ANNUAL REPORT

2024-25

ACENET
accelerating discovery 20 YEARS
accélérer la découverte ANS

ACENET
HH-2037 Henrietta Harvey
Memorial University
St. John's NL, A1C 5S7
admin@ace-net.ca

A regional partner of the Digital Research Alliance of Canada | Partenaire régional de l' Alliance de recherche numérique du Canada

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Research Spotlights

Message from Chair and CEO

2024 was a landmark year for ACENET as we celebrated two decades of impact, growth, and innovation. Our 20th anniversary offered an opportunity to reflect on our journey, acknowledge the dedication of our team, and share our story. The anniversary edition of our annual report captured the milestones and accomplishments that have defined our evolution over the past 20 years.

This year marked a significant progression in our training efforts. While researcher training has long been a cornerstone of our services, ACENET has expanded into workforce digital skills development through a partnership with techNL. Our inaugural cohort of the Microcredential in Advanced Computing graduated in July. The 26 graduates completed a comprehensive 90-hour, in-class program and independent project work. This initiative enabled us to lay a strong foundation for the future delivery of high-quality microcredentials. We are now rolling out the program across Atlantic Canada under three separate microcredentials.

Building on this momentum, we created and launched a second microcredential in collaboration with Digital Nova Scotia and the Centre for Online Learning & Professional Studies at St. Francis Xavier University. Centered on the Practical Utilization of AI, this 24-hour program focused on the application of large language models. The program successfully graduated 25 mostly mid-career IT professionals and earned significant praise, prompting the partners to commit to offering the program again.

Our research consulting services also expanded. A new collaboration with the New Brunswick Institute for Research, Data & Training saw us engage a new research consultant focusing on sensitive data. Our Embedded Technical Support Program continues to grow. We have completed three calls and supported five projects across the region.

Recognizing the rapidly changing national landscape and the evolving needs of our community, we also developed a three-year strategic roadmap. This roadmap positions ACENET to grow with intent and to effectively meet the challenges and opportunities ahead.

As a key regional voice in digital research infrastructure, ACENET was proud to participate in several strategic forums in 2024, including the Springboard-Atlantic Canada Opportunities Agency Atlantic AI Roundtable and Innovation, Science and Economic Development's national consultations on the federal government's $2.4 billion AI strategy. We have also been actively supporting the Digital Research Alliance of Canada's vision for national AI research infrastructure, and are committed to contributing meaningfully to a unified Canadian AI ecosystem — one that strengthens Canada's productivity, innovation capacity, and technological sovereignty.

We are proud of what we've achieved, and we look forward to building on this momentum as we continue to serve Atlantic Canada's research and innovation communities.

Sincerely,

Dr. Tana Allen
Chair, ACENET Board of Directors

Greg Lukeman
Chief Executive Officer, ACENET

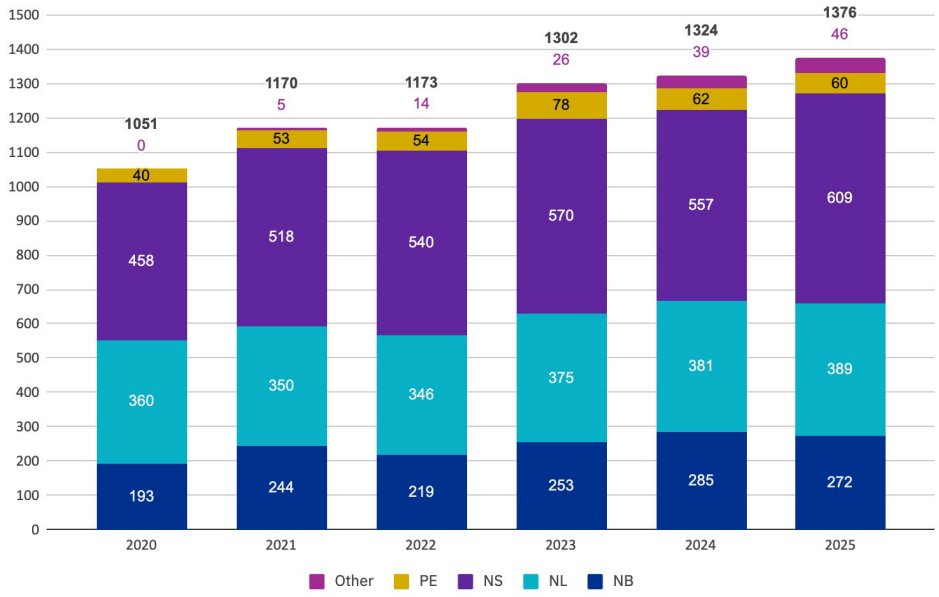
Our Community

ACENET supports almost **450** research and innovation groups, totaling **1376** users.

We have exceeded our year-end target of 425 research groups.

Over the past five years, the total client base has grown 31%. The most significant five-year growth has been seen on PEI, which has increased by 50%, followed by New Brunswick with 41%. At Université de Moncton, where the first ACENET staff member joined in 2023, the number of research groups has more than doubled since then.

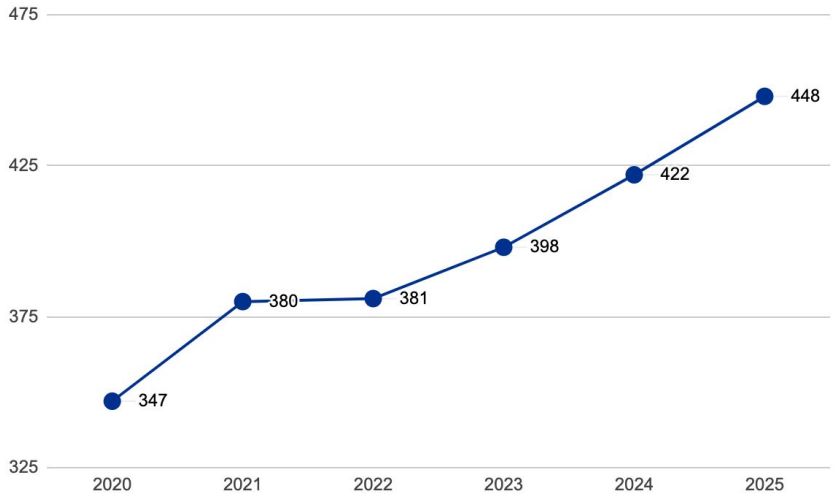
Number of Users in Atlantic Canada



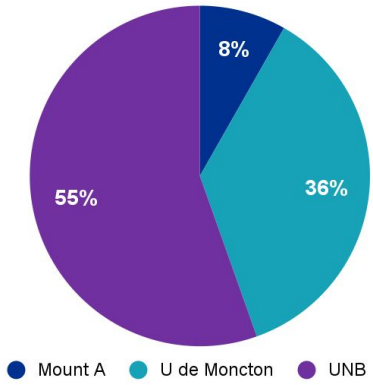
2024-25 PI Growth

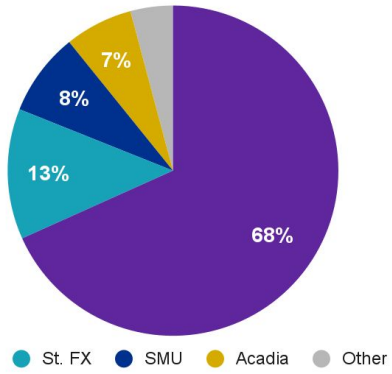
NB	15%
NL	3%
NS	5%
PE	0%
Other	0%
Overall	**6%**

Total Principal Investigators (PIs)*



** Includes industry, nonprofit and government*





Research Chairs

ACENET has provided support to 66 Canada and/or Industrial Research Chairs since inception.

Our Community

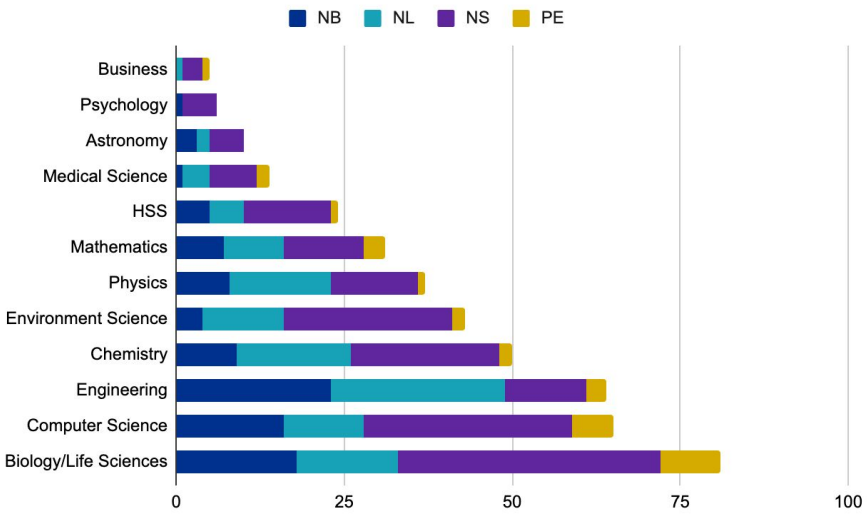
Research Focus in the Region

Biology, computer science, and engineering remain the leading disciplines using advanced computing in the region, together representing half of all research groups.

Computer science is experiencing the fastest growth, likely driven by rising interest in artificial intelligence. At the same time, physical sciences—including biology, chemistry, and physics—are also seeing steady increases in usage.

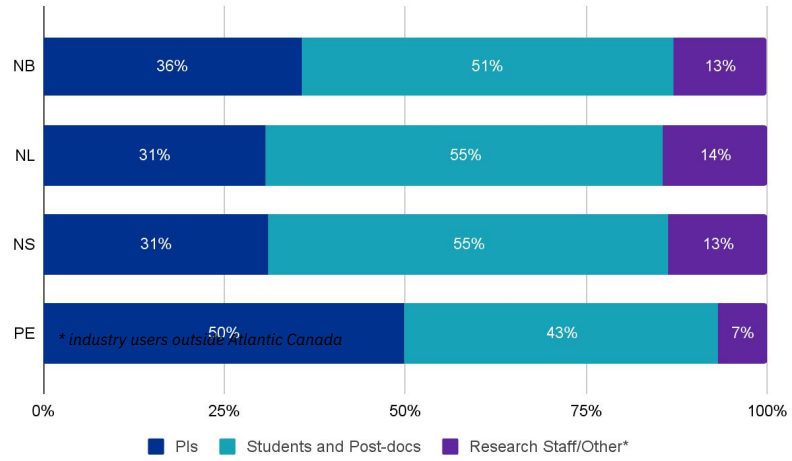
Although researchers in the humanities and social sciences are increasingly adopting digital tools, their use of ACENET services is less visible in HPC system accounts. Support for these fields is typically focused on research data management, the handling of sensitive data, and research dissemination platforms.

Academic PIs by Research Area



User Roles by Province

The majority of the users of our systems are students and postdocs, underscoring ACENET's important role in training Atlantic Canada's future labour force.



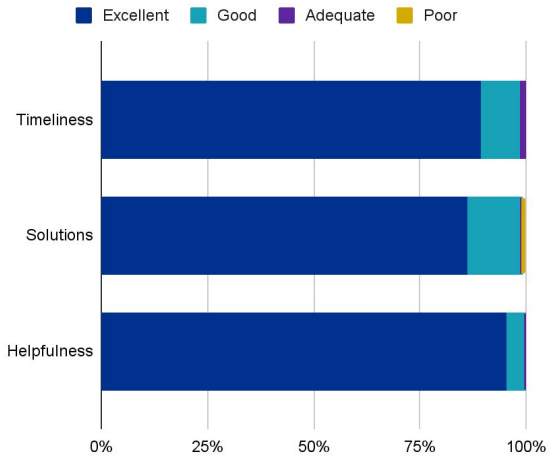
Client Satisfaction

ACENET continues to surpass its 80% target for client satisfaction across its services.

In the 2024 annual spring Alliance account renewal survey, Atlantic researchers rated the advanced computing resources available an average of 4.4 out of 5, the services provided 4.5, and their overall satisfaction 4.5, or 90%.

In national Help Desk post-ticket surveys, ACENET staff received top marks for service quality: 90% of users rated response timeliness as excellent, 86% rated the quality of the solution provided as excellent, and 96% rated overall helpfulness as excellent (based on rating options of poor, adequate, good and excellent.)

ACENET Staff Support Satisfaction



Research Spotlight

Predicting the Future of Fisheries

Ian Bradbury uses DNA technology to understand what aquatic species — whether Atlantic salmon, cod, crab or lobster to name just a few — Eastern Canada has and how they might respond to stressors such as climate change.

"We look at how things are adapted to the environment using genetic and genomic tools and then we use machine learning and climate models to look at how they might respond in the future," explains Bradbury, a research scientist with the Department of Fisheries and Oceans and an adjunct professor at Dalhousie and Memorial Universities. Genetics is the study of how genes work, while genomics is the study and mapping of genomes – the full set of genetic instructions for an organism.

The goal is to be able to make projections in terms of the rate of change happening with a specific species, as well as how it will respond to climate change and how that might impact fisheries and other stakeholders using those resources in the future.

The classic example, he says, is Arctic char in Labrador, which is culturally important for Indigenous groups along the coast, ecologically important because it's the dominant freshwater coastal fish species there and notable because it's at the southern portion of its range in Labrador.

Ian Bradbury

Marine Conservation

Department of Fisheries & Oceans, Dalhousie University, Memorial University

"So it would not be surprising that climate change might be pushing it northward," Bradbury says. "And we've done a lot of work over the last couple of years, some of it using ACENET, to understand how Arctic char in Labrador and north of that, are adapted to their climate and then how climate change might affect that."

Bradbury is building a baseline or map of genetic variation in Arctic char. His projections suggest that the Arctic char's range will start moving north, meaning the southern portion of Labrador will no longer be suitable for char, which will have implications for the people living in the area and for the ecosystems that remain there.

Bradbury and his team need ACENET because genetic tools generate massive datasets — multiple terabytes in fact — and since data management and data analysis are most of what they do, they couldn't do their work without ACENET.

"We don't have access to the computational power that my students would need to do these sorts of analysis," Bradbury says.

The students he supervises are sequencing the entire genomes of aquatic species and then analyzing them for differences among individuals and populations.

"We're making associations with climate on a set, and we're doing projections for future impacts," Bradbury says.

While there are other options out there, he says, ACENET is particularly useful because it's accessible to students. His research team includes students at all levels and postdocs at both Atlantic campuses.

Research Spotlight

Harnessing Bacteria with AI

Lourdes Peña-Castillo is looking to understand bacteria to find ways to strategically manipulate them.

“Bacteria or, more generally, microbes are everywhere,” says Peña-Castillo, who is jointly appointed as a professor in the departments of computer science and biology at Memorial University. “They are in the house, they are in the soil, they are in the environment and they interact with everything. We know that some bacteria cause diseases, but they are a minority. All other bacteria are beneficial for plants, animals and for us.”

Given that, Peña-Castillo’s research, which she describes as computational microbiology, applies machine learning to understand patterns in the genome of bacteria that signal to them how to “turn on” or express their genes.

Lourdes Peña-Castillo
Computational Microbiology
Memorial University

“Right now, if we want to treat a disease, we basically take antibiotics and kill every single bacterium, the good ones along with the ones causing the disease,” says Peña-Castillo, who did her PhD in Computer Science in Germany and her postdoctoral work at the University of Toronto. “With my research, we are understanding in more detail every single bacterium, and then potentially we could actually either modify the gene expression of that bacterium, or create treatments specifically designed for that bacterium. Instead of killing everything, let's try to just control a specific part of a bacterium.”

She refers to this work as a foundational endeavour in “smart biotechnology,” noting that in industrial processes, for example, they sometimes want bacteria to help to create more of a certain substance.

Peña-Castillo says she couldn’t do her job without ACENET.

“In my lab, we work with collections of sequencing data,” she says. “Each raw uncompressed sequencing file can be tens of gigabytes (GBs). As each dataset can have several of these files, it can quickly add up to hundreds of GBs in disk space. Add to that the fact that the software used to process these data can easily require tens of GBs of random access memory (RAM), often at least 50, and most laptops only have 8 to 16 GBs of RAM, and you can see that ACENET is not only necessary but indispensable.”

She says her team could run a single experiment in a high-end computer, but in many cases, it runs dozens of experiments to optimize its models.

“Using supercomputers allows us to run these experiments in parallel,” she says, adding that in one recent project her team combined more than 20 different datasets in an effort to train its models.

“ACENET enables us to do all the computational analysis that we do,” she says. “Most of my students run their calculations on ACENET, so it basically allows us to run all the experiments and analysis in an efficient way. Without ACENET, I would have to buy a lot of very expensive computers to do my job.”

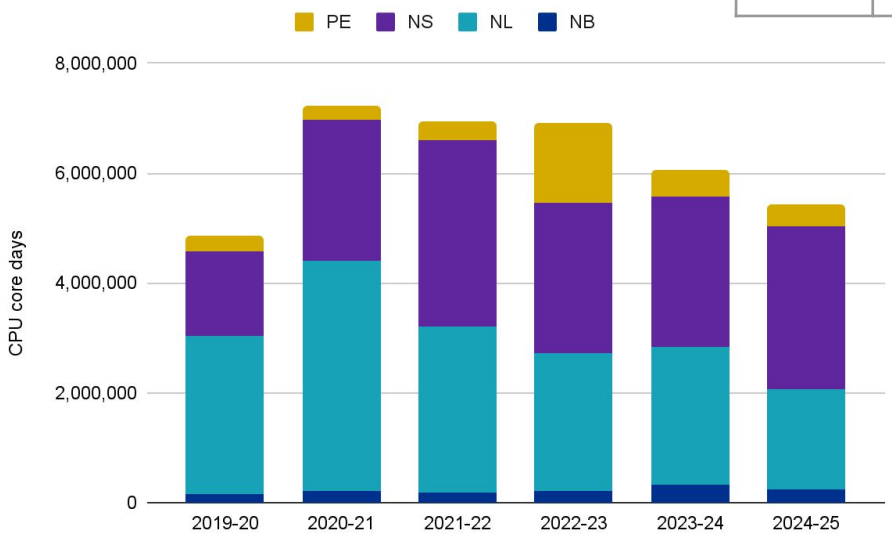
“Each raw uncompressed sequencing file can be tens of gigabytes. As each dataset can have several of these files, it can quickly add up to hundreds of gigabytes in disk space.”

Resource Demand

ACENET supported almost 1400 users in Atlantic Canada to use 5.4 million CPU days and 27,700 GPU days in 2024-25. The combined value of these resources is over $8.3 million based on commercial pricing.

Province	CPU core-days	GPU-days	Value
NB	257,347	13,891	$ 923,132
NL	1,828,513	5,390	$ 2,640,004
NS	2,985,212	8,184	$ 4,284,212
PE	335,120	243	$ 452,547
TOTAL	**5,406,191**	**27,708**	**$ 8,299,896**

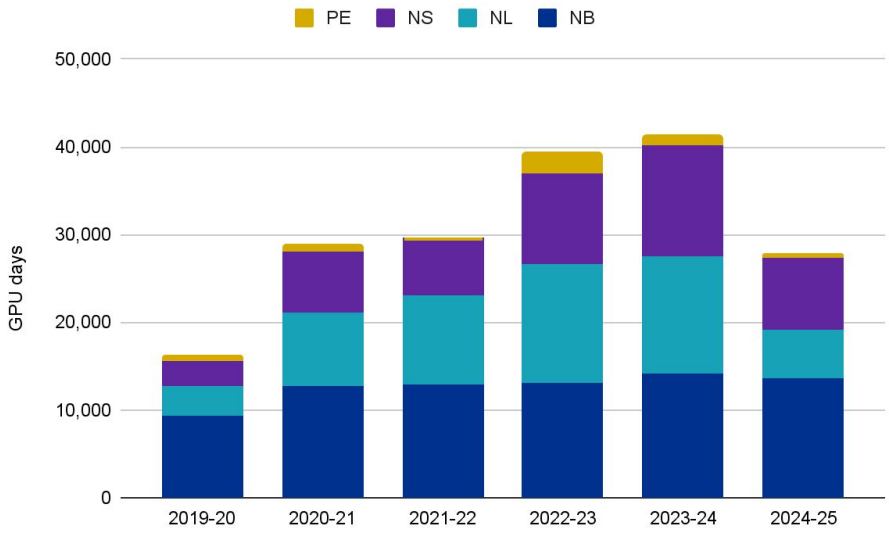
Atlantic CPU Usage by Province



Atlantic usage has declined over the past five years, as competition for resources has steadily increased. (Since the most recent system came online in 2021, users have grown nationally from 18,000 to 22,000.)

This year, resource availability was further constrained by extended downtimes and reduced capacity on most national systems while major upgrades took place. However, the new infrastructure — expected to come online in early summer 2025 — will deliver a **threefold increase** in computational capacity.

Atlantic GPU Usage by Province



Usage by Research Area

In Atlantic Canada, researchers in Physics, Chemistry, and Engineering are the primary users of CPU resources, collectively accounting for **79%** of the region's CPU time on national systems.

As expected, given the growing demand for AI model training, Computer Science researchers are the dominant users of GPU resources. Although they represent only 15% of Atlantic PIs, they consumed **74%** of the region's GPU time in 2024–25.

Resource Demand

Annual National Resource Allocation Competition (RAC)

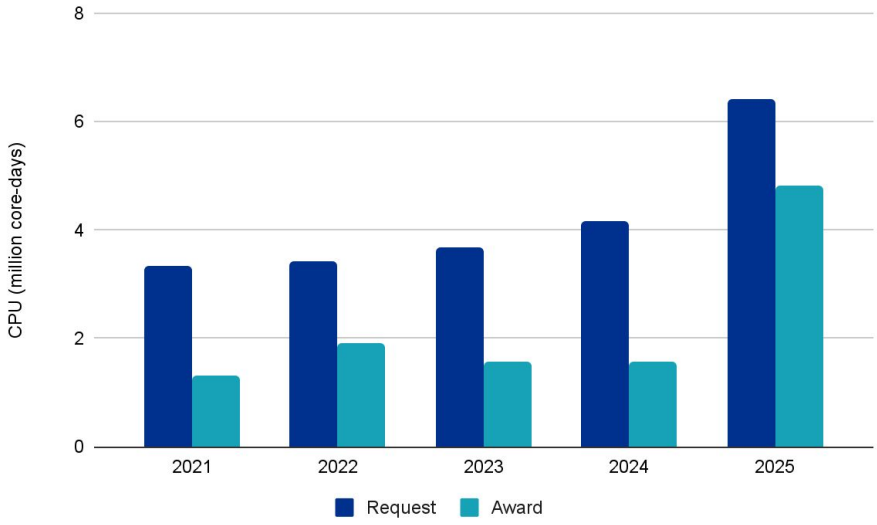
Each year, the Digital Research Alliance of Canada conducts a peer-reviewed competition for researchers who need resources beyond the default allocation provided with their accounts.

ACENET worked to support Atlantic researchers as they prepared their RAC 2023 submissions, leading to 28 applications from Atlantic Canada — a **12% increase** compared to last year.

RAC 2025 Resources Requested

	NB	NL	NS	PE	Total	% of Request Approved
Number of applications	1	9	18	0	28	
CPU (core-days)	0	3,293,760	3,089,360	0	6,383,120	75%
GPU (gpu-days)	3,650	0	45,260	0	48,910	19%
Cloud (vCPU-days)	0	5,840	311,710	0	317,550	100%
Storage (TB)	0	5,840	311,710	0	317,550	83%

Atlantic CPU Request vs. Award



Demand for resources continues to exceed the national capacity, however with new systems coming online in 2025, the award ratio for CPU time in the 2025 RAC has improved significantly.

Over the last five years, 42% of requested CPU capacity in Atlantic Canada was awarded. This year, the award rate has **increased to 75%**.

These new systems will provide, in aggregate, three times the capacity of the older systems they are replacing.

The total estimated commercial value of the 2025 Atlantic awards is $7.2M. The total 'RAC in-kind cost' (the estimated delivery cost of national resources) is $1.8M.

Integrated Infrastructure

ACENET continues to provide infrastructure integration services for Atlantic researchers planning to acquire advanced computing infrastructure with funding from the Canada Foundation for Innovation (CFI) and other sources. This service enables researchers to integrate their new equipment into ACENET's Siku system.

	NB	NL	NS	PE	Total
Integrated projects	2	1	8	2	13
Total value integrated	$ 91,298	$ 431,276	$ 1,448,297	$ 172,198	$2,143,069

ACENET provides architecture advice, procurement support, and professional system administration. Researchers also benefit from access to a broader, more powerful computing environment than they would have if hosting their infrastructure independently.

Contributed infrastructure is reserved for the researcher's exclusive use when needed, but is made available to other Siku users during idle times—maximizing the return on public investment. Thanks to these integrations, the Siku system has expanded from 2,000 cores in 2019 to over 9,000 cores in 2025, representing an additional **$2.1 million investment** in Atlantic Canada's digital research infrastructure.

Research Spotlight

Andrew MacDougall

Climate and Environment

St. Francis Xavier University

Getting to Net-Zero

Andrew MacDougall studies nature-based solutions to climate change.

“I’m leading a project with Environment and Climate Change Canada (ECCC) and three other universities,” says MacDougall, associate professor at the department of Earth and Environmental Sciences at St. Francis Xavier University. “We're trying to represent nature-based solutions within climate models to identify any unexpected side effects.”

The nature-based solutions he’s studying are ways to modify either agricultural or natural ecosystems to absorb more carbon.

“The easiest example is growing more trees,” MacDougall says. “It’s the solution governments love the most, even though it's not terribly effective at cooling the Earth.”

One of the things his group is examining is a local warming effect.

“In the high and mid latitudes such as Canada, forests tend to warm the local environment, even if the overall net effect is cooling globally,” he says. “That's because coniferous trees absorb heat and hold it. Large scale afforestation — which is ineffective at global cooling — has positive side-effects on climate change, including a surprisingly big effect on sea ice extent – the total area of ocean surface covered by sea ice.”

For that project, the team has been developing models and then using ACENET to run them.

“One of the climate models we’ve been using is the University of Victoria Earth system climate model,” MacDougall says. “We’re also using the Canadian Earth system model, which was developed by Environment and Climate Change Canada (ECCC). Our collaborators at SFU have worked to turn that model into a community model so other researchers will be able to use ACENET infrastructure instead of the computing infrastructure that ECCC maintains.”

MacDougall’s mission with these models is to represent the various climate change solutions within the models to determine how many tons of carbon a given solution will take out of the air.

He also does a lot of work on zero-emissions commitments, which involves trying to figure out whether warming will stop if we do get to net zero. For example, he led a consortium to examine zero-emissions commitments with different climate models.

“It was called the Zero Emissions Commitment Model Intercomparison Project,” he says. “I did the simulations for the University of Victoria part of it on ACENET infrastructure. We do most model development on local computers and use ACENET resources for model spin-up and simulations of the future. We often run hundreds of slightly different versions of the model, in what are known as perturbed parameter experiments, to assess uncertainty. The model also needs to be spun-up for 5,000 to 10,000 years, which is 10 to 20 days of computer time. Completing such simulations on local machines is impractical.”

The conclusion from this project was that if we stop emitting carbon dioxide, 50 years later, the amount of warming should stabilize.

MacDougall says doing his work without ACENET’s technology would be very difficult.

Cracking Cannabis Codes

David Joly studies the interaction between plants and micro-organisms.

David Joly
Biology
Université de Moncton

“We are looking at which genes make plants more resistant to disease and which make them more susceptible,” explains Joly, a biology professor at Université de Moncton. “On the pathogen side, we’re trying to determine what genes make a pathogen aggressive with a particular plant and what makes the pathogen detectable by that plant. Plants have an immune system and are able to recognize certain molecules from pathogens, triggering a defence response, a little like we humans do.”

Joly works mostly on cannabis and says some plants are more resistant than others — again, being comparable to humans. Some humans, for example, seem to get the flu every winter, and some simply never seem to get sick.

“If we focus on plants that are more resistant and compare them to plants that are susceptible, can we see differences in the genes?” he says, using tomatoes as an example. “We could take those more resistant plants and use them in a breeding program, crossing them with plants we know produce really juicy tomatoes.”

Joly says he’s starting from the beginning in many ways with cannabis because Canadian researchers have only recently been allowed to study it. “I have to stick to what’s been authorized to work with,” he says. “So we have to gather as many different plants as possible and test them in our growth cabinets, and then we can sequence their DNA and ultimately use ACENET resources to look at their differences.”

He says he and his team need to screen millions of “letters” in the cannabis genome, and on a small computer, that would take weeks.

“So that's where we use resources that are available from ACENET,” he says. “What I like about ACENET is the training they offer to take students from zero knowledge of bioinformatics to slowly making them more comfortable with bioinformatics coding. You need to be able to program and code and ACENET teaches them that. I can help them, but we often take advantage of the training from ACENET.”

He says ACENET has been especially instrumental with his undergraduate students, who are almost always new to bioinformatics.

“Even at the graduate level, I have students who arrive here and don't know much about bioinformatics, so ACENET’s training is still useful there,” he says. “Then we access the different tools and software so we can analyze the data. Every time we encounter problems, the ACENET people are always very useful in helping us find the problem. Sometimes it’s just a semicolon in the coding and they’re patient enough to help us find it.”

Joly says his work would be “very difficult” to do without the services of ACENET.

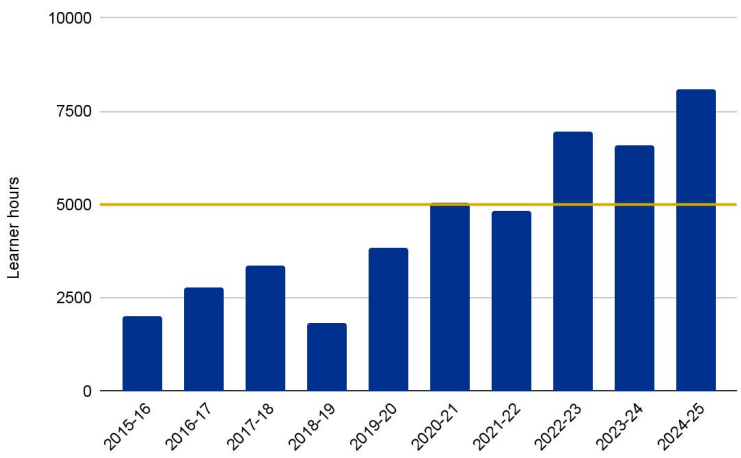
“You can wash the dishes manually, or you can use the dishwasher, but if you use the dishwasher, you can wash way more dishes in a given amount of time and get other things done while that's happening,” he says.

“What I like about ACENET is the training they offer to take students from zero knowledge of bioinformatics to slowly making them more comfortable with bioinformatics coding. You need to be able to program and code and ACENET teaches them that.”

Skills Development

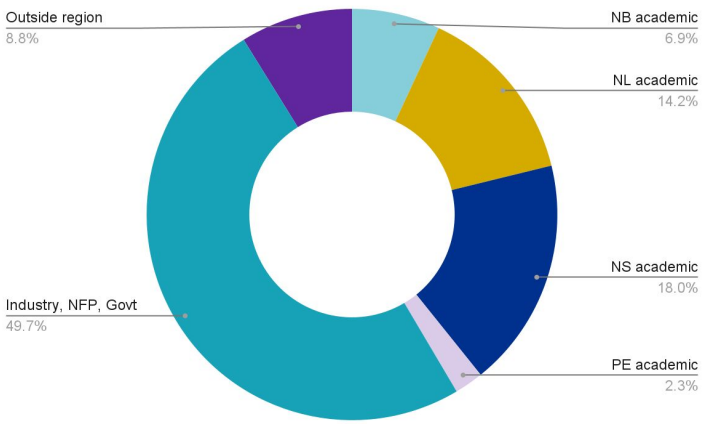
During the past year, ACENET delivered 354 hours of training through 76 events with 1665 participants for over 8000 learner hours* – exceeding its 5000 learner hours target.

Learner Hours Delivered Annually



** The gold line is ACENET's 2024-25 target number of learner hours to deliver.*

2024-25 Learner Hours



"Since the first day of the program, I found the instructors to be very professional, knowledgeable, and well organized. In fact, everything was very organized and well laid out. It was obvious that the instructors were well prepared and could easily answer any questions thrown at them. It was a interesting course with a lot of very interesting concepts covered!"

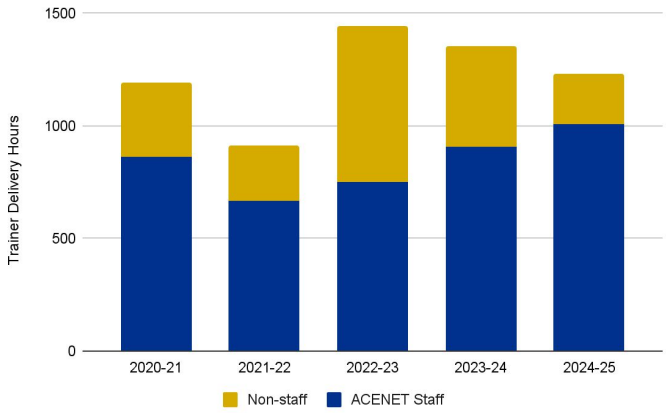
Graduate, Microcredential in Advanced Computing

ACENET delivers advanced computing skills training to faculty, research staff and students across Atlantic Canada's post-secondary institutions, as well as to private industry, non-profits, and government. Topics range from introductions to high performance computing and how to use national systems, to more advanced topics in programming, version control, scientific visualization, machine learning, and parallel computing.

Our training fills a critical gap by offering transferable, hands-on skills that are often not covered in standard university curricula.

This training is highly valued: in post-event surveys conducted over the past year, 88% of workshop participants found ACENET sessions relevant and beneficial—surpassing our 80% target. 54% of learners awarded the highest possible rating.

ACENET Staff and Partner Training Hours



ACENET collaborates with a range of partner organizations to increase resources and expand our reach. Over the past year, we worked with techNL, Digital Nova Scotia, the Partnership for Observation of the Global Ocean, the St. FX Digital Humanities Centre, Library and Archives Canada, the Digital Humanities Summer Institute, and our Alliance federation colleagues. We also partnered with NVIDIA to deliver a training program that awarded participants its internationally recognized *Fundamentals of Deep Learning* certification.

While ACENET staff delivered over 1,000 hours of training last year, our partnerships enabled us to leverage an additional 226 hours of external expertise to provide advanced digital skills to Atlantic Canadians.

** A 'learner hour' is one learner in training for one hour.*

Skills Development

Initiatives

This past year, ACENET not only delivered a record number of learner hours but also launched training programs targeted specifically at the Atlantic Canadian workforce.

In July, through our partnership with the techNL *Find Your Future in Tech*, 26 participants graduated with a *Microcredential in Advanced Computing*. A paper discussing our pedagogical process developing this microcredential was presented at PEARC24 (Practice and Experience in Advanced Research Computing) – an international conference for advanced research computing support professionals.

We also shared our experience during the Future Skills Centre's *Insights in Action Tour*. The Future Skills Centre is a national initiative that supports innovative approaches to skills development and workforce training to help Canadians thrive in a rapidly changing economy. The Atlantic stop of the tour brought together around 100 people in the skills development ecosystem to explore critical issues and emerging opportunities in the future of work.

During the winter, we partnered with Digital Nova Scotia and the St. FX Centre for Online Learning & Professional Studies to deliver a four-week *Microcredential in Practical Utilization of AI for IT, Programming & Development* aimed at mid-career IT professionals, programmers and developers.

We also hosted a very successful four-day in-person data analytics workshop at Memorial University. The event brought together 21 participants from MUN's Marine Institute and internationally from the Partnership for Observation of the Global Ocean.

A research group at Toronto Metropolitan University invited our humanities and social sciences specialist to deliver a two-day workshop on REDCap—a secure, research-focused survey platform. All 16 participants provided highly positive feedback.

ACENET delivers advanced digital skills training across a wide range of topics and difficulty levels. During the last year we offered:

- Microcredential in Advanced Computing
- Microcredential in Practical Utilization of AI
- Basics of Computers
- Basics: Introduction to HPC
- Basics: Introduction to Linux
- Basics: Introduction to Shell Scripting
- Basics: Job Scheduling with Slurm
- Molecular Dynamics
- Introduction to Natural Language Processing
- Introduction to Neural Network Architecture
- Introductory Programming with Unix Shell, Git and Python
- Introductory Programming in R
- Overview of Parallel Computing
- Parallel Programming with Dask
- Parallel Programming with OpenMP
- Parallel Programming with MPI
- Parallel Programming with GPUs
- Introductory Programming with Python
- The Unix Shell
- Introduction to Cloud
- Static Websites in the Cloud
- Desktops in the Cloud
- Command the Cloud
- HSS Python Series
- Using Git Tools
- Visualization with R
- Using Spreadsheets for Organizing Data
- Big Data Analysis with Apache Spark
- Foundations of Machine Learning

The range of training topics ACENET routinely delivers can be found on our website, with new topics and initiatives continuously under development.

Industry Ready Skills

Read here about two of the 25 successful graduates from the *Microcredential in Practical Utilization of AI*!

"This course gave me hands-on skills working with AI models. Most of the training I did in the past was more theoretical, but now I am confident that I can fine-tune a model end-to-end, from choosing the model and pre-processing the dataset to tokenization, training, and using the trained model. The last statement of this report is heartfelt gratitude: Thank you, guys, you did a great job!"

Graduate,
Microcredential in Practical Utilization of AI for IT, Programming, and Development

Research Spotlight

What Drives Galaxy Evolution?

Dr. Ivana Damjanov studies the relationship between galaxy size growth, changes in galaxies' stellar and dark matter content and their position in the universe.

"We are interested in the connection between the evolution of galaxies and their surroundings as cosmic time goes on," says Damjanov, associate professor at St. Mary's University. "Galaxies can live either surrounded by basically nothing or they can be in very dense regions of the universe called galaxy clusters."

She and her team zoom in on galaxies to see how they change their appearance in telescope images.

Ivana Damjanov and Michele Pizzardo

Astronomy

Saint Mary's University

"We take the images of millions of galaxies and we quantify their appearance," she says. "We measure their size, shape, how squished they are and we compare that to how many stars they're making, how fast these stars are moving and what they are surrounded by. Our goal is to understand how the changes galaxies are going through work together, and which physical processes drive those changes."

While answering these fundamental questions, Damjanov and her team are also developing techniques that can be used in everyday life. The techniques she's using to analyze her large-scale images are advanced statistical methods and the instruments they've been developing are used, for example, in medical imaging.

Dr. Michele Pizzardo, Damjanov's postdoctoral fellow, is using ACENET to see how simulated clusters of galaxies evolve and grow.

"We are interested in the study of these galaxy clusters," Pizzardo says. "I'm interested in the external part of these structures. This part is sensitive to the basic laws the universe follows. It can give us a way to test different cosmological models to determine whether a model is viable."

Using ACENET, he developed a "recipe" to understand how much these clusters are accreting at different ages of the universe.

"We need a lot of clusters and then we use all the information — the temperature, entropy, energy information, position of each particle in these boxes," he says. "We do this at different ages of the universe. One dataset can be 40 to 50 terabytes of data."

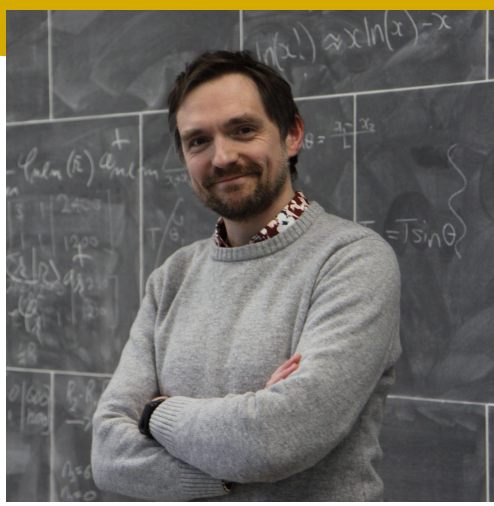
Obviously, he had to use ACENET's high performance computing technology to do these calculations. Damjanov adds that other members of her team also use ACENET to analyze actual images from telescopes.

"In principle, our software could be run on a standard computer," Pizzardo says. " However, the size of the data that our software processes makes it impossible to obtain any results. In other words, if the data we had to analyze were a few GBs, we could run the software on a local machine, but our data is more than 1,000 times larger than that so the use of a cluster infrastructure is essential."

He says the team members' models are computationally demanding because their random access memory needs can climb up to 100 gigabytes and they need dozens of high-performance nodes to obtain results in a reasonable amount of time. Storage needs are another consideration.

In other projects, Damjanov's students are creating simulated galaxies and adding them to the existing telescope images, thus bringing together voluminous simulated and real-world datasets. ACENET is essential for that big-data-driven work.

Simulating Solutions: The Power of Computational Chemistry



Stijn De Baerdemacker
Chemistry
University of New Brunswick

Stijn De Baerdemacker says his research in theoretical chemistry is “fairly fundamental” and yet it doesn’t find itself very far away from real-world applications.

“Typically, when we think about chemistry, it's about tubes and beakers and people in lab coats, and that’s still a big portion of what of what we do,” De Baerdemacker says. “However, it's not only running the experiments, it's also exploring what molecules you can make and how they can solve problems.”

In other words, he’s always looking to develop something new — a better material for a device, or a better drug for a disease, for example. And if you’re searching for the “holy grail” that will solve your problem, it’s very time-consuming, he says, because you have to assess all of the options.

“This is where computations come in, because on a computer, we are not bound by safety requirements,” he says. “We can just go in and try to simulate what will happen. That speeds up the discovery process by many orders of magnitude.”

De Baerdemacker applies various mathematical models that describe the structure of molecules to determine which ones would provide the most accurate results.

“We make sure the methods are grounded in proper theory,” he says. “Once we have the theory down, we run tests and we use ACENET’s resources to put everything into code. We test it on our own local systems and then try them on a bigger system like ACENET,” he says. They then send the code to the chemist, who runs computer simulations using various molecules. This enables the chemist to narrow the options to the most promising candidates before running experiments.

De Baerdemacker says that when he talks to people about high-performance computing and asks them who they think might be HPC’s biggest clients, they’re surprised to learn that chemists are among them. And, he adds, his colleagues in computational chemistry are definitely more frequent users, but even fundamental chemists make good use of services at ACENET.

“We also run a lot of simulations,” he says.

Using a concrete example, he says a lot of diseases are associated with how the proteins in our bodies work and the way they are folded in the cell is also are important for their functionality. Alzheimer’s is one example where a protein starts to curl up and then pierces through a cell membrane,” he says.

“When we’re working on computations, it’s not one variable, it’s millions,” he says. “With machine learning, we’ve discovered that the machine has figured out the kind of molecule we were looking at all by itself. It looked at the data and it found patterns.

“We're actively looking for a drug that will inhibit that behaviour, but in order to do that, we need to come up with candidates and do a lot of simulations,” he says. “When we’re doing those simulations, we use ACENET.” But where he has used ACENET to the fullest extent is with machine learning, which he says chemists have been using for 20 years.

“When we’re working on computations, it’s not one variable, it’s millions,” he says. “With machine learning, we’ve discovered that the machine has figured out the kind of molecule we were looking at all by itself. It looked at the data and it found patterns. At this point, ACENET is really crucial.”

Serving Atlantic Canada

Nurturing Local Researchers

Launched in 2023, the **Embedded Technical Support** program pairs our technical experts with innovative projects that have high potential for success and impact, and that require advanced computing resources, programming support and/or in-depth technical help. The objective of the program is to help researchers who may lack technical expertise, or who are facing particular challenges. To date, the program has accepted 8 projects.

We Have Specialists!

Bioinformatics
Engineering
Artificial Intelligence
Cybersecurity
Data management
Health Data
Humanities and Social Sciences
Molecular Dynamics
Cloud

Atlantic Innovation Ecosystem

As a key component of the region's research, industrial innovation and economic ecosystem, ACENET participates in various industry-related events each year. In 2024-25, we had visibility at 18 events attended by over 500 researchers, students and industry participants. These included the New Brunswick MedTech Summit, Memorial Research Week (with a panel discussion on AI career paths), Advancing Dual-Use Innovation with NATO DIANA, the Saint Mary's Research Expo, the Newfoundland & Labrador Offshore Digital 2025 conference and the Atlantic Aerospace & Defence Connector.

Local Support

We have 20 client support people located at six of our member institutions across the region.

Talent Development

Having successfully delivered our *Microcredential in Advanced Computing* through techNL's *Find Your Future in Tech*, we applied our learnings from the program and divided the course into three shorter microcredentials. *Practical Foundations for Data Analytics*, *Applied Data Analytics and Machine Learning with Python*, and *Data Processing and Analysis with Parallel Computing* will be rolled out Atlantic-wide in 2025-26. As with the original microcredential, they are focused on workplace upskilling/reskilling.

This first microcredential provided us with the tools and experience needed to deliver the *Microcredential in Practical Utilization of AI for IT, Programming & Development* in partnership with Digital Nova Scotia and the St. FX Centre for Online Learning & Professional Studies. Given the enthusiastic response of participants, the partners are seeking redelivery in 2025.

Artificial Intelligence

ACENET participated in several strategic forums this past year, including a techNL AI consultation, the Springboard-ACOA Atlantic AI Roundtable, and ISED's national consultations on the federal government's $2.4 billion AI strategy.

We fully support the Alliance's vision for coordinated, national AI research infrastructure, with the critical training and support services available to researchers across the country through holistic national and local resources.

"Dr. Ross Dickson is a dedicated technician for Canada's supercomputing infrastructure. His responsibilities include providing prompt and reliable support and ensuring efficient resolution of technical issues. Mr. Dickson consistently demonstrates a high level of expertise and professionalism, contributing significantly to the smooth operation and maintenance of our computing resources. His timely interventions and effective problem-solving skills are invaluable to our team. Thank you, Ross."

Doctoral student, Dalhousie University September 2024

"Dr Oliver Stueker was truly exceptional as always. His ability to prioritize requests and solve complex problems is incomparable."

Doctoral student, Memorial University, September 2024

"I cannot say enough good things about the support I have received and continue to receive. Some of the best support I've ever had. Serguei Vassiliev was very fast in his responses, helpful, and very patient. I am very new to HPC and he explained a lot and helped me a lot, way more than I expected and he showed genuine interest in the work he does!"

Doctoral student, University of New Brunswick, August 2024

Serving Atlantic Canada

Industry Connections

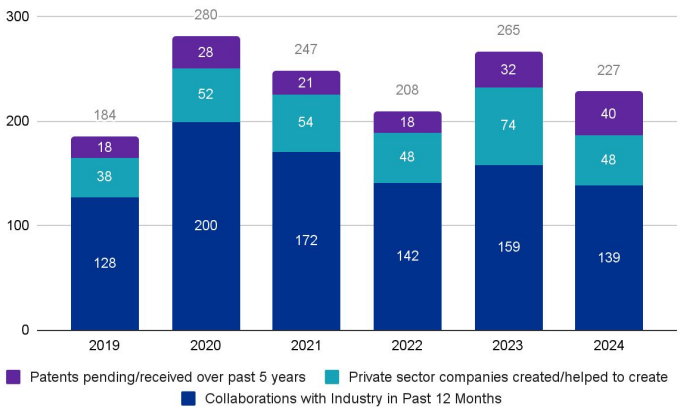
During the Alliance annual spring account renewal, Principal Investigators (PIs) are asked to indicate any industry outcomes of their research that relied on the infrastructure and services provided by ACENET and the national platforms. The latest data available is for the 2024 renewal.

In 2024, ACENET supported 139 industry collaborations involving 82 researchers during the previous 12 months. Over the past five years, 33 ACENET-enabled researchers contributed to the creation of 48 companies, and 21 researchers were associated with 40 patents received or pending

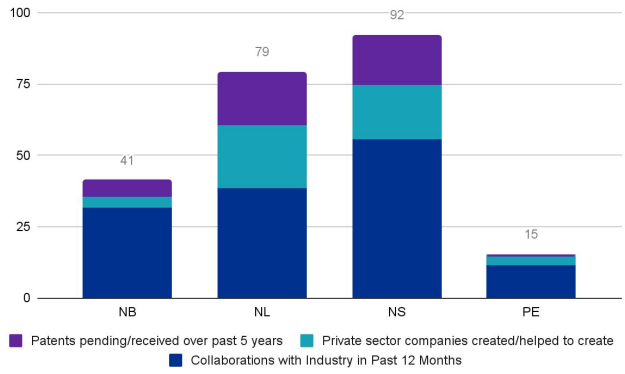
In addition to these collaborations, ACENET currently provides direct services to 18 industry clients.

Looking at the long-term trend since 2018, industry engagement has generally increased, though it has shown some year-to-year volatility.

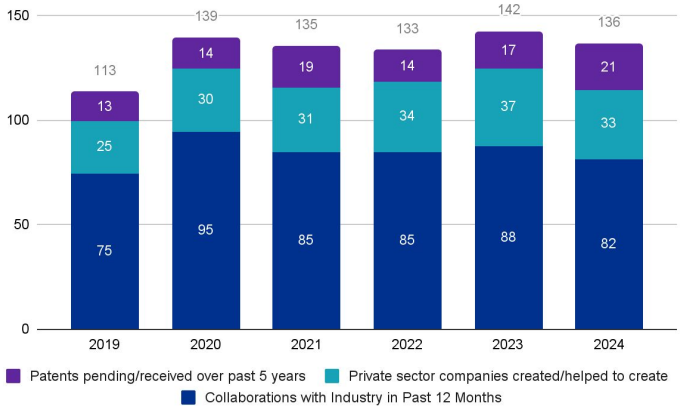
Total Researcher-Industry Outcomes by Year



2024 Researcher-Industry Outcomes by Province



Unique Researcher-Industry Outcomes by Year

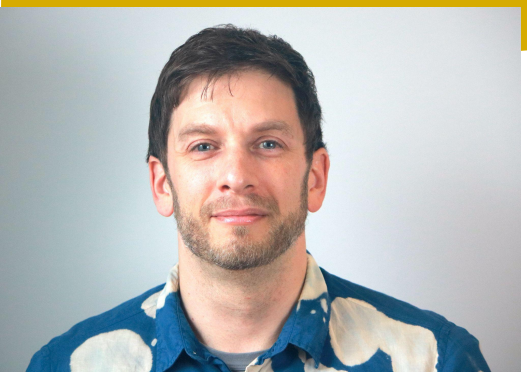


ACENET supports industry directly through access to our regional system Siku, our research consultants, and our training. We offer programs targeted to industry, including:

- A **free trial** program on our Siku cluster for 3 months or 2000 compute hours;
- **Jump Start for Start-ups**, which provides 10,000 compute hours and 20 hours of technical consulting over 12 months – a value of $5000.

Siku clients benefit from monthly usage reports, zero data transfer fees, and customizable usage caps that help manage and control budgets.

Research Spotlight



Paul Sheridan

Assistant Professor, Computer Science

University of PEI

Rachel Lai

Honours Student, Computer Science

University of PEI

Making Generative AI Sound More Human

Uyen "Rachel" Lai is looking into differences between the way AI algorithms that generate text, such as ChatGPT, express themselves compared to humans. The goal is to improve the usefulness of generative AI models in producing content.

“For example, my preliminary work suggests that generative AI models produce text that is more lexically diverse, though possibly less focused,” Lai says. “I want to make generative AI models that produce more “human sounding,” natural or realistic text.”

Lai, a fourth-year computer science honours student is working under the supervision of Paul Sheridan, assistant professor at the School of Mathematical and Computational Sciences at the University of Prince Edward Island. Even as an undergraduate, Lai has travelled as far as Tokyo to present a paper on her work with Sheridan Stable — Sheridan’s professional wrestling-inspired name for his “plucky” group of undergraduate researchers — which focuses on natural language processing and text analysis. The team is trying to understand how the two worlds of classic statistics and deep learning are connected.

“Deep learning inherits a lot of ideas from classical statistical methods. We’re looking at those connections and then mapping them out, which we hope will lead to insights about how to use all the statistics knowledge the world has accumulated over the years to do deep learning in more interpretable and efficient ways.”

Lai is setting the standard in that team of researchers.

“Rachel is an exceptional student who's on a good roll right now,” Sheridan says, “and there are lots more great students on the way who are hungry to make names for themselves.”

Lai uses ACENET resources to generate text using AI models, and she has also trained some of her fellow students on how to use them.

“We need a lot of text to compare lexical diversity in human-written and AI-generated text,” Lai says. “The compute clusters come in handy, helping us generate a massive amount of text.

“By using these resources, we can generate what we need in a few hours at most. Without them, it would take months or years to do our work.”

Sheridan says that as the program grows, the team will be generating vast volumes of text that will require hundreds of gigabytes which would be impractical to store on a regular computer.

“We need to use GPUs to generate text,” he says. “GPUs are in high-demand for deep learning applications.”

Lai lauds ACENET’s support services, which she says are also very responsive. “If one person can’t help, they will find us someone else who has more expertise in the problem we are trying to solve,” she says.

Research Directorate

Want to get involved with the RD? Contact us at info@ace-net.ca!

The ACENET Research Directorate (RD) is a researcher-led committee that provides advice and makes recommendations on digital research infrastructure (DRI) needs and perspectives to the ACENET Board of Directors (Board), ACENET staff, and other stakeholders. It serves to generate and advise on ACENET initiatives, and facilitates engagement with the broader research community in Atlantic Canada and supports a researcher-centric culture of service to, and engagement with, researchers.

Members are appointed for two years. The group meets monthly with ACENET's executive team to review local and national initiatives, and hear from our representatives on the Digital Research Alliance of Canada Researcher Council. During these meetings, individual RD members pitch and discuss a "blue sky idea" on a rotating basis. A number of these ideas have become part of ACENET's organizational strategy and planning, with some examples below.

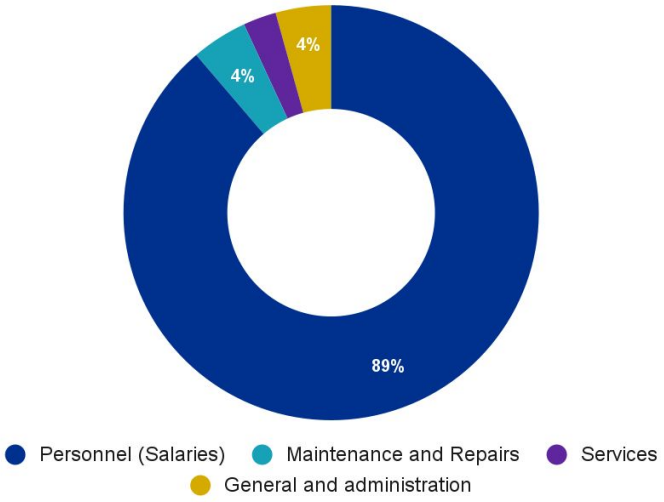
Blue Sky Idea	Description	Status
Distributed analysis for health	Enable ACENET infrastructure to become a hub for researchers to securely access and analyze provincial health data to overcome the barrier of data access due to privacy concerns.	Pilot is underway with the NB Institute for Research, Data & Training (IRDT), which if successful will be rolled out Atlantic-wide.
Distributed analysis when datasets are too large or sensitive to move	Provide a central server for federated analysis of data from repositories.	Being explored under the NB IRDT partnership.
Training cluster	Provide support to faculty incorporating computation into their courses by providing a bookable training cluster.	Now available as a service. Simply complete this form.
Using AI Assistants	Provide a training workshop on the shoulds/shouldn'ts, dos/don'ts and ins/outs of using AI assistants in your work.	Training team is taking this in hand to develop a 2-day workshop.
Quick Start Guide and tutorial	An asynchronous tool to help students quickly begin using the clusters.	Quick start guide now on our training page.
Cheat Sheet	Help new users with a cheat sheet showing basic Linux commands and tips'n tricks for the clusters.	Added to our list for asynchronous learning materials development.
Database and dataset sharing	Reduce storage duplication, ease access to common datasets, and provide a sharing pathway for researchers' own datasets.	Incorporated into ACENET's 2025-28 strategy under section on evaluating potential new services to fill gaps.
Community engagement	Periodically share Blue Sky ideas progress with the broader ACENET community, through annual reports for example, inviting new ideas.	We're sharing!
Instant Messaging and Social Platform	Reduce overhead and time for getting help in basic, or even not so basic, things by creating for example, an ACENET Discord Server.	Exploring how to integrate this with a national ITSM tool.

Questions?

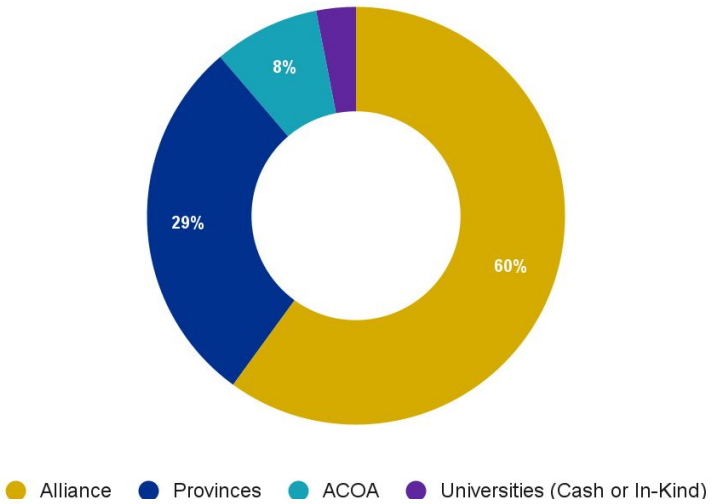
If you have a question, a concern, or an idea, please reach out to your local RD member, or contact us at info@ace-net.ca

Financials

Expenses 2024-25



Funding 2024-25



Financial Summary

1 April, 2024 to 31 March, 2025

Expenses	
Personnel (Salaries)	$ 2,295,522
Infrastructure (maintenance & upgrades)	112,877
Services	66,769
General and Administration	111,591
	$ 2,586,758
Funding	
Alliance	$ 1,552,055
Provinces	743,559
ACOA	211,884
Universities (Cash or In-Kind)	79,261
	$ 2,586,758

Acknowledgements

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Research Directorate

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Paul Sheridan	Assistant Professor, School of Mathematical & Computational Sciences	University of Prince Edward Island

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Financial Support

Atlantic Canada Opportunities Agency — Agence de promotion économique du Canada atlantique

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ACENET
HH-2037 Henrietta Harvey
Memorial University
St. John's NL, A1C 5S7
admin@ace-net.ca