enable researchers and government to reduce the harmful effects that algal blooms have on water quality, fish, and wildlife populations in and surrounding Lake Erie.

Academic institute: University of Guelph
Academic lead: Prasad Daggupati
Post-doctoral fellow: Masood Zamani

Environmental Protection   New Technology   Building Data Science Skills   Sustainable Living

Assistant Professor Prasad Daggupati

Carleton researcher is developing revolutionary technology to predict climate-change effects on permafrost regions

With about 40 per cent of the Canadian landmass underlain by permafrost, which is showing increasing evidence of thawing, an understanding of the effects of climate change on these regions is essential. When permafrost thaws, it can drastically impact ecosystems, communities, and major infrastructure in those regions, and it is thought to increase climate change globally.

Associate Professor Stephan Gruber with the Department of Geography and Environmental Studies at Carleton University is accessing SOSCIP's Cloud Analytics Platform to develop data science tools and methods that can be used to understand and potentially predict these changes. Professor Gruber, a Canada Research Chair in Climate Change Impacts/Adaptation in Northern Canada, is working with industry partner IBM Canada Ltd. to develop new

open-source technologies that can also be applied to understanding and predicting climate change impacts on snow, ecosystems, and water in remote areas.

Academic institute: Carleton University
Academic lead: Stephan Gruber
Post-doctoral fellow: Xiaojing Quan

Environmental Protection

Sustainable Living

New Technology

Building Data Science Skills

U of T research collaboration is designing high-efficiency, low-emission gas turbines for global leader Pratt & Whitney Canada

A professor with the University of Toronto Institute for Aerospace Studies (UTIAS) is developing next-generation combustor technologies that will help international company Pratt & Whitney Canada (P&WC) stay at the forefront of aerospace innovation.

Professor Clinton Groth and his team are using computational fluid dynamics to design a more efficient fuel injector for gas turbines. The design will deliver uniform and optimal engine performance for aircraft across multiple conditions — from the runway to take-off and in-air — while also helping P&WC meet federal and international targets for reducing emissions.

The team was able to leverage initial support from SOSCIP to attract additional funding of $8 million from the Ontario Research Fund and Canada Foundation for Innovation, which will support the development of the Advanced Combustion Energy Research (ACER) Facility. Once completed in June 2018, the team's designs can be tested and validated in a high-pressure facility. "P&WC are unique in Canada for the type of gas turbine they manufacture, and they've been smart to leverage support from SOSCIP," says Professor Groth. "This kind of innovation requires intense computation, which is extremely cost-prohibitive to many."

Academic institute: University of Toronto
Academic lead: Clinton Groth
Post-doctoral fellow: Lucie Freret

Industry Disruptor	New Technology	Building Data Science Skills	Sustainable Living	Enhanced Collaboration

Waterloo company is developing real-time hydrologic tool for managing water resources

SOSCIP is supporting a Waterloo-based company that delivers innovative tools for understanding and managing precious terrestrial water resources. Incorporated in 2012 by researchers at the University of Waterloo and Laval University, Aquanty is a research spin-off that has developed a flagship software program known as HydroGeoSphere (HGS).

HGS is one of the most advanced physics-based integrated groundwater-surface water models available. Aquanty is collaborating with Professor Ed Sudicky, Fellow of the Royal Society of Canada, to deliver enhanced real-time hydrologic modeling that incorporates high-resolution global weather forecasts with large datasets provided by The Weather Company. The tool will enable government agencies to better manage water resources, mitigate flood risks for dam operations, and provide agricultural companies with insights into soil moisture and groundwater levels important for planting and harvesting.

"Aquanty's customers are seeking an easy-to-use tool that will help communicate the results obtained from complex HydroGeoSphere simulations in real-time," says Steve Berg, president and CEO of Aquanty. "R&D is costly and prohibitive for small companies; SOSCIP's support, through the Cloud Analytics Platform and access to skilled post-docs, makes it easier for companies like ours to make those investments."

Steve Berg
President & CEO, Aquanty

Academic institute: University of Waterloo
Academic lead: Ed Sudicky
Post-doctoral fellow: Xiaoyang Xu

Enhanced Collaboration	Environmental Protection	Building Data Science Skills	Enhanced Technology

Cities & Movement

Kitchener-based tech company announces traffic AI platform in collaboration with Canadian universities

miovision

As a Waterloo AI founding partner, Miovision has engaged with Associate Professor Alexander Wong at the University of Waterloo to build some of the fastest and smallest neural networks in the world. The resulting networks have become the base of Miovision's cloud and embedded traffic analytics platforms. This made-in-Canada technology helps cities reduce traffic congestion and GHG emissions while making intersections safer.

"Collaborations with Canadian universities have given us the ability to break AI boundaries through research and rapid prototyping," says Justin Eichel, technical director at Miovision. "We have been able to discover and implement feasible AI–driven solutions quickly in a highly competitive market, thanks to the contributions of SOSCIP."

Academic institute: University of Waterloo
Academic lead: Alexander Wong
Post-doctoral fellow: Keyvan Kasiri

| Smart Cities | Sustainable Living | Enhanced Technology | Company Growth | Job Creation |

McMaster research team builds a virtual city for smart city planning

A team of researchers at McMaster University is using artificial intelligence to build a virtual environment for the City of Hamilton, complete with people, buildings, streets, trees, and parks.

"The goal is to build a smart city platform that enables individuals to change elements of the model to assist planning activities. Within the virtual city they can conduct simulations for increasing population density, and estimate information such as air pollution counts and traffic," says Professor David Harris Smith, who also serves as director of research for the macGRID Simulation Research Network.

Using machine-learning and image-processing algorithms made available through SOSCIP's platforms, they can map out the entire city — a useful tool in planning for modern smart cities. The project will provide enhanced visualization for planning activities and enable integration with real-time data for a more enhanced and interactive environment.

RethinkRenewal
Reshaping City Spaces

RethinkRenewal is a collaboration of planning and design professionals providing services for the renewal and revitalization of urban spaces.

civicplan + dpai

GeoDigital

Academic institute: McMaster University
Academic lead: David Harris Smith
Post-doctoral fellow: Hossein Taghinesuad
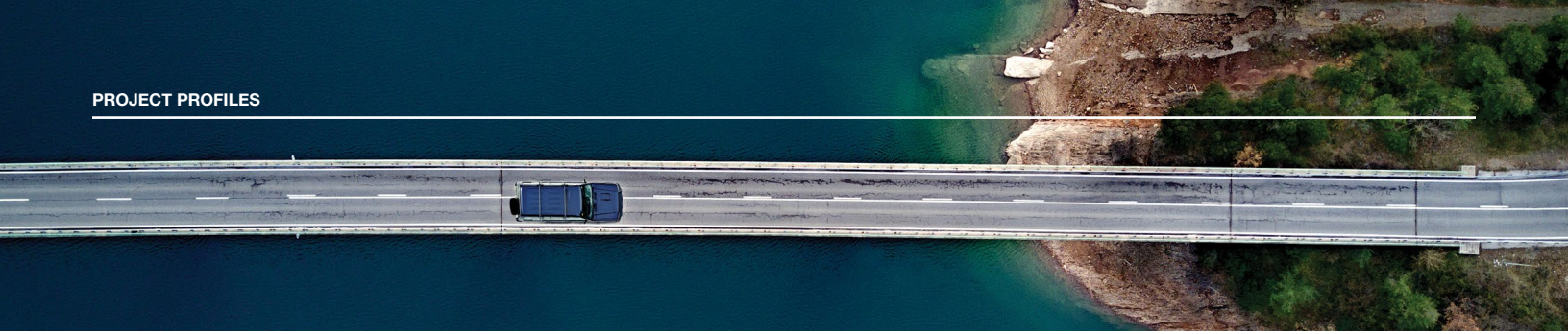
Smart Cities

Sustainable Living

New Technology

Building Data Science Skills

Industry Disruptor

Research collaboration is building smartphone application to accurately predict cross-border wait times

inovex

C G L R
COUNCIL OF THE GREAT LAKES REGION
REIMAGINING OUR FUTURE TODAY

The border between Canada and the U.S. in the Great Lakes Region serves as a critical juncture for many sectors delivering essential and time-sensitive goods and services. However, borders are subject to unpredictable delays during customs and security inspections. This challenge is being addressed through a research collaboration between the University of Windsor's Cross-Border Institute and mobile application developer Inovex Inc.

The team is accessing SOSCIP's Cloud Analytics Platform to accurately predict border delays within a range of ten minutes to two hours. The project will support the development of a smartphone application that will provide notifications of port-of-entry delays to shippers, dispatchers, drivers, receivers, and supply chain managers. "This technology will enable the smooth flow of goods and services and support a rapidly growing exchange between Canada and the U.S.," says Hanna Maoh, associate director of the Cross-Border Institute at the University of Windsor.

The project is an initiative undertaken by the Council of the Great Lakes Region with the Midwest Big Data Hub, supported by SOSCIP and IBM Canada, called Great Lakes 4.0. It will position the Great Lakes region as a world leader in innovation and the data-enabled digital economy.

Academic institute: University of Windsor
Academic lead: William Anderson
Post-doctoral fellow: Mina Maleki

Enhanced Collaboration   **Enhanced Technology**   **Smart Cities**   **Building Data Science Skills**

Renowned collaboration to make shipping smarter with the Maritime Internet of Things

LARUS TECHNOLOGIES

A collaboration spanning twenty years between the University of Ottawa and a reputable Canadian company is transforming the way companies ship goods over land, air, and sea. Professor Emil Petriu of the school of electrical engineering and computer science is working with Larus Technologies, a Canadian engineering and software development company, to develop disruptive multi-sensor monitoring technologies.

Previous collaborations with Professor Petriu led to the development of Total::Insight™, the first predictive analytics, multi-sensor Decision Support System (DSS) for defence system integrators. The tool uses behavioural learning algorithms and predictive modelling to optimize situational awareness. The current SOSCIP project will help companies access accurate, real-time big data to make timely decisions regarding the shipping of goods and services when circumstances threaten to delay or disrupt the supply chain.

A recipient of the NSERC 2016 Synergy Award for Innovation, the collaboration has already developed a reputation for delivering novel

technology. "Support from SOSCIP has elevated the research and development and has helped bring the technology to life, providing valuable learning experiences for many generations of students to benefit from," explains Professor Petriu.

The goal of the two-year project is to have the prototype tested and validated for Technology Readiness Level (TRL) 5, which will set the stage for achieving successful commercialization by the industrial partner.

Academic institute: University of Ottawa
Academic lead: Emil Petriu
Trainees: 6 full-time students

Enhanced Collaboration   **New Technology**   **Smart Cities**   **Building Data Science Skills**

Digital Disruption

Seneca research is using automation to help Ontario tech company scale up and filter fake news

In the age of misinformation and fake news, demand is growing for credible video content. Enter Vubble, a next-generation digital media company that provides customized and curated video content from reputable sources, all provided by a combination of algorithms and human editors.

Vubble, which has experienced year-over-year growth, is working with Professor Vida Movahedi from Seneca's School of Information and Communications Technology. With the help of three undergraduates, the team will design, implement, and train a system that can automatically categorize and label video using about 20,000 hand-labelled videos provided by Vubble. The automatic video categorization system will reduce valuable editorial time and can be used to focus and broaden the types of videos the editors will review.

Automating the video labels will help Vubble scale up and better serve major media conglomerates such as *The New York Times*, BBC, PBS

and others. "In addition to finding interesting content more easily, this generation needs to watch more quality videos and less fake news. Categorizing video content automatically can help Vubble suggest important and authentic content at a faster pace," explains Professor Movahedi.

Academic institute: Seneca College
Academic lead: Vida Movahedi
Trainees: 8 full- and part-time students

Enhanced Technology

Enhanced Collaboration

Industry Disruptor

New Start-up

Building Data Science Skills

OCAD University is building interactive visualization tools to enhance *The Globe and Mail* experience for subscribers

THE GLOBE AND MAIL

OCAD University's SOSCIP R&D project will boost its long-standing collaboration with industry partner *The Globe and Mail*. Led by Dr. Ahmad Karawash, a SOSCIP post-doctoral fellow, under the leadership of Dr. Sara Diamond, president of OCAD University and principal investigator, the team is building an interactive data visualization tool that will help *The Globe and Mail* extract valuable insights from their big datasets.

The project is using taste graphs to explore the relatedness of one demographic's interests to other potential interests. For instance, what is the relationship between one group's interest in sports cars and an interest in BBQs or grilling? The tool will help *The Globe and Mail* better understand, support, and retain existing subscribers while also increasing new subscriptions and providing valuable insights important to attracting new advertising streams.

"One does not have to move in a linear way through digital media," explains Dr. Diamond. "Visualization is about telling stories and demonstrating data in a meaningful and visual way." Post-doc Ahmad Karawash added that "SOSCIP is helping us to deliver strong computational power and access to Large Memory Systems needed to facilitate the data analysis of the project."

Academic institute: OCAD University
Academic lead: Sara Diamond
Post-doctoral fellow: Ahmad Karawash

Enhanced Collaboration **Building Data Science Skills** **Industry Disruptor** **Job Creation**

Dr. Sara Diamond

Queen's University to develop multi-level real-time predictive analytics framework

gnowit™
Strategic Web Intelligence

Many Canadian companies understand the value of leveraging data to extract knowledge for important insights and industry trends, but what happens when there is a continuous flow of large streaming data that can't be processed by humans alone at the required speed, or that comes from multiple and fragmented sources?

Gnowit Inc. is an Ottawa-based company that provides information monitoring and knowledge extraction solutions to media and finance companies in Canada, the U.S., U.K., and Switzerland. The firm, which has seen year-over-year growth, requires new technologies to meet the demands of its growing customer base. Gnowit is collaborating with Professor Farhana Zulkernine at Queen's University to develop infrastructure that can facilitate complex multilevel predictive analytics for real-time streaming data. The new low-latency and scalable

architecture will employ in-memory structures and methods that would work well on big data artificial intelligence tasks.

"Combining streaming and in-memory data analytics to process data in real time without persisting it on the disk will result in an innovative and efficient technology that will help Gnowit improve and expand their product line. The infrastructure can be applied to processing data from a variety of data domains, including audio, video image, text, and signals from the Internet of Things," says Professor Zulkernine.

Academic institute: Queen's University
Academic lead: Farhana Zulkernine
Post-doctoral fellow: Haruna Isah

Enhanced Technology **Building Data Science Skills** **Enhanced Collaboration** **New Start-up**

Professor Farhana Zulkernine
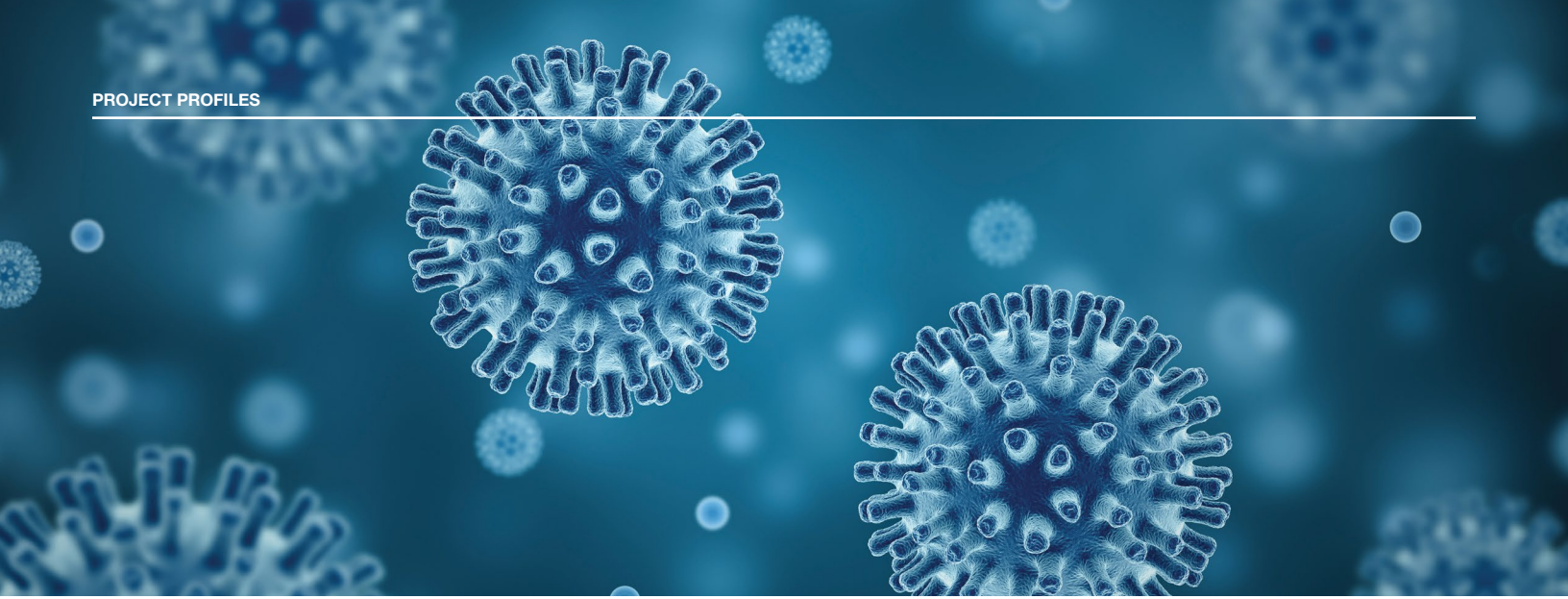
Predicting the outbreak of illnesses with social media tools

AdaptCore

Could an average of 500 million tweets posted per day be used to analyze and create awareness of potential health outbreaks? Associate Professor Ebrahim Bagheri of Ryerson University's Department of Electrical and Computer Engineering is using SOSCIP's Cloud Analytics Platform to mine social media data to detect activity related to foodborne illnesses. The goal of the research is to analyze illness patterns and help healthcare entities predict future outbreaks. Although the team is specifically analyzing foodborne illnesses, the tool can be used to monitor and predict a wide range of illnesses, including the flu. The research will reduce delays and empower health departments to intervene earlier in critical outbreaks. The application will also include a Q&A technology that would match health-related inquiries posted by Twitter users with appropriate and relevant answers backed by credible health websites.

Academic institute: Ryerson University
Academic lead: Ebrahim Bagheri
Post-doctoral fellow: Mahdi Noorian

Healthier Lives

Enhanced Technology

Building Data Science Skills

Professor Ebrahim Bagheri

Wilfrid Laurier project to enable new materials discovery with quantum dots research

ATOMIC WORKS
We are changing the way materials are discovered

Although small in size, quantum dots are hugely powerful. They are tiny (1-100 nanometer) semiconducting nanoparticles that literally illuminate LCD displays on electronic devices such as smartphones and TVs. Professor Ian Hamilton of Wilfrid Laurier University's Faculty of Science and his research team are investigating how the properties of quantum dots behave as a function of their size and shape, and the surface ligands that are used to passivate them.

Help from SOSCIP made it possible to recruit a talented post-doctoral fellow from Germany, Christopher Ehlert. The team has been able to able to perform computations on SOSCIP's Blue Gene/Q Platform that would not otherwise have been possible.

The research could enable new technologies that would boost Ontario companies as they compete to innovate in the burgeoning

area of advanced manufacturing. "To be able to perform these types of calculations on the nanoscale will put our industry partner, Atomic Works, in a strong position to deliver an attractive product to their customers, and it will also provide researchers with access to unique software for materials discovery," says Professor Hamilton.

Academic institute: Wilfrid Laurier University
Academic lead: Ian Hamilton
Post-doctoral fellow: Christopher Ehlert

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