

**Seneca INNOVATION**

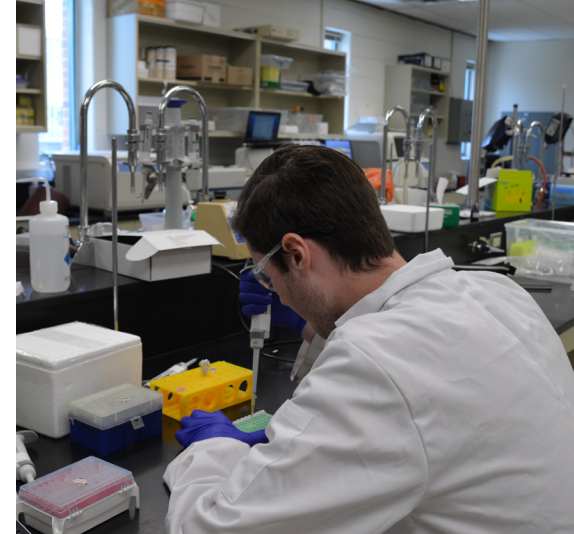


# **ANNUAL REPORT**



2019/20









“Anyone who has never made a mistake has never tried anything new.”

ALBERT EINSTEIN

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## Introducing Seneca Innovation

The fiscal year 2019/20 started with the Province of Ontario's creation of an expert panel to maximize commercialization opportunities for postsecondary institutions. Led by Jim Balsillie, philanthropist and former Chairman and Co-CEO of Research In Motion (BlackBerry), the expert panel was formed with the objective of reporting on intellectual property (IP) in Ontario's innovation ecosystem. The report includes the results of a comprehensive survey of all Ontario colleges, universities, medical research centres and regional innovation centres, and a series of recommendations in adopting a "Made in Ontario" approach to IP and innovation.

Like most colleges and polytechnics surveyed, Seneca has a hands-off approach to IP. When partnering with industry on applied research projects, our objective is to contribute to regional socioeconomic development and provide valuable experiences for our students, rather than to build an IP portfolio to license or otherwise commercialize. Further, we take no ownership stake in our HELIX ventures. One of the key recommendations of the report is for offices like Seneca Innovation to prepare mandates, clearly describing roles and responsibilities in generating (or improving) IP for the benefit of Ontario's economy. Another recommendation is that the province should build a standardized IP education curriculum across the ecosystem.

Seneca finds itself well positioned, with support from government funders, to contribute to the Ontario innovation ecosystem by working with entrepreneurs, industry and other academic institutions to advance new ideas, inventions and IP along the path to commercialization. As the province takes the framework recommended by the expert panel and pushes this into an action plan, Seneca's role in the ecosystem is clear and the road ahead looks promising.

# Seneca INNOVATION

To that end, building Seneca's innovation capacity has been Seneca Innovation's key focus for 2019/20. The record-setting number of research grant awards from federal funders and the creation and launch of Career Recharge, with a substantial grant through the TD Ready Challenge, are testaments to the efforts of the Seneca Innovation team this year. We have engaged more students, more faculty and more industry and community partners than ever before. One of our student research assistants, Vitaliya Lysenko, was invited to Ottawa to present her research project at the national CIGan Student Showcase. And, we boosted the visibility of applied research activity in the classroom through our annual Applied Research Capstone Showcase at Seneca@York and through collaboration with Seneca's Centre for Institutional Data & Enterprise Analytics (C-IDEA).

Those who have been at Seneca for a while will notice we have changed our name from Applied Research, Innovation & Entrepreneurship to, simply, Seneca Innovation. Internally this makes the name easier to recognize and remember. Externally, the name asserts Seneca's presence in the regional innovation ecosystem. More importantly, for all stakeholders, Seneca Innovation ties together HELIX and Applied Research into one unified brand and becomes an umbrella for other innovative programs and services.

Overall, the theme of 2019/20 for Seneca Innovation was about refining our focus, integrating our team and growing our capacity. In this report you will find statistics, stories, profiles and photographs illustrating this theme. It is a snapshot of what the year looked like for our team and for innovation at Seneca.



**Ben Rogers**  
Dean, Seneca Innovation



# Seneca INNOVATION

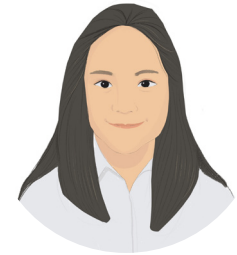
## Meet the Team



**Ben Rogers**  
Dean, Seneca Innovation



**Atani Gopalasingam**  
Manager, Finance & Operations



**Sally Yeung**  
Seneca Innovation  
& REB Coordinator



**Chris Dudley**  
Director, Entrepreneurship



**Kate Collins**  
Project Manager - HELIX



**Oscar Vargas**  
Event Management  
& Administration Assistant



**Colin Gervais**  
Senior Project Assistant



**Alison Sylvester**  
Marketing Coordinator



**Chad Leaver**  
Director, Applied Research



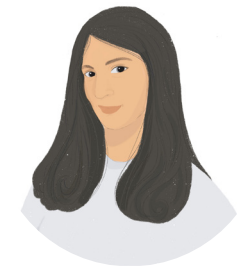
**Tina Perricone**  
Research Manager



**Ralph Lisak**  
Research Manager



**Andrew Paton**  
Research Manager



**Asma Umair**  
Jr. Project Manager

## Recognition of Funders & Donors

Nothing we do at Seneca Innovation would be possible without support from Seneca, donors and government funding agencies. We recognize and thank every organization that has contributed to our operations in the past year. And, we would like to acknowledge the following funders for their significant contributions throughout the year.





# Seneca Innovation Funding

		Applied Research	HELIX	Total Seneca Innovation
<b>Federal Funders</b>	Cash Total	\$1,028,939		\$1,028,939
<b>Provincial Funders</b>	Cash Total	\$196,344		\$196,344
<b>Municipal Funders</b>	Cash Total		\$30,500	\$30,500
<b>Private Sector</b>	Cash	\$232,707	\$546,300	\$779,007
	In-Kind	\$596,389		\$596,389
	Total	\$829,096	\$576,800	\$1,405,896
	Total (all sources)	\$2,054,379	\$576,800	\$2,631,179

# Applied Research Report

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**APPLIED RESEARCH**

DATA ANALYTICS  
RESEARCH CENTRE

OSTEP



# Applied Research Metrics

## Seneca Applied Research External Funding

<b>Federal Funders</b>	Cash Total	\$1,028,939
<b>Provincial Funders</b>	Cash Total	\$196,344
<b>Municipal Funders</b>	Cash Total	
<b>Private Sector</b>	Cash	\$232,707
	In-Kind	\$596,389
	Total	\$829,096
	Total (all sources)	\$2,054,379

## Funded Applied Research

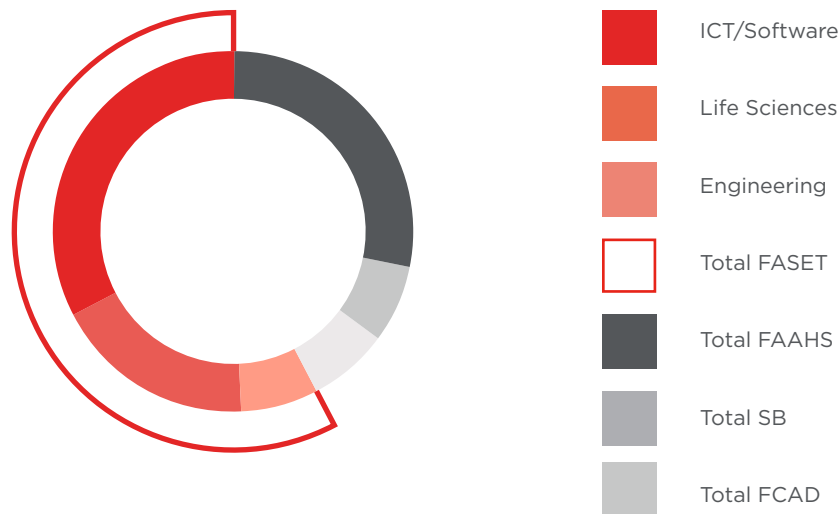
<b>Research Partnerships</b>	119
<b>Seneca Applied Research Supported Projects</b>	57
<b>Faculty Investigators</b>	46
<b>Student Research Assistants</b>	190

## In-Class / Capstone Applied Research

<b>Students involved in Applied Research</b>	3695
<b>Total Courses Surveyed</b>	2664
<b>Courses Reporting Applied Research Activity</b>	123
<b>Research Intensity</b> (% of courses involving applied research)	4.62%

# Faculty Specific Metrics

## Funded Applied Research



## In-Class / Capstone Applied Research



	Total	Faculty of Applied Arts & Health Sciences (FAAHS)	Faculty of Applied Science & Engineering Technology (FASET)	Faculty of Communication Art & Design (FCAD)	Seneca Business (SB)
<b>Total Courses Surveyed</b>	2664	625	548	509	982
<b>Courses Reporting Applied Research Activity</b>	123	38	23	23	39
<b>Research Intensity</b>	4.62%	6.08%	4.20%	4.52%	3.97%

# Save the Beer!

## Detecting Contamination in the Brewing Process Early

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**Selene Biosystems Corporation** combines founder Ryan Campbell's background in machining and microbiology to create and manufacture rapid lateral flow assays and other diagnostic tests targeting diverse fields such as industrial bakeries, crop quality control, and medical diagnostics. When Selene wanted to create a rapid test for identifying a contaminating yeast in the brewing process, they approached Frank Merante, David Zwick and research assistants in Seneca's School of Biological Sciences & Applied Chemistry. The yeast contaminant releases a highly undesirable enzyme capable of further fermenting the beer following packaging, which can cause the bottle or tallboy can to rupture and/or produce an undesirable aftertaste in the finished product. The early detection of the contaminating yeast, through the detection of a specifically produced enzyme called glucoamylase, is highly desirable by the brewing industry as contaminated pitching stocks of brewing yeasts can be identified early before they are used for large-scale beer fermentation.

Most current tests for this contaminating yeast are based on polymerase chain reaction methods, which detect the DNA of the yeast, but take more than 48 hours to complete and specialized equipment is required to observe the results. The present collaborative research project, funded by the Ontario Centres of Excellence College Strategic Sector/Cluster/Technology Platform program, designed an immunochemistry-based, rapid diagnostic test that can give results within 10 minutes of sampling. The Seneca team, in close collaboration with Selene Biosystems, designed each stage of the test, making sure that each step could be easily and quickly carried out in a standard brewery lab. The team even worked to design a prototype device unit, with case, detectors, sensors and electronics, to provide a proof of concept for product commercialization relevant to the broader industry.

One of the challenges overcome by Seneca's research assistants on the project was figuring out how to create an





immunodiagnostic test when there is no commercially available source of antibodies.

“[We] produced novel customized recombinant proteins and antibodies of industrial importance. These custom products will play a key role in beer testing development that commercially available products could not meet. The custom products modified with protein engineering improved the test and gave a higher specificity that would be otherwise unobtainable.” — Bryan Chalk, Research Assistant

The result was a combination of immunochemistry, design, prototyping, and microbiology, to create a prototype diagnostic that has the potential to revolutionize the field of brewing and yeast propagation.

“The Selene Biosystems research project offered many

hands-on challenges that spanned multiple disciplines. It was a spectacular opportunity to develop and engage in cutting-edge techniques, which were successful by the collaborative spirit exhibited by the research assistants, co-investigators and the industry partner. We look forward to a continued rewarding relationship with Selene Biosystems.” — Frank Merante, Principal Investigator

This system is currently being taken from a prototype to becoming a product in Selene’s facilities, and they expect to have a product based on this work in the market in 2021. Seneca is now working with Selene Biosystems on developing other new prototype diagnostic systems for niche applications in food safety and *in situ* biomedical diagnostics.

“

The collaborative work we’ve done with Seneca has enabled us to move quickly in developing new, niche diagnostic tests that fit into our strategic goals. The extensive expertise and talent housed at Seneca in both the faculty and students is a resource that we will continue to work with whenever possible.”

— Ryan Campbell, CEO and Founder, Selene Biosystems Corp.

# Harnessing the Power of Mitochondria to Help Athletes Maximize Performance

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**Mitronite Inc.** — is a Canadian health science and sports nutritional supplement startup. Their mission is to improve human well-being through science and nutritional intervention.

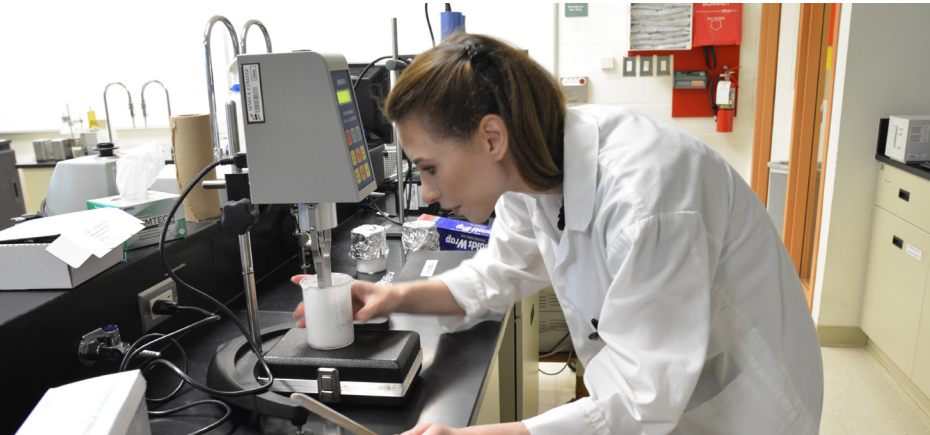
The company's goal is to demonstrate the scientific benefits of augmenting and fostering mitochondrial function, and as such their nutritional supplement has been formulated to enhance strength, speed, stamina and recovery by providing the optimal combinations of tricarboxylic acid cycle intermediates and antioxidants, to improve mitochondrial function.

"Our business strategy is based on expanding the intellectual property around our scientifically validated health supplement and engaging international companies that would bring these products to the broad marketplace," said Eaton Donald, CEO Mitronite Inc. "Scientifically demonstrating the effectiveness of our products is a key

component of this model. A component that Mitronite does not currently have the capacity to do on its own, particularly because many of the experiments undertaken to demonstrate effectiveness require specific instrumentation which would not be easily accessible to Mitronite."

To that end, Mitronite approached Seneca in 2017 to engage in a partnership, which would lead to a series of experiments in three categories: kinesiology, *in vitro* mycoblast cell culture modeling and metabolic assessment of organic acid production in athletes.

The projects utilized the expertise of Seneca's Frank Merante and George Clark **from the School of Biological Sciences & Applied Chemistry** and provided invaluable experiential learning opportunities for five upper-year students who have now graduated from the Biotechnology – Advanced program.



“I can confidently state that the students of programs at Seneca demonstrate superior laboratory and research skills as developed in their programs and through mentoring from their professors,” Mr. Donald said.

This collaboration also provided opportunities for the development of college-university collaboration through the support of the York University Microscopy Service Facility and Sandeep Raha from McMaster University.

To date, the applied research collaborative activities have resulted in three publications which described the findings from various experiments. The initial work with Mitronite examined exercise work capacity and exercise-associated muscle pain in athletes consuming the supplement, versus a control, non-interventional, group. These studies demonstrated physical performance improvements and rapid recovery in athletes taking the supplement. The resulting kinesiology study publication will lay the ground-work for marketing and potential licensing of the sports nutritional supplement.

The *in vitro* studies tested the supplement in differentiating muscle cell, myoblast models. The results of this research were so compelling that Mitronite filed global patents to secure intellectual property rights to the methods and compositions for improving physical recovery after exertion. The resulting data supported Mitronite’s non-provisional patent application (US 16/078,382). The publication in the Biomedical Journal of Scientific and Technical Research for the *in vivo* and *in vitro* experiments, was authored by Seneca’s research assistants on the project. The skills gained by these research assistants as well as the resulting publication offered a solid foundation for the students to be competitive candidates at various research facilities in Toronto.

“

The Mitronite collaboration gave me the privilege to work with well-renowned scientists, professional athletes and devoted business professionals and learn so much from them. Better yet, two years after I can use the product I was testing to help me reach my athletic goals.”

— **Kamilia Talipova, a graduate of Seneca’s Biotechnology – Advanced program**



# Getting Medical Tests

## to Underserved Regions with Shelf Life Extending Technology

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**Evik Diagnostic Innovations, Inc.** aims to be a world leader in the development and validation of new diagnostic technologies and rapid assay test devices for point-of-use applications. They manufacture lyophilized/freeze-dried reagents for a large environmental testing company in the United States.

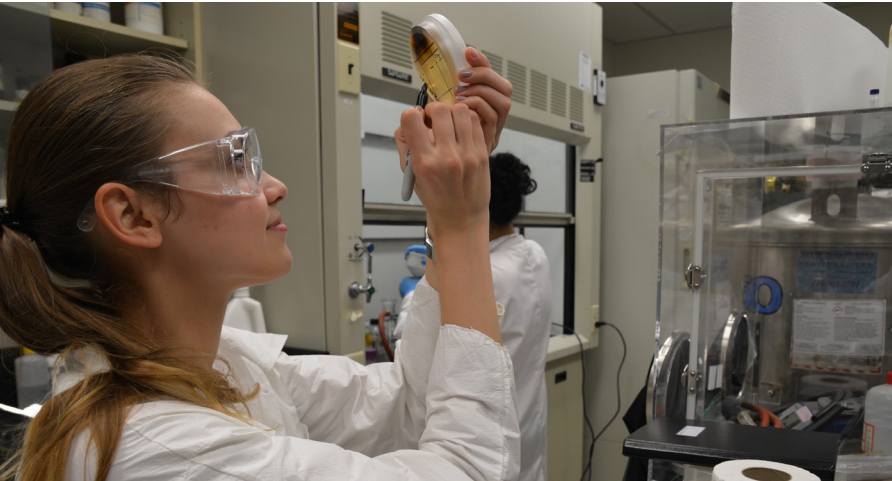
Evik came to Seneca at a point in their development in which they were ramping up pilot manufacturing to support entry to other molecular diagnostics markets, including Canada. The challenge for which they sought out Seneca's support was in the assessing, scaling and the development of point-of-use immunoassays and employing excipient stabilized reagents which exhibit an extended shelf life at room temperature.

This challenge was significant and if successful, Evik could change the face of diagnostics because companies in the field are currently limited by the increased costs associated with short room-temperature shelf stability or

long-term refrigeration. In fact, specific diagnostic reagents requiring refrigeration are not shipped or available in underserved regions of the world – regions which can benefit most from these technologies. The dynamic advantage Evik aimed to foster was to provide their customers the ability to eliminate refrigeration, waste of expired materials, and the additional costs associated with dry ice shipments. This clear market advantage would increase the incentive for companies to work with Evik.

The solution proposed by Seneca focused on creating prolonged stability through the introduction of excipients (substances formulated alongside the active ingredient for the purpose of long-term stabilization) to the base reagents.

The experimentation and optimization of this process spanned over three separate projects



funded by government grants. Unlike our traditional project outcomes, where we focus on proof of concepts and prototypes, the work with Evik sought to provide immediate results for the company, allowing them to start commercialization of their room temperature solutions. Evik has already attracted new clients, mainly in the area medical device manufacturing companies focused on molecular diagnostics assays. The growth in new clients has increased revenue for Evik and new client growth is projected to continue to advance the company's position. They were able to support two Canadian companies developing COVID-19 assays. Evik has also received a large government grant to expand manufacturing capacity for RT-PCR beads.

These outcomes were made possible by the extensive expertise of Frank Merante, the project's principal investigator, as well as the unique set of instruments available at Seneca for training students in the School of Biological Science & Applied Chemistry. The instruments made available for this applied research collaboration made the work feasible and expanded the opportunity to test various excipients and excipient combinations. If not for the support from Seneca's expertise and resources, this research and experimentation would have been significantly delayed until Evik could add more laboratory space and expertise in molecular diagnostic assays.

Professor Merante states that the Evik collaboration "represented a wonderful model of how industry and academic institutions can effectively collaborate to expedite research, increase project bandwidth, utilize specialized instrumentation and provide value to a company with assurances that the collaborating partner maintains full ownership of potentially emerging intellectual property."

In addition to the advantages for Evik, Seneca gained immensely by this unique challenge as it provided tremendously valuable experiential learning opportunities for three of Seneca's upper-year students who have now graduated from the Biotechnology - Advanced program.

“

So far, Seneca was the most efficient academic partner we have had, we were very impressed with the level of expertise provided by Seneca professors and students.”

— Vladimir Evtodienko, CEO,  
Evik Diagnostic Innovations, Inc.

# Applied Research Report

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APPLIED RESEARCH

**DATA ANALYTICS  
RESEARCH CENTRE**

OSTEP





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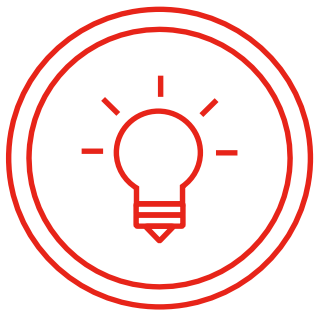
## Data Analytics Research Centre

Established in 2019, the Data Analytics Research Centre (DARC) focuses on harnessing the power of data to drive innovation and enhance business productivity and competitiveness. With expertise to support the continuum of advanced data analytics, Seneca faculty and students collaborate with industry partners to tackle business and technical challenges through all stages of data utilization, from data storage and processing, to data modelling and analysis, and data visualization.

Projects fall within the broad themes of descriptive, prescriptive and predictive data analysis, addressing challenges such as variability and risk analysis, pattern detection and recognition, and prediction and optimization.

DARC has physical space inside Seneca Innovation on the second floor of the Centre for Innovation, Technology and Entrepreneurship (CITE) at Newnham Campus.

# Data Analytics Research Centre Metrics



**9 APPLIED  
RESEARCH  
PROJECTS**



**8 FACULTY  
INVESTIGATORS**



**29 STUDENT  
RESEARCH  
ASSISTANTS**



**5 JOBS OFFERED**



**\$550,382  
RESEARCH  
FUNDING**





# Growing

## an International Workforce? This is What you Need to Know

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**The Canadian Employee Relocation Council (CERC)** provides leadership, services and assistance to its membership of companies enabling them to effectively serve relocated families by addressing issues that impact workforce mobility both domestically and internationally. They provide resources and tools to assist companies when their employees need to relocate to different countries. CERC collaborated with Seneca's School of Leadership & Human Resources to develop a framework for best practices on global mobility compliance risk management. The study was undertaken to identify

how employers with global workforces are managing in an era of increased compliance. The team found eight key areas of compliance, ranging from data privacy to immigration and tax, and examined practices to find trends in those areas.

“Through our research we found that many direct and indirect compliance issues are discussed, with different actions provided in response to specific challenges. However,





we observed a major gap. A comprehensive description of an approach to managing the spectrum of inherent risks involved with managing a workforce in more than one global location does not appear to be reported.”  
— principal investigator Cal Barber from the School of Leadership & Human Resources.

The study also found a higher level of compliance when the global mobility program of an organization is fully integrated into the risk management policy and culture of the organization.

The project was conducted between January and August 2019. The research team examined more than 250 published papers about global mobility compliance and conducted an industry survey along with in-person interviews with corporate mobility managers. The study was informed by subject matter experts in the eight areas of compliance and overseen by a steering committee of industry representatives from all over the world.

“The study uncovered some important best practices,” said Stephen Cryne, CERC President and CEO. “One of our key research findings that distinguishes organizations across the continuum of compliance is having a centralized, organization-wide approach to defining and managing the inherent risk across the range of workforce global mobility compliance considerations.”

Results were presented at the 2019 European Relocation Association (EuRA) Conference in Munich and at the CERC 2019 Annual Global Mobility Conference in Toronto.

This project was made possible by funding from Ontario Centres of Excellence, the Natural Sciences and Engineering Research Council of Canada and EuRA. Seneca and CERC are currently developing a project to create a digital interface to provide updated and better access to the global mobility best practices framework.

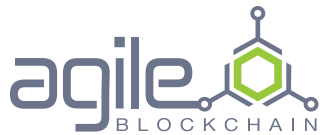
“

Working on Phase 1 of the Global Mobility Compliance Project was an incredible learning opportunity for me in the field of human resources, and understanding the role of HR as a strategic business partner both at the domestic and global stage. The exposure to events like the CERC Niagara conference introduced me to the Canadian global mobility industry and its various partners from different parts of the world. I had the best work experience during my internship on this project.”

— **Shweta Padiyar, Seneca Research Assistant**

# Transforming Trade with Blockchain Technology

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**Agile Blockchain Corporation**, based in Toronto, provides management solutions to food and manufacturing supply chains to generate a connected marketplace in a globalized world. Their tracking solution enables business consumers to track a product's origins and journey, and vital information facilitating verification certifications and product labels that are displayed on retailer shelves.

Agile approached Seneca's School of Software Design & Data Science to understand, develop, and optimize a novel blockchain architecture as a means to create a proof-of-concept implementation for their supply chain product. Currently, Agile has a proprietary method of managing supply chain data, but has turned to Seneca's Tanvir Alam and research assistants to develop a complementary blockchain solution to address the complex and often fragmented data produced by supply chain processes into a permanent, transparent and traceable record.

The Seneca team used their programming and data structures expertise to turn Agile's design into a functional blockchain implementation in Hyperledger Fabric (HLF).

"We tackled the HLF configuration and ChainCode for appropriate business rules and smart contract creations for Agile's clients. The findings suggest that under optimized resource allocation and the correct protocol selection, HLF can provide automation, transparency and security for supply chain solutions." — Tanvir Alam, principal investigator.

The project, funded by the National Sciences and Engineering Research Council (NSERC) resulted in a novel multi-node blockchain implementation that overcame a number of challenges not



expected when the project first started, including overcoming blockchain's relatively slow write speed to meet transactional standards required by supply chain and Internet of Things data collection.

**Professor Alam** states that the Seneca team was able to “optimize transactional speed based on number of endorsing peers and organizations in the HLF layer, integrating a secure “protocol to establish a secure communication API with the HLF layer and to create a Docker-ready virtual machine to leverage the solution into a Cloud platform.”

The discoveries that the Seneca team have made in this

area are novel and the team has produced a manuscript that will be submitted to an IEEE journal for publication to contribute to the field.

Gaining valuable experience in the blockchain field, research assistants Crystal Ding and Ruiqi Yu were able to leverage the expertise they gained in their academic programs at Seneca to quickly adapt and tackle this emerging topic.

“After reading tons of technical documentation, research papers and applying a rigorous research approach, we were not only able to obtain a good understanding of blockchain technology and work with HLF and framework, but also develop an effective and efficient blockchain application for our clients according to their requirements and business timelines,” Ms. Ding said. “I’m very proud of my team!”

The success of this project laid the foundation for Agile to move more quickly towards commercialization by porting the entire system to the cloud and deploying the data and blockchain components. They are currently working on scaling up and are planning a commercial release in 2021 as well as leveraging the results to inform future ventures.

“

Our collaboration with Seneca has provided valuable blockchain resource capacity while enabling our senior developers to focus on exacting implementation of our scalable digital forgery protection solution. Their work has helped position us for commercialization and aided in discovery for this critical product.”

— **Jonathan Crum, Project Manager, Agile Blockchain Corp.**

# Making Social Web Browsing

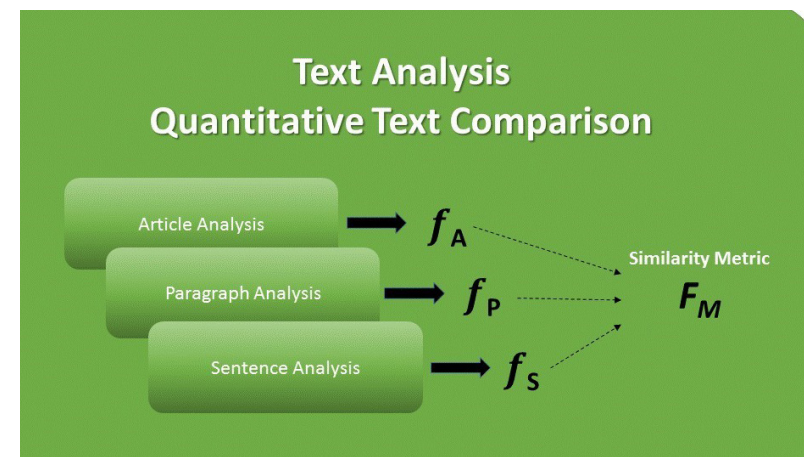
## Possible in a Dynamic Environment



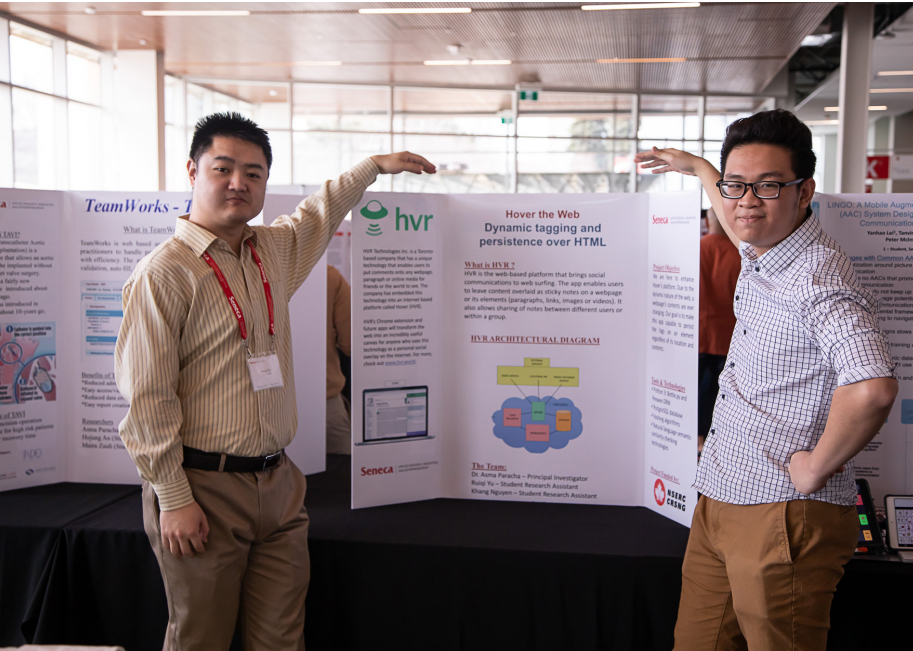
**Toronto-based HVR Technologies** has developed a platform to bring social communication to web surfing. Using their technology, users can leave notes and tags overlaid on any website directly in a web-browser window. They can also share notes, create groups, reply to comments, follow other users and check social feeds. HVR's technology allows users to tag pages or their content elements (photos, video, etc.). However, when source content changed slightly or was moved from one location to another, HVR's tags were often broken and no longer "pointed" to the correct web page, adversely impacting user experience.

In order to address this challenge, HVR turned to Seneca. Asma Paracha from the School of Software Design & Data Science, and two research assistants, Khang Nguyen and Ruiqi Yu, developed a Quantitative Text Comparison algorithm that replaced the existing Exact Text Matching algorithm. The new approach calculates the Similarity

Metric by conducting text analysis at the sentence, paragraph and article levels. This novel approach addresses a majority of possible scenarios that can lead to broken HVR tags on the source website content.







“The root cause for the broken web content tags was the dynamic nature of the web, as source pages are constantly changing and being updated. Our goal was to make this algorithm capable to persist the tags regardless of its location and contents,” said Professor Paracha. “We had worked on this issue and were able to come up with an approach that uses text comparisons to look for possible changes and the relevancy of the changes to the original text.”

Since the project completion, the developed software code has been incorporated by HVR into their platform,

This project was funded by the Natural Sciences and Engineering Research Council of Canada (NSERC).

“

Our collaboration with Seneca has enabled us to resolve a significant functional problem faced by our users as a result of continuous web page updates that can make tagging and sharing elements challenging.”

— Jesse Capon, President of HVR Technologies Inc.

resulting in a significant reduction in the number of broken tags. With a consistent, functional user-experience, the company is now able to accelerate market adoption of its platform establishing itself as a market leader providing social communication solutions for web browsing. This first-to-market position will create a significant advantage, enabling HVR to engage a broad range of business partners to generate revenue.

# Applied Research Report

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APPLIED RESEARCH

DATA ANALYTICS  
RESEARCH CENTRE

**OSTEP**



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## OSTEP

The NSERC Industrial Research Chair for Colleges (IRCC) in Open Source Technologies for Emerging Platforms (OSTEP) was established to provide early access by local SMEs to emerging computer platforms through collaboration with global open source communities to increase their global competitiveness. This includes the development of open source software for emerging enterprise platforms, such as ARM64, DevOps (Software Development and IT Operations) technologies and methodologies as well as application in super-embedded systems.

The OSTEP program, led by Chris Tyler of the School of Software Design & Data Science, advances the state of open source software to make it possible for local companies to migrate from legacy computer systems to these emerging platforms, taking full advantage of new features, including reduced space, power and cooling requirements which are now demanded by the market.

# OSTEP Metrics

## Impact of Chair on College Faculty and Staff

Person hours of faculty and staff given paid release time to participate in applied research and development projects	2,008
Number of faculty participating in applied research and development projects	3
Number of faculty and staff receiving paid release time to participate in applied R&D projects	3

## Impact of Chair on Students

Number of students participating in applied research and development projects	78
Person-hours of students participating in applied research and development projects	6,700

## Impact of Chair on Local Businesses

Number of existing products, technologies, or processes improved / year	5
Number of new products, technologies, or processes developed	5

Number of prototypes developed	18
Number of technical publications derived from funded projects	14





## Bringing Rugged Computer Systems Built for Arctic Conditions to the Tradeshow Floor

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Alteeve's Niche! is a Toronto-based software and systems design developer that specializes in server uptime and operational continuity. The company started in 1997 with a goal of preventing servers from becoming unavailable. With roots in open source software, their fault-tolerant technology stack, the Anvil! Intelligent Availability™, has been developed from the ground up, enabling an impressive server historical uptime of over 99.9999 per cent across all company deployments. It not only eliminates a single point of failure by providing complete hardware redundancy, but also by utilizing autonomous decision-making capabilities and eliminating the need to involve IT personnel to maintain uptime. This technology

is particularly well suited for applications where, due to unreliable connectivity, security reasons or physical server inaccessibility, it makes more sense to host IT infrastructure on a physical, in-house server, rather than in the Cloud.

The problem the company was facing was that any software development, system testing, trade show attendance or customer demonstrations needed to be performed on a bulky and expensive Anvil! that weighed more than 100 kilograms and costed more than \$20,000.

“Bringing the Anvil! anywhere created significant logistic problems, and had a negative impact on costs related to



both system development and marketing activities,” said Dennis Mansillo, Alteeve’s Vice-President of Operations.

In order to find a better solution, Alteeve turned to Seneca’s Chris Tyler (NSERC Industrial Research Chair) and his team for help. This led to the development of SimEngine, an open-source, hardware simulation software that can reconstruct Alteeve’s system topology and simulate common hardware failure scenarios. The Anvil! is comprised of two management servers called Striker, two Uninterrupted Power Supplies, two Power Distribution Units, two Switches and two Nodes. Seneca research assistants Olga Belavina, Miguel Roncancio and Yanhao Lei were able to accurately recreate behaviour

of core hardware assets, simulate power connections as well as internal thermal and data storage behaviour. Hardware data produced by the simulation engine is exposed through IPMI and SNMP interfaces in the same way physical components present their state. In addition, SimEngine supports both web-based management dashboard as well as a set of command line tools aimed to automate continuous testing.

“The interactions between the Anvil! hardware components are complex – an electrical failure in part of the system will have cascading effects that reduce power or thermal stress in one part of the system but increase it in others. SimEngine models these complex relationships and presents accurate information to the systems inside the simulation, while presenting an easy-to-use dashboard and control system for the user, with the ability to create and replay scenarios to easily test and demonstrate Alteeve’s ScanCore software,” said Mr. Tyler.

This innovative platform greatly accelerates Alteeve’s development process by saving hardware resources and surpasses traditional ways of approaching quality assurance of infrastructure design. SimEngine was created with open-source community in mind and it is capable of modelling a broad range of high-availability setups. Future project phases include research and development of an adaptive decision engine capable of applying machine learning to the simulated hardware models.

*The project was funded by Natural Sciences and Engineering Research Council of Canada (NSERC).*

“

By working with Seneca to build SimEngine, Alteeve is able to simulate environments and test conditions that would have otherwise required a significant amount of test equipment, space and staff to develop our Intelligent Availability™ platform”

– **Madison Kelly, Alteeve’s Founder and CTO**



# Seneca HELIX

Fiscal 2019-20 was another amazing year for HELIX. We continued to develop, refine and deliver programming to encourage the growth of the entrepreneurial mindset in individuals, and to provide resources and mentorship to support new venture development for our students, alumni and community.

Throughout HELIX's first full year in CITE, engagement in our programming continued to grow. More than 300 individuals participated in our two HELIX INNOVATION Strands. I am very proud of the talented, passionate and dedicated HELIX team that provided more than 770 hours of mentorship and delivered 95 innovation events, supporting more than 3,000 individuals. A number of these events included new, targeted programming to address venture needs.

HELIX launched the innovative Career Recharge initiative that connected and helped more than 2,800 participants prepare for their career future. Sponsored by TD Ready Commitment fund, this series of in-person and livestream workshops and exclusive events provides participants with the skills and qualities needed for the new world of work.

Throughout the past year, we continued to develop international partnerships in the entrepreneurship ecosystem. We were proud to partner with Seneca International to send a HELIX graduate to Mozambique to facilitate entrepreneurship training. We also welcomed students and dignitaries from China, India, Jamaica, England, Pakistan and South America. These delegations wanted to learn about entrepreneurship and identified HELIX as a leader in innovation and the incubation of the entrepreneurial mindset.

The fiscal year ended with a number of challenges presented by COVID-19. The HELIX team quickly responded by moving all existing programming and mentorship over to online formats, and developed new, targeted initiatives to ensure HELIXers would continue to be supported.

I would like to thank Seneca's senior leadership team, our partners and funders. Without their vision and financial support, we would not be able to grow and continue to positively impact innovation and new venture development.

Sincerely,



**Chris Dudley**  
Director Entrepreneurship, Seneca Innovation



# Seneca HELIX

Since Inception (2014)

**11,000+**

TOTAL EVENT PARTICIPATION

**510+**

PITCHED TO ACCELERATION

April 2019 - March 2020

**3,048**

PARTICIPANTS

**86**

PITCHED TO  
ACCELERATION

**302**

ATTENDED SOME OR ALL OF  
THE INNOVATION STRAND

**95**

EVENTS

**770+**

MENTOR/COACHING HOURS



[www.tazwiz.com](http://www.tazwiz.com)

Parth Patel, a Seneca Computer Science graduate, entered HELIX with the dream of developing a new venture. He envisioned a crowd-sourcing platform that would connect students and youth to odd jobs that need to be completed “around the house.”

With assistance from HELIX, Mr. Patel is now the CEO of Tazwiz. His company has received significant investment and currently has over 11,000 users registered on their platform, an expanded startup/SME target audience of 900 and more than 2,100 tasks posted on Tazwiz. They have established their corporate headquarters in Toronto’s Liberty Village and have 14 full-time team members and four interns now rounding out their staff complement.

As Mr. Patel explains, “Tazwiz began with a simple vision, to create an ecosystem that connects odd jobs to local students.” Building on this concept, he has continued to leverage Tazwiz to assist in the development of young entrepreneurs.



This evolution led to the development of a new tool called Tazwiz For Business, an online platform which provides support to students who have an entrepreneurial and business mindset. Through this platform, an entrepreneur can post a task on the platform they need help with, which can then be completed by students. This allows students to earn money and gain experience, while businesses get critical tasks done, tasks that they themselves don’t have bandwidth to complete. Through the tool, small business ventures can hire on-demand. Tazwiz currently boasts 500 businesses and entrepreneurs that have registered with them as customers. They have connected into Seneca’s Work Integrated Learning department to explore ways to support Seneca students requiring experiential work placements to complete their academic studies.

As a natural extension to Tazwiz for Business, the team developed a platform that connects job seekers with an employer. They launched Jobwiz to assist students in their pursuit of full-time employment. Tazwiz has further

connected into Seneca’s Career Development office to provide free access to the platform for Seneca Students.

Mr. Patel has also expanded his portfolio to include philanthropy. He and his company have donated funds to HELIX to allow the incubator to continue to assist young entrepreneurs like himself. As Mr. Patel states, “I wanted to thank HELIX for all the opportunities we were given, and still receive, and the priceless mentorship and guidance we have been given! We will forever be grateful of the support we have received from everyone HELIX.”

During the COVID-19 pandemic, Mr. Patel and his team have explored ways to support the community. In March 2020, the Tazwiz team adapted their HELIX-incubated online jobs platform Tazwiz as part of a partnership with the Ontario Long Term Care Association. They developed and launched Link2LTC, an online platform designed to help address the severe staffing shortages in long-term care facilities across the province during COVID-19. Link2LTC allows qualified students to find employment opportunities across the province, giving them valuable clinical experience while freeing up personal support workers and nurses to focus on resident care. The Link2LTC platform was featured on Breakfast Television.

Mr. Patel and Tazwiz also contributed to the HELIX Emergency Relief Fund to help entrepreneurs and startups affected by the COVID-19 pandemic. Thanks to support from Tazwiz and other donors, the HELIX Emergency Relief Fund has positively affected 22 HELIXers in the ACCELERATION Strand with awards of \$2,000 each. In Mr. Patel’s own words, “It’s hard for entrepreneurs to survive in the current crisis. Keeping this in mind, we decided to donate to the HELIX Emergency Relief Fund to help our fellow HELIXers.”



[www.imaginix.co](http://www.imaginix.co)

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Imaginix is a company founded by gamers for gamers.

Through their flagship platform DreamPlay they have created a network through which gamers can connect, share and build communities around their favourite games.

Over the last year, Imaginix has received 92 per cent customer validation, completed and launched its phase one of the DreamPlay platform and signed up more than 3,000 users.



[www.nexushealth.ca](http://www.nexushealth.ca)

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Nexus Health was built to fill the information gaps between health-care institutions and individual patients. They have created a digital database for patients to collect and share their personal health information and designed an accompanying QR code wristband that allows for quick and easy access in times of need.

Over the last year, Nexus Health has completed its customer validation, minimum viable product, business plan and expanded its team from two members to five.

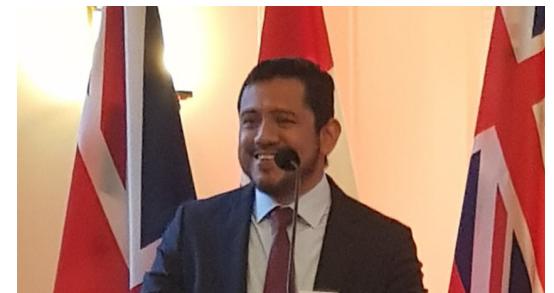


[www.ezbeanz.com](http://www.ezbeanz.com)

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EzBeanz is a financial platform uniquely designed with international students in mind. Their platform connects international students with educational institutions, payment platforms and other services which effectively reduces the complexity and headache involved in preparing to settle and study in Canada.

Over the last year EzBeanz has validated its business concept, reached a preliminary agreement with a financial institution and developed its landing page for international students.

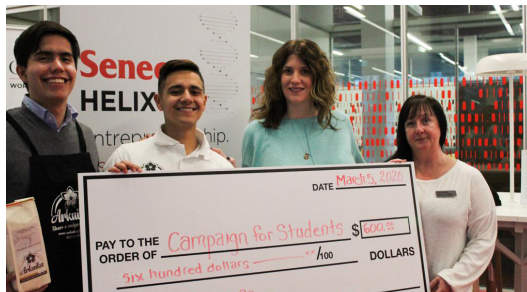




[www.arkaikacoffee.com](http://www.arkaikacoffee.com)

Arkaika is a high-quality coffee brand that uses their product to unite people around a passion for coffee and community. Their ethical buying process helps support farmers in Colombia and through the sale of their ground and whole bean coffee they contribute to Canadian causes like Seneca's Campaign for Students.

Over the last year, Arkaika has imported its product from Colombia, launched its website, exhibited at the Toronto Coffee and Tea expo, turned a profit and donated \$600 to Seneca's Campaign for Students.



[www.progoti.ca](http://www.progoti.ca)

Progoti is a clothing brand that aims to drive change in Bangladesh's garment industry by purchasing life insurance and pension policies for workers. Progoti partners with customers to leverage crowdfunding and directly support garment workers in their post-retirement life.

Over the last year, Progoti has expanded its product line and continued to contribute to worker pensions, insurance and accident benefits for Bangladeshi garment workers. This fund now totals more than \$10,000.



**SNAKEBYTESTUDIOS**

[www.snakebyte.ca](http://www.snakebyte.ca)

SnakeByte Studios is a one-stop-shop digital marketing company that helps businesses leverage their potential through websites and social media. Through the use of their expertise in content creation and digital design they provide unique and tailored client experiences that facilitate growth and unlock potential in the digital arena.

Over the last year, SnakeByte Studios has launched its website, taken on its first two clients, increased its Instagram following and hired its first employee.







**Seneca** HELIX

**Career Recharge**  
WORKSHOPS. EVENTS. MENTORSHIP.

PRESENTED BY





In October 2018, Seneca was named one of 10 winners of the inaugural TD Ready Challenge presented by TD Bank Group. Seneca received a \$1-million grant from the TD Ready Challenge to develop and deliver an innovative, scalable solution that can contribute to building a more inclusive and sustainable tomorrow.

In 2019 Seneca HELIX launched the **Career Recharge** initiative, designed to assist mid career individuals to prepare for their career future, whether that means re-entering the workforce, advancing in their field, changing careers or starting a new venture.

Career Recharge provides individuals barrier free opportunities to develop through:

- live and on-demand workshops
- coaching and mentorship
- exclusive events

The **Career Recharge** initiative provides the opportunity to transform participants into creative thinkers, designers, problem solvers, collaborators and communicators. It will also build up their resilience as they navigate the ever-changing employment landscape.

“Seneca has brought forward a creative and scalable solution to help address the uncertainty associated with technological acceleration and the future of work.” said Andrea Barrack, Vice-President, Global Corporate Citizenship, TD Bank Group. “Being a winner of the TD Ready Challenge is a testament to the skill, ingenuity, and vision of its creators, as well as their dedication to opening doors to a more inclusive and financially secure tomorrow.”

PRESENTED BY



**Career Recharge**  
WORKSHOPS. EVENTS. MENTORSHIP.

PRESENTED BY

# Career Recharge

WORKSHOPS. EVENTS. MENTORSHIP.

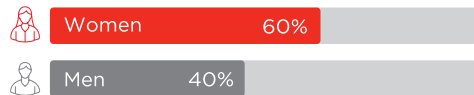


## Preparing for the future of work.

Career Recharge is an innovative initiative that has engaged and helped 2,800+ participants\* prepare for their career future. A series of 24 workshops, mentorship and exclusive events are offered to provide participants with the skills and qualities needed for the new world of work.

### Our Participants

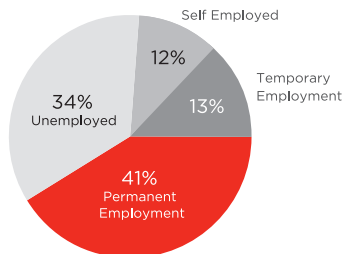
More than half our participants are women



More than half our participants are +29 years old



Over 65% of our participants are employed



### Our Results

**6.4+ million**

Digital Ad Impressions

**278,000+**

Organic Social Media Impressions

**238,000+**

Opened Emails

**51,000+**

Media Impressions

**22,000+**

Unique Web Page Views

\* Based on 19 workshops: June 4, 2019 to March 10, 2020  
Total participants: 2,830 (1,282 in-person, 1,040 online, and 508 at viewing hubs)

"I highly recommend Career Recharge because you will meet many like-minded participants and the staff are excellent at teaching the material."

Bobby Ramroop  
Career Recharge Participant

"I'm in between opportunities and I'm finding these sessions very valuable in my work search."

Linda Litwin  
Career Recharge Participant





# Participants & Recognition



# Seneca INNOVATION

## Research Leader of the Year Winner

The award is presented to a faculty research leader (principal investigator) who has made a significant contribution to applied research at Seneca this year and who has gone over and above to provide mentorship and guidance to research assistants. The winner is nominated by research assistants.



**Frank Merante**

School of Biological Sciences & Applied Chemistry

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**Industry partner for Project**

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Connect Genomics Inc.

**Term of Project**

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September 2019 to April 2020

**Statement from Nominator**

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“For continuously being a supportive, humble and knowledgeable leader, giving opportunities for professional growth in the scientific field to all research assistants.”

# Seneca INNOVATION

## Applied Research Fund Recipients

Angie Arora

**VCA Canada**

Best Practice Guidelines for Pet Loss Support

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David Connolly

**Jen's Place**

Elevating the Voices of Children and Youth in Care

---

Kirsti Clarida

**VCA Canada**

Best Practice Guidelines for Pet Loss Support

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Farah Jindani

**Centre for Addiction and Mental Health**

The Development, Implementation and Evaluation of an Online Gambling Self-Help Tutorial with Ontario Post-Secondary Students

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Filimon Tsionas

**International Energy Research Centre**

Heat Pump and Photovoltaic Panels Life Cycle Effect on Energy Models

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Kyle Valdock

**International Energy Research Centre**

Heat Pump and Photovoltaic Panels Life Cycle Effect on Energy Models

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Sabine Weber

**Fashion Takes action**

Analyzing Textile Waste

# Seneca INNOVATION

## Faculty Principal Investigators

---

**Tanvir Alam**

School of Software Design & Data Science

---

**Cal Barber**

School of Leadership and Human Resources

---

**Mark Buchner**

School of Software Design & Data Science

---

**Irene Chong**

School of Creative Arts & Animation

---

**George Clark**

School of Biological Sciences & Applied Chemistry

---

**Jim Cooper**

School of Biological Sciences & Applied Chemistry

---

**Jamie Cote**

School of Biological Sciences & Applied Chemistry

---

**Bill Doern**

School of Marketing

---

**Mariam Daoud**

School of Software Design & Data Science

**Varinder Gill**

School of International Business & Management

---

**Sandra M Ireland**

School of Biological Sciences & Applied Chemistry

---

**Charmaine Johnson**

Coordinator, Work Integrated Learning

---

**Barkev Keoshkerian**

School of Biological Sciences & Applied Chemistry

---

**Tania Killian**

School of Nursing

---

**Ivana Knezevic**

School of Biological Sciences & Applied Chemistry

---

**Catherine Leung**

School of Software Design & Data Science

---

**James Manson**

School of Recreation & Environmental Studies

---

**James Mayo**

School of Biological Sciences & Applied Chemistry

---

**Frank Merante**

School of Biological Sciences & Applied Chemistry

# Seneca INNOVATION

## Faculty Principal Investigators

**Vida Movahedi**

School of Software Design & Data Science

---

**Margaret Osborne**

School of Marketing

---

**Asma Paracha**

School of Software Design & Data Science

---

**Ash Patel**

School of Leadership and Human Resources

---

**Allan Randall**

School of Software Design & Data Science

---

**Tonia Relkov**

School of English & Liberal Studies

---

**Sharon Robertson**

School of Biological Sciences & Applied Chemistry

---

**Mark Shtern**

School of Information Technology Administration & Security

---

**Rohan Singh**

School of Accounting & Financial Services

**Alex Sochaniwskyj**

School of Electronics & Mechanical Engineering Technology

---

**Philip Sparks**

School of Fashion

---

**Agnieszka Stopka**

School of Electronics & Mechanical Engineering Technology

---

**Muhammath Siyam Subair**

School of Biological Sciences & Applied Chemistry

---

**Ali Taha**

School of Electronics & Mechanical Engineering Technology

---

**Ramy Taraboulsi**

School of Accounting & Financial Services

---

**Chris Tyler**

School of Software Design & Data Science

---

**Kyle Valdock**

School of Electronics & Mechanical Engineering Technology

---

**David Zwick**

School of Biological Sciences & Applied Chemistry

# Seneca INNOVATION

## Student Research Assistants

Alisha Abdulla	Dinoyan Ganeshalingam	Tia McQuaid	Andriy Shmatukha
Tasfia Ahmed	Sai Vijay Harish Ganti	Carmen Mei	Cheng-Tuo Shueh
Suad Ali	Daniel Goncalves	Lainne Morales	Yoosuk (Tony) Sim
Lujain Almughmsi	Alexandra Griffith	Janaina Moreira Cunha E Nascimento	Arshdeep Singh
Nicole Marie Amendola	Arian Hajiakbar	Mitchell Victorino Carag Navarro	Diljot Singh
Amina Arshad	Sepideh Hashemi	Ngoc Nam Khang Nguyen	Nadine Starikova
Lyza Gin Austria	Antonia Julia Hoffman	Phan Y Nhi Nguyen	Margaret Steffan
Madhuri Himmatbhai Avaiya	Lex A. Holman	Quynh Hai Yen Nguyen	Kamilia Talipova
Omeshwari Baburam	Matthew Sheldon Horn	Waqar Nishanto	Konica Tallari
Mikhail Henri Gracias Barrameda	Xiaowei Huang	Pouya Oftadeh	Irina Ten
Josi Barreto Chaves	Anitta Joseph	Bamidele John Olubadejo	Nguyen Thien An Than
Olga Belavina	Tamana Kabir	Shweta Padiyar	Nicole Ting
Tessa Caroline Bound	Maria Kapnik	Wang (Abby) Pan	Jessica Taylor Turner
Kartik Budhiraja	Harleen Kaur	Hei-jin Park	Burcu Us
Quang Vu Bui	Maria Kendal-Kong	Tara Pedramy	Stephanie Valdez
Joaquin Esteban Ceballos Henson	Jasmin Khan	Orinami Pius	Andre Luiz Valle Rosa
Guralampreet Singh Chahal	Raymond Foster Kariuki Kiguru	Alexander Ponomaroff	Juan Jose Vanegas Maya
Bryan Chalk	Minji Kim	Josue Quilon Barrios	Thi Anh Truc (Panda) Vu
Julia Chan	Volodymyr Klymenko	Jeison Rafael Coronel Loaiza	Apoorva Wadhwa
Akshaykumar Ranchhodbhai Chaudhari	Anaita Lashley	Ambika Raghubir	Michaela Jade Whitney
Akshay Chaudhary	Alberto Laurenzi	Genevieve Ramirez	Raymond Glen Wong
Callia Chui	Yanhao Lei	Daniel Jesse Ray	Chaoyi Wu
Amber Sky Margaret Clarke	Ugen Tshering Lepcha	Evan Thomas Reynolds	Saihong Xiao
Stuart Lee Crust	Nathan Li	Miguel Eduardo Roncancio	Bonnie Yeung
Gustavo Dantas Baida	Jessica Adrian Liu	Yelyzaveta (Liz) Rzhepishevskaya	Candice Yeung
Thi Gam Dao	Vitaliya Lysenko	Caitlin Sammut	Jae Hyun You
Crystal Ding	Navita Mahant	Saima Seer	Christopher Young-Hong
Andrew Dolson	Ishani Maharaj	Jiel Selmanovski	Ruiqi Yu
Sharmaine Vitug Felicen	Sukriti Malla	Sana Shabbeer Moosavi	Daniella Christina Zamora-Natareno
Goncalo Semide Ferreira	Charles Mbuga Matovu	Amanat Sharma	Winnie Zhao
Yu-Ting Fu	Joshua Ryan Mayers	Srushti Kalpesh Sheth	Yiran (Ian) Zhu



# Seneca HELIX

## HELIX Mentors/Coaches

Elliott Atkins

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Judy Cameron

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Rob Cattle

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Donovan Dill

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Heather Gramlow

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Alan Luk

---

Jason Presement

---

Paul Rivett

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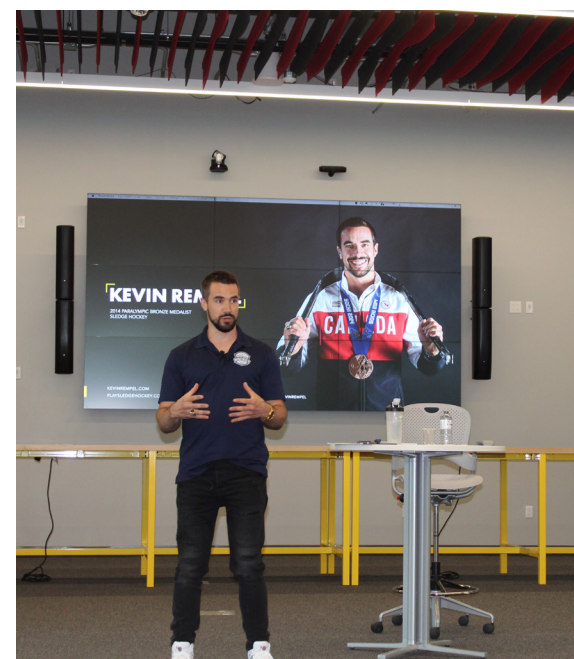
Perry Smith

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Ramy Taraboulsi

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**Seneca INNOVATION**