Pacific Institute for the Mathematical Sciences

Year in Review 2020

Simon Fraser University • University of Alberta • University of British Columbia • University of Calgary
University of Lethbridge • University of Manitoba • University of Regina • University of Saskatchewan
University of Victoria • University of Washington

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About PIMS

The Pacific Institute for the Mathematical Sciences was founded in 1996; it is a consortium of universities in the Pacific Northwest and Western Canada.

Member universities: Simon Fraser University, University of Alberta, University of British Columbia, University of Calgary, University of Lethbridge, University of Manitoba, University of Regina, University of Saskatchewan, University of Victoria and University of Washington.

Affiliates: Portland State University, the University of Northern British Columbia, and Athabasca University.

The Pacific Institute for the Mathematical Sciences (PIMS) is a collaborative network dedicated to the promotion of discovery, understanding and awareness in the mathematical sciences. PIMS brings together leading researchers from major universities across western Canada, as well as the University of Washington, and is an International Research Lab of the National Center for Scientific Research (Le Centre national de la recherche scientifique, CNRS).

PIMS sponsors and organizes educational and community outreach, aboriginal math camps, and summer schools for both teachers and students, as well as initiatives to promote diversity in mathematics, partnerships that bring mathematical research to industry, cutting edge mathematical and scientific research, and events across the PIMS network that promote advancement in computer science, pure and applied mathematics, and statistics.

The central office is at the University of British Columbia, with a PIMS site office and a Site Director local to each of the ten member universities. The Site Director facilitates local opportunities and synergies, while the PIMS site offices provide administrative assistance for organizing local events. This distributed structure renders it quite unique, involving strong local site offices and activities, and allowing a broad impact across Western Canada and beyond.

The Board of Directors oversees the administration of PIMS, with membership consisting of the VP of Research from each of the member universities, as well as distinguished scientists and representatives from industry. An independent Scientific Review Panel composed of internationally renowned mathematical scientists assesses proposals for scientific events and programs.

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From the Director

2020 was a difficult year. The tragic loss of so many lives from the COVID-19 pandemic brought grief and efforts to slow the spread of infection brought loneliness and isolation. The PIMS community, through research, teaching, and advocacy, contributed to our region's capacity to understand and cope with the pandemic. With these efforts, the Institute has become more robust and our community more resilient. Isolation has driven us to find new ways to connect.

The year started off with an excellent talk in the January bcdata colloquium by Joe Hamman on big data challenges in climate modeling. A few weeks later, Caroline Colijn forecast the unfolding of COVID-19 in the same forum. Scientific clairvoyance into the dynamics of COVID-19 and the challenges to influence public policy and societal behavior emerged as a recurring pattern during the year. By learning new ways to advocate for public policy changes based on science, infectious disease modelers are blazing trails for how scientists will contribute solutions to the climate emergency.

Together with the rest of the world, PIMS transitioned into virtual operation in March. Our experience operating as a distributed institute empowered PIMS to think beyond the immediate challenges to advance on the Institute's mission. With creativity and distributed leadership, PIMS launched new programs to support research, education, training and career pathways in the mathematical sciences. PIMS integrated a suite of digital tools (Slack, Zoom, Jupyter, GitHub, web hosting, web event production,…) to support effective collaboration by remote research teams while also lowering the carbon cost.

The Institute launched a collection of network-wide graduate courses, convened a PIMS-wide seminar to showcase research advances by the extremely talented PIMS Postdocs, and will soon launch a network-wide colloquium series in 2021. PIMS supported an interdisciplinary team of approximately one hundred people, the BC COVID-19 Group, focused on infectious disease modeling to inform public health policy in British Columbia. We integrated a suite of digital collaboration tools and workflows to support the launch of the Kantorovich Initiative, another interdisciplinary team anchored by research in and applications of optimal transportation.

PIMS recognized early that COVID-19 would affect career opportunities for graduate students and postdocs in our community. Building on the Institute's legacy with Industrial Problem Solving Workshops, the recent bcdata workshops and our ongoing partnership with Mitacs, PIMS took action and created the Math-to-Power-Industry Summer School and Workshop. Sixty young researchers received specialized training and then collaborated in teams on industrial problems posed by ten industry partners.

The core PIMS operation continued unabated in 2020. We welcomed thirteen new postdocs (see the spotlight article on Debanjana Kundu at UBC below). Two new Collaborative Research Groups launched: one multi-site team is focused on new techniques in low dimensions using Floer homology and related ideas; another multi-site team is exploring quantum topology and links with quantum information and engineering. PIMS' programs on interactive computing (Syzygy, Callysto) , in partnership with Compute Canada and Cybera, continued to advance. Activities across the sites continued despite the pandemic.

The killing of George Floyd by the Minneapolis Police in May brought an overdue focus on anti-Black racism. The PIMS community participated in ShutDownSTEM and reflected on ways the Institute can help make society more just. Enlivened interest in PIMS outreach efforts toward indigenous communities, the Diversity in Mathematics Program and ongoing leadership by the PIMS EDI Committee were positive signs in 2020.

PIMS amplifies research, training, education and public outreach activities in the mathematical sciences across our vibrant network of member universities. The PIMS community found new ways to work together and developed resilience during 2020. It has been my honour to serve as PIMS Director over the past five years. I look forward to supporting a new Director and contributing to the Institute's 25th anniversary year in 2021!

James Colliander
Director

2020 Around the Sites

In any given year, individual universities that make up the PIMS community organize a wide range of seminars, conferences and workshops that pack the annual calendar. In spite of the pandemic, the PIMS community continued its activities, moving from in-person events to online meetings. Here is a small selection of some activities from 2020.

University of Lethbridge

A mathematics fair was hosted on February 8, as an outreach activity for students from kindergarten to grade 12. Despite a raging snowstorm, over 100 students gathered to play games with a mathematical component. Participants strategized to play: NIM, Frogs on a Log, and the 100 Doors Problem.

University of Regina

The Topology Seminar hosted over a dozen speakers in 2020. A goal is to find synergies between closely related fields, namely geometry and algebra. This series provided the opportunity to foster research collaborations amongst topologists across the PIMS network.

University of Calgary

PIMS was pleased to support the Calgary Peripatetic Seminar in 2020. This seminar series hosted over 40 virtual seminars with an impressive roster of speakers. Seminar themes included: differential and integral categories, type and proof theories (including homotopy type theory), and categorical quantum information theory.

University of Manitoba

Launched in 2016, the PIMS - UManitoba Distinguished Lecture has hosted over 22 speakers. In 2020, the lecture hosted Professor Peter Ashwin from the University of Exeter. Professor Ashwin gave a lecture on Computational Properties of Network Dynamical Systems to 80 attendees.

University of British Columbia

From September 16 – 18, UBC Computer Science hosted the International Symposium on Graph Drawing and Network Visualization. Over 250 participants came together online for what is considered to be the premier event for geometric representation of graphs. Graph drawing and network visualization are motivated by applications where it is crucial to visually analyze and interact with relational datasets. Areas of application include: data science, social sciences, distributed computing, information systems, biology, geography, business intelligence, information security and software engineering.

Simon Fraser University

The Discrete Mathematics Speaker Series hosted over a dozen seminars in 2020 and successfully built a sense of community amongst its attendees in a virtual setting. This seminar series is currently organized by Shuxing Li, who is a PIMS Postdoctoral Fellow.

University of Victoria

In 2020 we held two PIMS - UVic Distinguished Colloquiums. Over 60 attendees came together on two separate occasions. Natalia L. Komarova, University of California - Irvine, gave a lecture on "Mathematics of Evolution: mutations, selection, and random environments". Soumik Pal, University of Washington, lectured on, "From portfolio theory to optimal transport and Schrodinger bridge in-between".

University of Saskatchewan

The 32nd Canadian Conference on Computational Geometry was held from August 5-7, and hosted virtually by the University of Saskatchewan. This forum disseminates and discusses new theoretical and applied results in discrete and computational geometry. 180 participants came together to focus on the design of efficient algorithms, the development of software, and computational problems whose formulations involve geometric constraints.

University of Alberta

The Banff International Research Station hosted the Alberta Number Theory Days XII (ANTD XII) workshop from May 1 – 3. Participants converged online and included researchers, students and visitors. As number theory is an area which is both active and diverse, this annual conference provides a unique opportunity to forge new research collaborations and strengthen existing connections.


University of Washington

As part of the UW/ PIMS- France Student Exchange Program, PIMS was pleased to support Max Goering, a PhD student under the supervision of Tatiana Toro. Through this support, Max was able to participate in a research exchange program where he spent the beginning of 2020 in both France and Germany. While in France he was able to further study the anisotropic plateau problem. Partial results were achieved, and will be included in his PhD thesis. While in Germany he was further exposed to families of well approximable measures, which lead to a publication.

All Sites: #ShutDownSTEM

On June 10 we stepped away from our daily tasks to educate ourselvesabout racism against Indigenous, Black and other minorities in Canada.   Like many colonized structures, academia is a system that sustains racism, from targeting people, to suppressing their voices. We must continue to learn how we can work together to create lasting change.
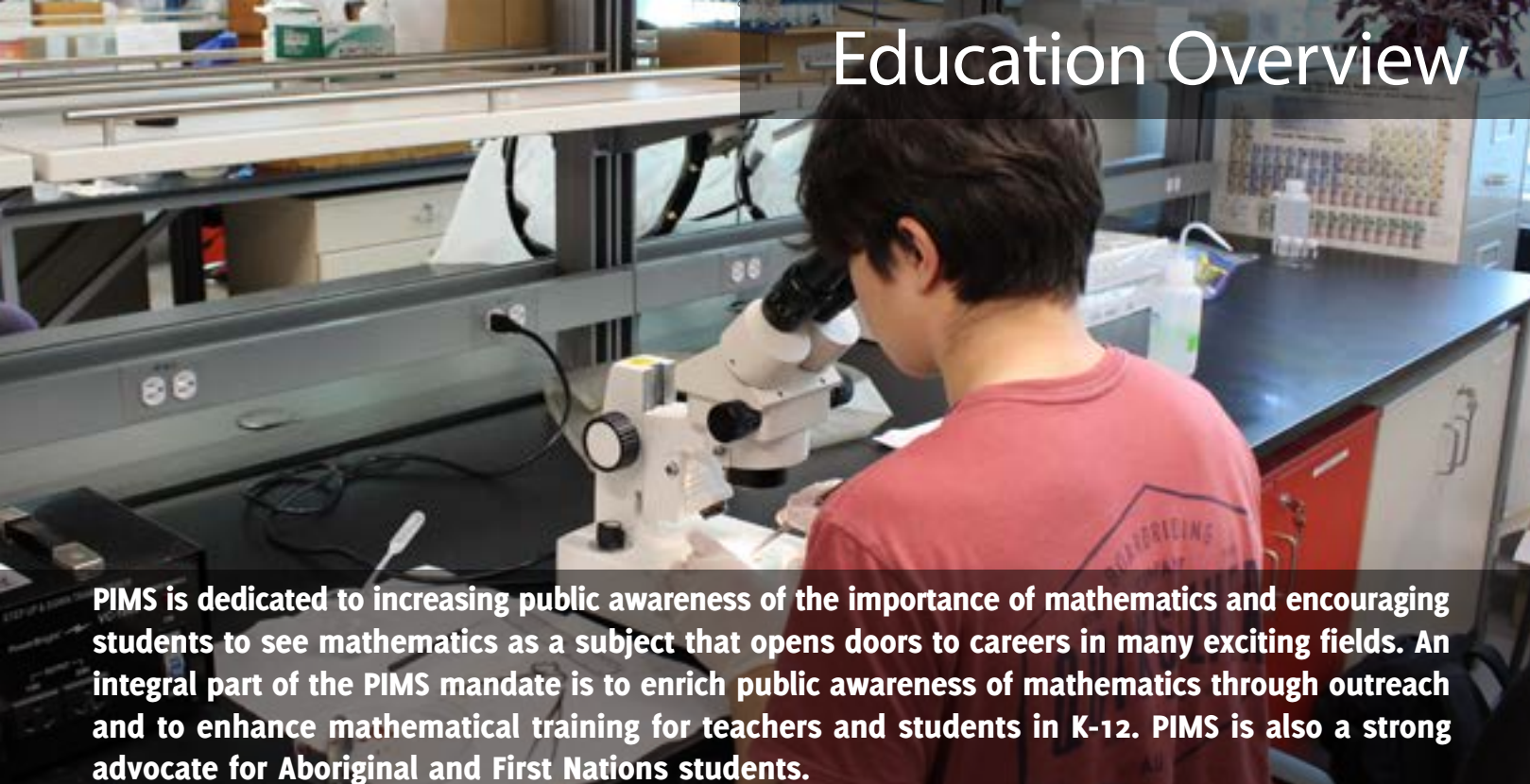
PIMS is dedicated to increasing public awareness of the importance of mathematics and encouraging students to see mathematics as a subject that opens doors to careers in many exciting fields. An integral part of the PIMS mandate is to enrich public awareness of mathematics through outreach and to enhance mathematical training for teachers and students in K-12. PIMS is also a strong advocate for Aboriginal and First Nations students.

Math education and outreach are fundamentally important components of PIMS' activities. We engage and connect with the different groups within the PIMS community, and deliver relevant content that promotes K-12 education in math through high quality education programs.

Changing the Culture

In 2020, we hosted the first virtual Changing the Culture event. This annual event aims to narrow the gap between those who enjoy mathematics, and those who claim they don't. George Gadanidis from Western University gave a plenary talk on, Shifting from Computational Thinking to Computational Modelling in Math Education. The day wrapped up with a panel discussion on, Teaching Mathematics in the Coronavirus Era with Fok-Shuen Leung from UBC, Kseniya Garaschuk from University of the Fraser Valley, Jamie Mulholland from SFU and Mike Prunner from Windsor Secondary School.

Math Summer Camp for Indigenous Students

This year, we were able to support summer camps at both Britannia Secondary School in Vancouver, and in Sooke. Educators worked with students in a small group setting to provide mathematical instruction, while following COVID-19 guidelines. By the end of the workshop many of the students had determined that math was actually quite fun!

Every year PIMS sponsors numerous postdoctoral fellows (PDFs), attracting outstanding young scientists who contribute to PIMS research programs, many of whom later become faculty members at Canadian universities. PDFs are distributed throughout PIMS sites on a competitive basis. In addition, each one of PIMS' Collaborative Research Groups is allocated a number of PDFs, the selection of which is determined by an assessment panel.

2020 Postdocs:

Sebastian Dominguez (US)	Kexue Zhang (UC)	Sacha Ikonicoff (UC)
Shangzhi Zeng (UV)	Andrew Schopieray (UA)	Peter Kristel (UM)
Seyed Ahmad Mojallal (UR)	Debanjana Kundu (UBC)	Kazuki Ikeda (US)
Sajad Fathi Hafshejani (UL)	Christopher M. van Bommel (UM)	
Eric Jones (SFU)	Isam M.A. Al-Darabsah (UM)	

Featured Postdoctoral Fellow: Debanjana Kundu

Postdoctoral Researcher at the University of British Columbia.

"I entered graduate school at the University of Toronto in 2015, knowing I wanted to study algebraic number theory, even though I had little exposure to modern number theory. On the first day that I visited the university, I walked into Kumar Murty's office for a chat. He had recently become interested in certain aspects of Iwasawa theory and suggested I consider studying it for my dissertation. Even though I had never heard of this subject area prior to that meeting, the key philosophy sounded counterintuitive yet intriguing. Instead of trying to describe the structure of any particular Galois module, it is often easier to describe every Galois module, in an infinite tower of fields at once. The subject began in the late 1950's, and through the decades there were many generalizations. But, it's safe to call an area Iwasawa theory, if it studies some Galois representation, ranging over an infinite tower of fields and connects it to p-adic L-functions.

The questions that interest me include studying the structure and growth of arithmetic objects, like class groups of number fields and (fine) Selmer groups of elliptic curves over p-adic Lie extensions. I am also interested in studying the growth of Galois modules in non-p-adic analytic towers, where standard Iwasawa theory techniques fail. I have recently started investigating control problems for fine Selmer groups. In the past I mainly studied the algebraic aspects of Iwasawa theory. My hope is to understand the analytic side as well. During graduate school, I had several opportunities to study with Jim Arthur, where I was introduced to the Langlands program. I have continued to think about Langlands functoriality, trace formula, and beyond endoscopy in my spare time.

Starting January 2021, I will be a PIMS Postdoctoral Fellow at UBC Vancouver. I am excited to spend the next two years in a department that has experts in both Iwasawa theory, and Langlands. I look forward to participating in PIMS outreach activities, and contributing to the community through active engagement."

2020 Prizes & Awards

CRM - Fields - PIMS Prize

Catherine Sulem, University of Toronto
Catherine Sulem is currently a professor of Mathematics at the University of Toronto. She received her Doctorat d'Etat from the Université Paris-Nord in 1983, and held a CNRS position at the École Normale Supérieure in Paris. In 1998, she was awarded the Kriegel-Nelson prize by the Canadian Mathematical Society, and was elected Fellow of the Royal Society of Canada in 2015. Dr. Sulem was among the inaugural class of Fellows of the American Mathematical Society in 2013, and of the Canadian Mathematical Society in 2018. She was awarded the 2019 AWM-SIAM Sonia Kovalevsky prize, a Killam Research Fellowship from the Canada Council for the Arts in 2019, and the CRM-Fields-PIMS Prize in 2020.

Dr. Sulem works in partial differential equations arising in nonlinear dynamics. Her work uses both analytic and numerical methods.

PIMS Education Prize

Fok-Shuen Leung, University of British Columbia
Fok-Shuen Leung obtained his doctoral degree in Mathematics from the University of Oxford. He taught at the University of Waterloo before taking a faculty position at the University of British Columbia, where he is currently Professor of Teaching, Undergraduate Chair of the Mathematics Department, and Academic Director of UBC First Year Experience. He won the Killam Teaching Prize in 2012. Dr. Leung is invested in encouraging activities which enhance public awareness and appreciation of mathematics, as well as fostering communication among various groups and organizations, concerned with mathematical training.

UBC/PIMS Mathematical Sciences Young Faculty Award

Elina Robeva, University of British Columbia
Elina Robeva is an Assistant Professor in the Department of Mathematics at the University of British Columbia. Prior to joining UBC she was a Statistics Instructor and an NSF Postdoctoral Fellow in the Department of Mathematics and the Institute for Data, Systems, and Society, at the Massachusetts Institute of Technology. In 2016 she completed her PhD from UC Berkeley, under the supervision of Bernd Sturmfels. Her thesis won the Bernard Friedman prize in applied mathematics. Dr. Robeva received a master's degree in mathematics from Harvard in 2012 and a bachelor's degree in mathematics from Stanford in 2011. Her research lies at the intersection of mathematical statistics, machine learning, combinatorics, multilinear algebra, and applied algebraic geometry.

PIMS Network-Wide Graduate Online Courses

In the fall of 2020 PIMS offered 5 graduate online courses to the PIMS network. Students from PIMS member universities were able to register for these courses through the Western Deans Agreement, allowing them to learn topics that may not be available at their university while having access to experts in advanced mathematical subjects. PIMS hopes to amplify the variety of expertise in the mathematical sciences and promote courses beyond core graduate offerings. Courses were offered between September 1, 2020 and Dec 30, 2020 and included the following:

- Process-Based Hydrological Modelling: Martyn P. Clark (University of Saskatchewan)
- Graph Theory: Karen Meagher (University of Regina), Joy Morris (University of Lethbridge), Karen Gunderson (University of Manitoba)
- Mathematical Modeling of Complex Fluids: James Feng (University of British Columbia)
- Optimal Transport + X: Brendan Pass (University of Alberta)

2020 New Collaborative Research Groups

Novel Techniques in Low Dimension

The CRG in Novel Techniques in Low Dimension is led by Liam Watson (UBC) together with Ryan Budney (U Victoria), Sabin Cautis (UBC), Robert Lipshitz (U Oregon) and Ben Williams (UBC). Though the CRG had to postpone its first event (Frontiers in low-dimensional topology, to be held at UBC), the group has met regularly through seminars and is actively planning for the Floer homotopy bootcamp, a graduate summer school slated for 2021. The caliber of this CRG group is indeed high, each with an extensive background in various thematic areas in Topology.

Quantum Topology and its Applications (quanTA)

quanTA brings together a unique and energetic team consisting of specialists in condensed matter physics and topological superconductivity, algebraic topology, algebraic and differential geometry, integrable systems, and quantum technologies, all drawn from Prairie universities and institutes. This CRG is anchored at the University of Saskatchewan and is led by Steven Rayan together with Robert Green (U of S Physics), Derek Krepski (U of M Math) Lindsay LeBlanc (U of A Physics), Joseph Maciejko (U of A Physics), Artur Sowa (U of S Math & Stats), Jacek Szmigielski (U of S Math & Stats) and Kaori Tanaka (U of S Physics).

Through PIMS support, quanTA has recruited two postdoctoral fellows who will work collaboratively at the University of Saskatchewan, University of Manitoba and the University of Alberta. The members of quanTA aim to use pure mathematics to develop 21st Century tools with exciting applications to real-world problems. As such, they are looking forward to training a new generation of scientists across Western Canada.
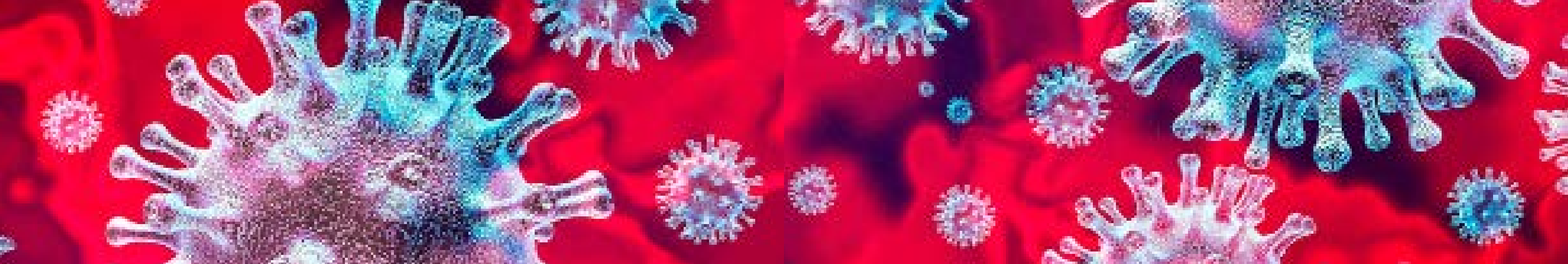
Transitioning to, and Supporting Online Collaboration During COVID-19

As we collectively navigated the COVID-19 pandemic, PIMS took this as an opportunity to support the need for researchers to collaborate exclusively in a remote setting. As new initiatives emerged, we were pleased to offer our expertise and support to ensure research in the mathematical sciences could move forward in a collaborative manner.

PIMS - BC COVID-19 Group Lecture

On May 14, 2020, Dan Coombs (UBC) and Caroline Colijn (SFU) gave a much anticipated lecture on the pandemic. Their lecture "Real-time modelling of the COVID-19 epidemic- perspectives from British Columbia", was one of our first open online events, and drew and audience of more than 250 across the network. Coomb's and Colijn's work has since been used by the BC Health Authority in managing the pandemic response. It also led to the formation of the BC COVID-19 Modelling Group (details below).

BC COVID-19 Modelling Group

This interdisciplinary and multi-university group is focused on rapid response modelling of the COVID-19 pandemic, with a focus on British Columbia and Canada. The team at PIMS is supporting this project with digital collaboration tools and workflows, logistics, and internal and public-facing communications. The group is using Slack, GitHub, and Syzygy--an interactive computing platform that is able to support COVID-19 research activities.

CAIMS - PIMS Coronavirus Modelling Conference

Over the course of 3 days, 25 speakers and 125 attendees came together to exchange ideas and learn from each other. Using digital infrastructure, researchers were able to investigate and understand the epidemiology of the disease and the in-host dynamics of COVID-19 through mathematical modelling. The conference facilitated the exchange of data and expertise in addition to connecting researchers with the public and government. It took place online from June 22 - 24, 2020 and was hosted by Thomas Hillen (UAlberta), Dan Coombs (UBC) and Morgan Craig (UMontreal & CRM).

Online Open Probability School (OOPS)

Due to the impossibility of hosting the PIMS - CRM Probability Summer School in Vancouver, PIMS worked with the organizers to pivot toward an online summer school, held from May to August 2020. This provided the opportunity for graduate and posdoctoral mathematicians to access high level presentations, on a variety of probability topics. Among the speakers were Elchanan Mossel, Nina Holden, Tom Hutchcroft and Perla Sousi.

Qolloquium: A One-Day Conference on Quivers, Representations, Resolutions

This one-day online conference, held on June 25, 2020, brought together geometers and representation theorists working on various aspects of quiver varieties and symplectic resolutions. The meeting was organized by Steven Rayan (USaskatchewan) and Travis Schedler (Imperial College London) and was attended by 108 participants across 4 time zones! The goal of the conference was to establish new connections between researchers and their program. It also aimed to explore ideas in birational geometry, universal enveloping algebras, hyperplane arrangements, character varieties, Higgs bundle moduli spaces and the Hitchin system, hyperpolygon spaces, and the geometric Langlands program.

Emergent Research: PIMS Postdoctoral Seminar Series

In the fall of 2020 PIMS launched an ongoing seminar series featuring current Postdoctoral Fellows. Held every three weeks, our PIMS PDFs have had the opportunity to showcase their emerging research. PIMS PDFs are amongst the top young researchers in Canada, and this series has been an excellent opportunity to learn about them and their work. It continues through to May 2021.

Syzygy: Delivering Jupyter Notebooks Across Canada

PIMS provides a platform called Syzygy where people can build Jupyter notebooks to combine code, text, equations, images and videos and produce compelling narratives with their browsers. PIMS, Compute Canada and Cybera collaborated to create the Syzygy service which is used to provide computational infrastructure for PIMS events and is also widely available at over 25 Canadian universities. People at these universities use Syzygy to create notebooks supporting their teaching and research, which can be easily shared with colleagues. To date, the Syzygy platform has been used by over 40,000 people.

Diversity in Mathematics

Over 100 high school and undergraduate students participated in the third annual Diversity in Mathematics program hosted by the Pacific Institute for the Mathematical Sciences. Offered virtually, this multi-year, multi-level program promotes diversity and inclusivity in STEM.

The summer school is for female-identifying, non-binary and two-spirit undergraduate students studying mathematics or a related discipline. Participants were exposed to a variety of mini-courses, lectures, group projects and panel discussions each week. The first mini-course was Inverse problems and images, taught by Dr. Tracy Balehowsky (University of Helsinki). The second course was given by Dr. Shonda Dueck (University of Winnipeg) on Self-complementary graphs and cyclic hypergraph decompositions.

Students in the high school day camp stream covered a variety of mathematical themes--Callysto, Visualization in Math, and Cryptography--that are not currently explored in the regular curricula.They also had the opportunity to be mentored and tutored by the undergraduate participants. A variety of academic and industrial career options were showcased to highlight the many opportunities that use advanced mathematics.

Callysto is a free, interactive, curriculum-based skills development platform which is available with any web browser without any software installation. It was launched in 2018 by the Pacific Institute for the Mathematical Sciences and Cybera and is designed to enhance computational thinking skills in students in grades 5-12. Callysto is funded through the federal government's CanCode program and received new funding in 2020.

As a result of the COVID-19 pandemic, there was a huge shift towards online learning. This resulted in a 52.5% increase of Callysto Hub users. Teachers are able to deliver assignments that are self-contained within a single Jupyter Notebook, and students can work directly inside the assignment. They can follow a student's thought process in its raw form, helping them assess the level of understanding, as well as potential problem areas.

In 2020 Callysto hosted three free hackathons for students in grades 9 – 12, which were themed as data science missions. In April, students had to figure out how to survive a zombie apocalypse. In June and August, students had to determine how to colonize Mars and sustain life on Mars.

Additionally, a new online data science course for teachers was launched through Callysto in November. In December a new website was launched with additional resources, including weekly data visualizations, which are pre-made lessons teachers can use in their classrooms.
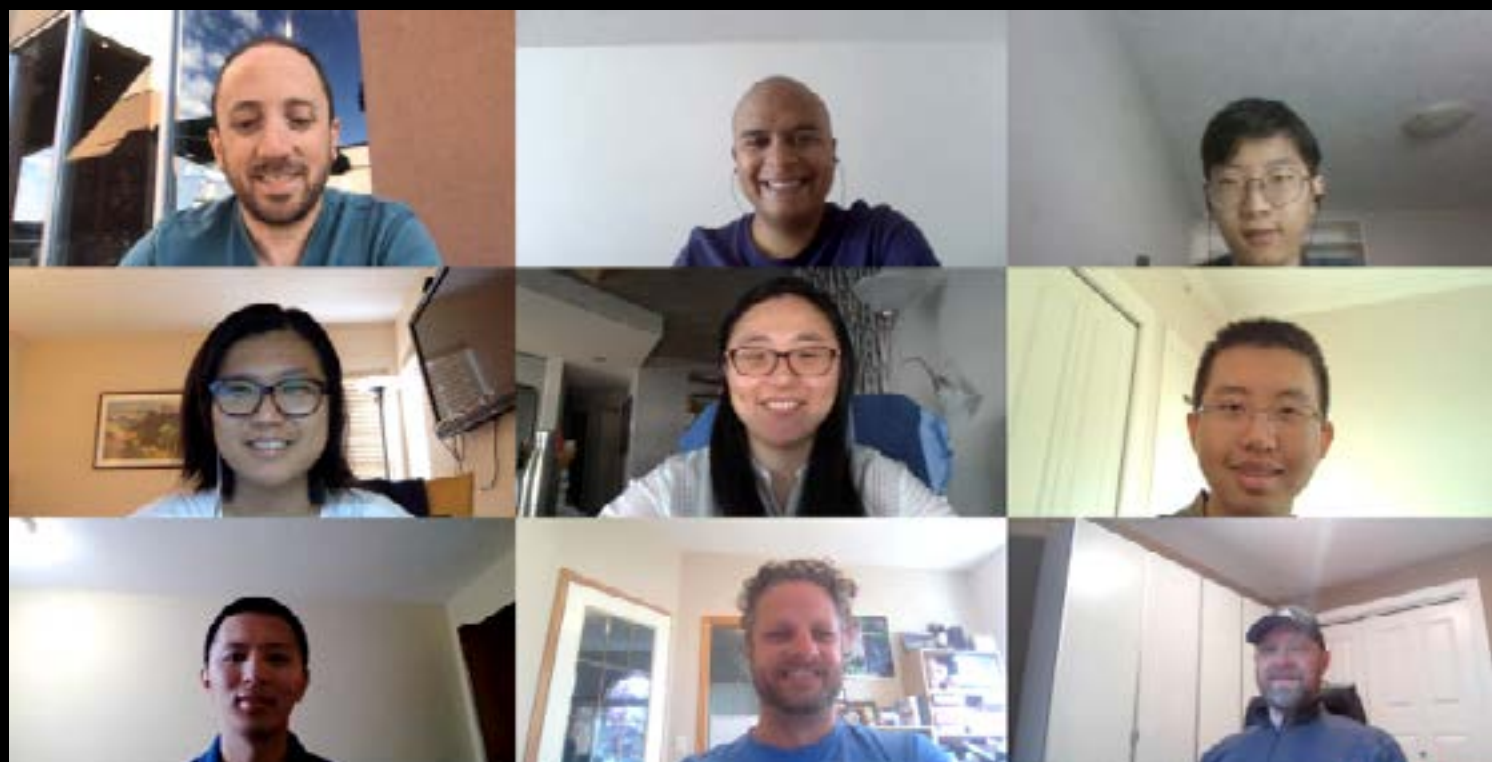
Math^{Industry} Workshop
An Economic Stimulus Opportunity for Canada

The Pacific Institute for the Mathematical Sciences (PIMS) and our partners offered the Math^{Industry} (Math to power Industry) workshop in 2020 as a rapid response program to the economic impacts of the COVID-19 pandemic. The workshop trained young mathematical scientists for jobs in important industry sectors in western Canada. The program began with a training bootcamp (software best practices, business communications, project management) and included group collaborations with industry partners.

Effective business decision-making requires expertise in modelling, computation, statistics, optimization and other areas of the mathematical sciences. During the workshop, teams developed tools which can be used to automatically detect when parking lots have available parking spaces, create optimal work schedules for employees, and analyze how making changes to a cylindrical heater may alter the heater's performance. Some teams analyzed housing price data to determine what features most impact real estate markets, or developed pricing models for oil which take into account constraints due to congestion in the networks which deliver oil and the recent trends of oil prices to fall below zero. One team used data to approximate the relative amounts of two different radon isotopes present in samples, despite the difficulties encountered in taking precise measurements of these samples. Another team found ways to make blockchain technology more efficient by reducing the size of the computation required to make a transaction, and another developed metrics to measure the performance of politicians.
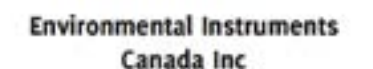

Math^{Industry} Workshop
An Economic Stimulus Opportunity for Canada

All of these projects were motivated by an industry partner's desire to advance their technology, perform more efficiently, or commercialize their ideas in development. In short, these teams provided business solutions which are benefitting Canada's economy.

We thank Mitacs for providing training and internship opportunities, and Quansight for supporting the teams. Also, we are grateful for the industry partners and academic mentors who worked closely with the teams. The 2021 final report, including the solutions found by participants, can be found here. The second iteration of this event will be held in August 2021. Details are available at https://m2pi.ca/.

2020 Industry Partners

bcdata

Over the last 4 years bcdata has run a series workshops and colloquiums to support the data science community in British Columbia. bcdata has created a vibrant data science community, intertwining people from government, industry, universities and not-for-profits with the goals of:

1. Sharing knowledge and identifying opportunities emerging from the data explosion,
2. Developing training experiences and career pathways for young mathematical scientists (mathematicians, statisticians, computer scientists) and supporting organizations in recruiting talent,
3. Forging long-term research and development partnerships to improve society and advance industry in British Columbia.

Through the support of Avigilon (a Motorola Solutions Company) and the Pacific Institute for the Mathematical Sciences, bcdata facilitated two colloquiums in 2020. This initiative fosters a robust and diverse data science community, while strengthening the exchange of expert knowledge. Networking opportunities and research collaborations bring together students and industry professionals. It also provides networking opportunities and fosters research collaborations which bring together students and industry professionals.

2020 bcdata COLLOQUIA:

Tackling Big Climate Data in the Cloud
Joe Hamman, National Center for Atmospheric Research

Coronavirus 2019: The Math and Stats Behind the News, and the Role of Genetic Data
Caroline Colijn, Simon Fraser University

2021 Event Highlights

SEMINARS, CONFERENCES AND WORKSHOPS

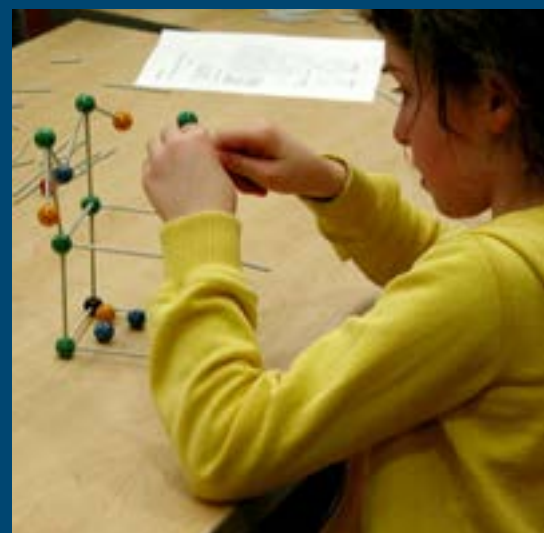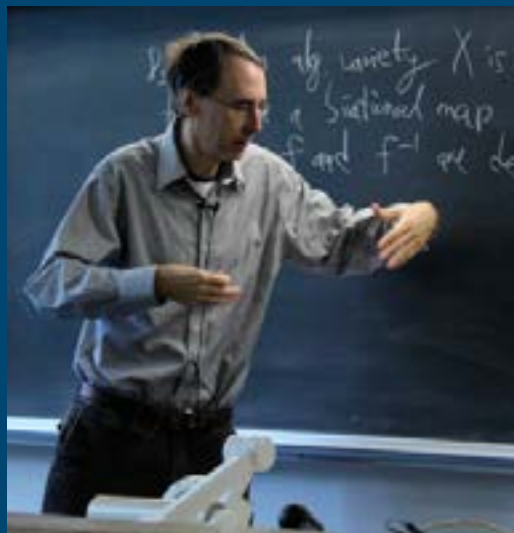|		
January - May	**PIMS-UBC Distinguished Colloquia** University of British Columbia	
January - May	**TR(U)BC Seminar Series** University of British Columbia & Thompson Rivers University	
January - May	**PIMS 25th Anniversary Network-Wide Colloquium** https://tinyurl.com/ycvyrgbm	
January - May	**Emergent Research: The PIMS Postdoctoral Fellow Seminar** https://tinyurl.com/y9n3obwz	
10 - 14 May	**PIMS Workshop on New Trends in Localized Patterns in PDEs** https://tinyurl.com/ycpu6re6	
16 - 22 May	**GAP XVII - Deformations and Higher Structures** University of British Columbia	
25 - 28 May	**CanaDAM 2021** https://tinyurl.com/ybg5t95d	
Summer	**Alberta Number Theory Days XIII** Banff International Research Station (BIRS)	
June	**Second Canadian Geometry and Topology Seminar** Université du Québec à Montréal	
3 - 10 July	**Algebraic and probabilistic methods for graph colouring** University of Victoria	
5 - 9 July	**Theta series: representation theory, geometry and arithmetic** Fields Institute	
August	**Alberta-Montana Combinatorics and Algorithms Days** Banff International Research Station (BIRS)	

9 - 12 August	**17th Algorithms and Data Structures Symposium & 33rd Canadian Conference on Computational Geometry** Dalhousie University
26 - 29 October	**Mean Field Games on Networks** University of British Columbia
5 - 10 December	**PRIMA Congress 2021** Vancouver & Online

SUMMER SCHOOLS

5 - 9 July	**Inclusive Paths to Number Theory** University of Calgary

SPECIAL FOCUS PERIOD

2021 - 2022	**Coalescing Campus Alberta** University of Calgary & University of Lethbridge

COLLABORATIVE RESEARCH GROUPS

2018 - 2021	**High Dimensional Data Analysis**
2020 - 2023	**Quantum Topology and Its Applications**
2020 - 2023	**Novel techniques in low dimension: Interactions between Floer homology, representation theory and algebraic topology**
2021 - 2024	**Movement and Symmetry in Graphs**
2021 - 2024	**Pacific Interdisciplinary Hub on Optimal Transport**

For more information and updates, visit
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