BIRS 2024 ANNUAL REPORT

Banff International Research Station
for Mathematical Innovation and Discovery

THE UNIVERSITY OF BRITISH COLUMBIA
Okanagan Campus

5-DAY WORKSHOPS 2024

Jan 07 - Jan 12 ● Community in Algebraic and Enumerative Combinatorics

Jan 14 - Jan 19 ● Randomness and Quasiperiodicity in Mathematical Physics

Jan 21 - Jan 26 ● Higher Segal Spaces and their Applications

Jan 28 - Feb 02 ● Bridging Statistical Strategies for Censored Covariates

Feb 04 - Feb 09 ● Exponential Fields

Feb 11 - Feb 16 ● Statistical Aspects of Trustworthy Machine Learning

Feb 18 - Feb 23 ● Structured Machine Learning and Time–Stepping for Dynamical Systems

Feb 25 - Mar 01 ● Computational Complexity of Statistical Inference

Mar 03 - Mar 08 ● Fundamental Limitations to Quantum Computation

Mar 10 - Mar 15 ● Algorithmic Structures for Uncoordinated Communications and Statistical Inference in Exceedingly Large Spaces

Mar 17 - Mar 22 ● The Crossroads of Topology, Combinatorics and Biosciences

Mar 24 - Mar 29 ● Optimal Transport and Distributional Robustness

Mar 31 - Apr 05 ● Knot Theory Informed by Random Models and Experimental Data

Apr 07 - Apr 12 ● Representation Theory and Topological Data Analysis

Apr 14 - Apr 19 ● Bootstrap Percolation and its Applications

Apr 21 - Apr 26 ● Modern Methods for Differential Equations of Quantum Mechanics

Apr 28 - May 03 ● Building and Enhancing Mathematical Reasoning

May 05 - May 10 ● Skew Braces, Braids and the Yang-Baxter Equation

May 12 - May 17 ● Analysis of Complex Data: Tensors, Networks and Dynamic Systems

May 19 - May 24 ● Modeling and Theory in Population Biology

May 26 - May 31 ● Advances in Hierarchical Hyperbolicity

Jun 02 - Jun 07 ● Bridging Prediction and Intervention Problems in Social Systems

Jun 09 - Jun 14 ● On the Interface of Geometric Measure Theory and Harmonic Analysis

Jun 16 - June 21 ● Mathematics of Multiscale and Multiphysics Phenomena in Materials Science

Jun 23 - Jun 28 ● Cross-Community Collaborations in Combinatorics

Jun 23 - June 28 ● Computational Geometry

5-DAY WORKSHOPS 2024

June 30 - Jul 05	Mathematical Analysis of Soft Matter
Jul 07 - Jul 12	Formation of Looping Networks - from Nature to Models
Jul 14 - Jul 19	Non-Newtonian Flows in Porous Media
Jul 21 - Jul 26	Statistical, Computational, Translational, and Ethical Challenges in Biobank Data Analysis
Jul 28 - Aug 02	Combinatorics and Geometry of Moduli Spaces of Curves
Aug 04 - Aug 09	What's your trick? A Non-Traditional Conference in Low-Dimensional Topology
Aug 11 - Aug 16	Frontiers of Statistical Mechanics and Theoretical Computer Science
Aug 18 - Aug 23	Causal Inference and Prediction for Network Data
Aug 25 - Aug 30	Enumerative Geometry Beyond Spaces
Sep 01 - Sep 06	Combinatorial Nonpositive Curvature
Sep 08 - Sep 13	Stochastics and Geometry
Sep 15 - Sep 20	SocioEconomic Mathematical Epidemiology: Developing Mathematical Modelling Theory
Sep 22 - Sep 27	Group Operator Algebras: Classification, Structure and Rigidity
Sep 29 - Oct 04	New Perspectives in Colouring and Structure
Oct 06 - Oct 11	Dynamical Models Inspired by Biology
Oct 13 - Oct 18	Symmetry and Geometry in Neural Representations (Cancelled)
Oct 20 - Oct 25	New Directions in Machine Learning Theory
Oct 27 - Nov 01	Nonlinear Water Waves: Rigorous Analysis and Scientific Computing
Nov 03 - Nov 08	Cartan Subalgebras in Operator Algebras, and Topological Full Groups
Nov 10 - Nov 15	Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics
Nov 17 - Nov 22	Detection and Analysis of Gravitational Waves in the era of Multi-Messenger Astronomy: From Mathematical Modelling to Machine Learning
Nov 24 - Nov 29	Movement and Symmetry in Graphs
Dec 01 - Dec 06	Conformal and CR Geometry

2-DAY WORKSHOPS 2024

Mar 22 - Mar 24	Alberta Number Theory Days XV
Apr 05 - Apr 07	Combinatorial Optimization for Online Platforms
Apr 12 - Apr 14	Ted Lewis SNAP Math Fair Workshop
Aug 09 - Aug 11	Model-Informed Drug Discovery and Quantitative Systems Pharmacology: Key Applications, Opportunities and Challenges
Oct 20 - Oct 22	Responsible AI in Healthcare with Electronic Health Records Data

FOCUSED RESEARCH GROUPS

| Jun 30 - Jul 13 | PIMS-BIRS TeamUp: Quantum State Transfer |
| Jul 14 - Jul 21 | Advancing Stability through Rigorous Computation |

RESEARCH IN TEAMS

Feb 04 - Feb 11	Stable and Hyperbolic Polynomials and their Determinantal Representations
Mar 03 - Mar 10	Homological Invariants of Fourier Algebras
Mar 17 - Mar 30	PIMS-BIRS TeamUp: Twisted Tensors of Hopf Algebras
Mar 22 - Mar 24	Deciphering the Topology/Geometry of three-stranded RNA-DNA Hybrids
Mar 24 - Mar 31	Problems in Lefschetz and Liaison Theory
Mar 31 - Apr 14	Homomorphisms between Braid Groups and Holomorphic Maps between Configuration Spaces
May 19 - May 26	Real Cubings and Large Scale Geometry of Hierarchically Hyperbolic Groups
Jul 14 - Jul 21	Applications of Multivariate Hawkes Processes in Finance, Insurance and Epidemiology
Jul 14 - Jul 28	Algebraic K-theory of Lawvere Theories
Jul 28 - Aug 11	Novel Effective Theories of Phase Separation in Quasi-Crystals
Jul 28 - Aug 10	PIMS-BIRS TeamUp: Generalizations of the Prime Number Theorem
Aug 04 - Aug 11	The Steklov Eigenproblem under Polygonal and Polyhedral Approximation

RESEARCH IN TEAMS

Aug 18 - Aug 25	Centers of mass of Convex Bodies
Sep 08 - Sep 15	Computability of Markov Partitions
Oct 13 - Oct 20	Determining a Collection of Boundary Points on the p-adic Mandelbrot Set of degree d Polynomials
Nov 24 - Dec 07	BIRS-PIMS TeamUp: Small Solutions to Thue Equations Over Quadratic Imaginary Fields
Dec 08 - Dec 15	Explicit Local Solubility and Applications

SUMMER SCHOOLS

May 26 - Jun 01	12th ICAPS Summer School on Automated Planning and Scheduling
Jun 30 - Jul 13	IMO Team Summer Training Camp

BANFF INTERNATIONAL RESEARCH STATION

5-DAY WORKSHOPS 2024

Community in Algebraic and Enumerative Combinatorics
January 7 - 12, 2024

Organizers:

Marni Mishna (Simon Fraser University)

Olya Mandelshtam (University of Waterloo)

Shaheen Nazir (Lahore University of Management Sciences)

Rosa Orellana (Dartmouth College)

Bridget Tenner (DePaul University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5302*

This five-day workshop provided a supportive and vitalizing environment for gender minorities in algebraic combinatorics from a wide variety of backgrounds and experiences to share their expertise and to strengthen their presence in the mathematical community. Algebraic combinatorics as a branch of mathematics has significant connections to representation theory, mathematical physics, algebraic geometry, number theory, knots and links, mathematical biology, statistical mechanics, symmetric functions, invariant theory, computer science, and other areas. Ultimately, the goal of this workshop was to foster collaboration and advance the state of knowledge in several important and interconnected topics of combinatorics. Moreover, this workshop improved the visibility and success of women and people from underrepresented gender identities in combinatorics and mathematics more generally.

Participants:

Almousa, Ayah (University of Minnesota - Twin Cities)

Azenhas, Olga (Universidade de Coimbra)

Banaian, Esther (Aarhus University)

Barnard, Emily (DePaul University)

Brauner, Sarah (UQAM/LaCIM)

Chepuri, Sunita (University of Puget Sound)

Colmenarejo, Laura (North Carolina State University)

Corteel, Sylvie (CNRS)

Daugherty, Zajj (Reed College)

Dorpalen-Barry, Galen (Ruhr-Universität Bochum)

Elder, Jennifer (Missouri Western State University)

Fishel, Susanna (Arizona State University)

Fraser, Melanie (Cornell University)

Gonzalez, Nicolle (UC Berkeley)

Hainzl, Eve-Maria (TU Wien)

Hardouin, Charlotte (Institut de Mathématiques de Toulouse Université Paul Sabatier)

Harris, Pamela (University of Wisconsin - Milwaukee)

Hicks, Angela (Lehigh University)

Huang, Daoji (University of Minnesota)

Jiang, Yuhan (Harvard University)

Kelley, Elizabeth (University of Illinois Urbana-Champaign)

Klivans, Caroline (Brown University)

Lafreniere, Nadia (Concordia University)

Li, Yifei (University of Illinois at Springfield)

Mandelshtam, Olya (University of Waterloo)

Mishna, Marni (Simon Fraser University)

Nazir, Shaheen (Lahore University of Management Sciences)

Orellana, Rosa (Dartmouth College)

Pan, Jianping (NSCU)

Panova, Greta (University of Southern California)

Pun, Ying Anna (Baruch College)

Rosas, Mercedes (Universidad de Sevilla)

Schilling, Anne (University of California, Davis)

Selkirk, Sarah (University of Klagenfurt)

Striker, Jessica (North Dakota State University)

Sundaram, Sheila (University of Minnesota)

Torres, Jacinta (Jagiellonian University in Krakow)

Van Willigenburg, Stephanie (UBC)

Wallace, Nancy (York University)

Whitehead McGinley, Tamsen (Santa Clara University)

Yeats, Karen (University of Waterloo)

Yin, Mei (University of Denver)

Yip, Martha (University of Kentucky)

Randomness and Quasiperiodicity in Mathematical Physics

January 14 - 19, 2024

Organizers:

Wencai Liu (Texas A&M University)

David Damanik (Rice University)

Constanza Rojas-Molina (CY Cergy Paris Universite)

Mira Shamis (Queen Mary Univerisity of London)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5237*

Random and quasiperiodic structures have been the center of active research since the late 1970s, as part of the broader theory of ergodic operators which developed, motivated by the the study of electronic properties in materials. Ergodic operators give a common framework to both fields, allowing for close interactions and mutually beneficial exchanges between the two subareas, both in terms of phenomena and techniques. In recent years there have been numerous exciting developments in each of the subareas and hence it is an excellent time to foster new interactions and exchanges of ideas. The aim of this workshop is to bridge these topics with random matrix theory and statistical mechanics, which we believe to have significant potential for inspiring new developments in the field of random and quasiperiodic systems. This workshop brought together leading experts and promising junior researchers with interests in the study of the effects of randomness, quasiperiodicity, or other stationary environments of physical interest.

Participants:

Becker, Simon (ETHZ)

Black, Adam (Yale University)

Damanik, David (Rice University)

Davis, Nyah (Rice University)

Drogin, Reuben (Yale University)

Elgart, Alex (Virginia Tech)

Emilsdottir, Iris (Rice University)

Fillman, Jake (Texas State University)

Fyodorov, Yan (King's College London)

Ganguly, Shirshendu (UC Berkeley)

Ginsburg, Victor (UC Berkeley)

Goldsheid, Ilya (Queen Mary Universiy of London)

Gorodetski, Anton (University of California Irvine)

Hurtado, Omar (UCI)

Jitomirskaya, Svetlana (UC Berkeley)

Kachkovskiy, Ilya (Michigan State University)

Khanin, Konstantin (University of Toronto)

Klein, Abel (University of California, Irvine)

Klein, Silvius (Pontifical Catholic University of Rio de Janeiro)

Klopp, Frédéric (Sorbonne Université)

Krasovsky, Igor (Imperial College London)

Li, Long (Rice University)

Li, Yong (Jilin University)

Liu, Wencai (Texas A&M University)

Lukic, Milivoje (Rice University)

Malinovitch, Tal (Rice University)

Matos, Rodrigo (PUC-Rio)

Mueller, Peter (Ludwig-Maximilians-Universitaet Muenchen)

Pastur, Leonid (B.Verkin Institute for Low Temperature Physics and Engineering)

Powell, Matthew (Georgia Tech)

Puig, Joaquim (Universitat Politècnica de Catalunya)

Schroder, Dominik (ETH Zurich)

Shamis, Mira (Queen Mary Univerisity of London)

Shapiro, Jacob (Princeton University)

Shi, Yunfeng (Sichuan University)

Smart, Charles (Yale)

Spencer, Thomas (Institute for Advanced Study)

Srivastava, Nikhil (UC Berkeley)

Taarabt, Amal (Pontificia Universidad Católica de Chile)

Takase, Alberto (Michigan State University)

Wang, Wei-Min (CNRS)

Wang, Xingya (Rice University)

Wang, Xueyin (Nankai University)

Xu, Fei (Jilin University)

Yin, Jun (UCLA)

You, Jiangong (Nankai University)

Young, Giorgio (University of Michigan)

Zhang, Zhenghe (University of California, Riverside)

Zhang, Shiwen (UMass Lowell)

Zhang, Lingfu (UC Berkeley)

Zhou, Qi (Nankai University)

Zhu, Xiaowen (University of Washington)

Higher Segal Spaces and their Applications on Algebraic K-Theory, Hall Algebras, and Combinatorics

January 21 - 26, 2024

Organizers:

Julie Bergner (University of Virginia)

Maru Sarazola (University of Minnesota)

Joachim Kock (Universitat Autònoma de Barcelona)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5266*

Homotopy theory and combinatorics are two typically quite disparate areas of mathematics. Whereas combinatorics is concerned with discrete, enumerative problems, homotopy theory has its origins in a more geometric context and has in many ways become quite abstract. The emerging theory of higher Segal spaces provides a bridge between these two areas, allowing for the more theoretical tools of homotopy theory to be applied to combinatorial problems, as well as new homotopy-theoretic frameworks motivated by combinatorial constructions. The aim of the workshop was to bring together researchers in each of these areas: homotopy theory, combinatorics, algebraic K-theory, and Hall algebras, to help facilitate not only the study of higher Segal spaces themselves, but also the interplay between these different fields with the goal of opening new research directions and forming collaborations.

Participants:

Anel, Matthieu (Carnegie Melon University)

Asmat, Farwa (Peking University)

Bai, Qingyuan (University of Copenhagen)

Basualdo Bonatto, Luciana (Max Planck Institute for Mathematics)

Behr, Nicolas (CNRS, Université Paris Cité, IRIF)

Bergner, Julie (University of Virginia)

Calle, Maxine (The University of Pennsylvania)

Campbell, Jonathan (Center for Communications Research, La Jolla)

Carawan, Tanner (University of Virginia)

Contreras, Ivan (Amherst College)

Cooper, Benjamin (University of Iowa)

Dyckerhoff, Tobias (Universitaet Hamburg)

Eppolito, Chris (The University of the South)

Feller, Matt (MPIM Bonn)

Gálvez-Carrillo, Imma (Universitat Politècnica de Catalunya)

Gödicke, Jonte (University of Hamburg)

Gorsky, Mikhail (University of Vienna)

Grossack, Chris (UC Riverside)

Hackney, Philip (University of Louisiana at Lafayette)

Hoekstra Mendoza, Teresa (Cimat)

Joyal, André (Université du Québec à Montréal)

Jun, Jaiung (SUNY New Platz)

Keenan, Liam (University of Minnesota)

Kobin, Andrew (Emory University)

Kock, Joachim (Universitat Autònoma de Barcelona)

Lindenstrauss, Ayelet (Indiana University)

Lynd, Justin (University of Louisiana at Lafayette)

Mehta, Rajan (Smith College)

Nass, Felix (University of Hamburg and University of Copenhagen)

Ozornova, Viktoriya (Max Planck Institute for Mathematics)

Rovelli, Martina (University of Massachusetts Amherst)

Rovi, Carmen (Loyola University Chicago)

Sarazola, Maru (University of Minnesota)

Shapiro, Brandon (University of Virginia)

Sibilla, Nicolo (SISSA)

Steinebrunner, Jan (University of Copenhagen)

Stern, Walker (Bilkent University)

Tanaka, Hiro Lee (Texas State University)

Tonks, Andrew (Universidad de Málaga)

Weibel, Charles (rutgers university)

Young, Matthew (Utah State University)

Zakharevich, Inna (Cornell University)

Bridging Statistical Strategies for Censored Covariates

January 28 - February 2, 2024

Organizers:

Tanya Garcia (University of N. Carolina at Chapel Hill)   Yanyuan Ma (Pennsylvania State University)

Joan Hu (Simon Fraser University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5160*

Diseases of aging, like Alzheimer, Parkinson, and Huntington disease, are expected to affect 153 million individuals worldwide by 2050. Treatments to prevent or slow these diseases will significantly decrease the projected impact, and modeling how disease symptoms worsen over time---the symptom trajectory---before and after a diagnosis can help evaluate if a treatment can prevent or slow a disease. Yet modeling the symptom trajectory is not easy because these diseases of aging progress slowly over decades, so studies that track symptoms often end before a diagnosis can be made. The challenge creates a unique statistical problem of modeling the symptom trajectory as a function of a \emph{right-censored covariate}, time to diagnosis. Tackling this problem by modeling time to diagnosis has long been thought to be the best strategy, but new discoveries now show that when those models are even slightly wrong, that strategy produces biased results and incorrectly powered clinical trials. This workshop brought together clinician scientists, statisticians, and biostatisticians to bridge ideas and create working groups toward developing practical, model-free strategies for censored covariate problems.

Participants:

Bernhardt, Paul (Villanova University)

Bodek, Benjamin (UNC Chapel Hill)

Cao, Jiguo (Simon Fraser University)

Chen, Jinbo (University of Pennsylvania)

de Luna, Xavier (UMEA University)

Farouk, Nathoo (University of Victoria)

Foes, Abigail (UNC Chapel Hill)

Garcia, Tanya (University of North Carolina at Chapel Hill)

Gomez Melis, Guadalupe (Universitat Politècnica de Catalunya -BarcelonaTECH)

Griffin, Maryclare (UMass Amherst)

Grosser, Kyle (UNC Chapel Hill)

Han, Kihyun (Penn State University)

Insolia, Luca (University of Geneva)

Liu, Jianxuan (Syracuse University)

Liu, Juxin (University of Saskatchewan)

Lotspeich, Sarah (Wake Forest University)

Ma, Yanyuan (Pennsylvania State University)

Ma, Renjun (University of New Brunswick)

Matsouka, Roland (Duke University)

Morrison, Ezra (UC Davis)

Ortega-Villa, Ana (National Institute of Allergy and Infectious Diseases)

Parast, Layla (University of Texas at Austin)

Qian, Jing (University of Massachusetts, Amherst)

Richardson, Brian (UNC Chapel Hill)

Rockwell, Emmanuel (UNC Chapel Hill)

Sang, Peijun (University of Waterloo)

Shetty, Samidha (Montana State University)

Sjostedt de Luna, Sarah (UMEA University)

Tang, Yin (Penn State University)

Tarr, Garth (University of Sydney)

Van Keilegom, Ingrid (KU Leuven)

Vazquez, Jesus (UNC Chapel Hill)

Wang, Liqun (University of Manitoba)

Wang, Molin (Harvard)

Wei, Ying (Columbia University)

Zhao, Jiwei (University of Wisconsin-Madison)

Zhao, Lihui (Northwestern University)

Exponential Fields

February 4 - 9, 2024

Organizers:

Adele Padgett (McMaster University)　　　　　Salma Kuhlmann (Universität Konstanz)

Sebastian Eterovic (University of Leeds)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5224*

Scientists often study real-world phenomena using mathematical models. A model is a function whose input is usually time and whose output approximates a real world quantity. For example, an epidemiologist could gather data early in a pandemic and use it to create a model that predicts the number of new infections in the future. One of the simplest types of models that closely reflects many real-world processes is exponential growth. The initial spread of a virus, the amount of debt over time as interest accumulates, and nuclear chain reactions can all be modelled using exponential growth. Exponential functions, in particular $f(t) = e^t$, have also been intensely studied in mathematics, not only because of their important real-world applications, but also because of their striking mathematical properties. There is still much that is not known about the solvability of systems of equations involving exponential functions, the geometry of exponential functions, and their abstract theory. The aim of this 5-day workshop at BIRS was to bring together young researchers and established experts to share recent discoveries and outline new strategies for better understanding the mathematical properties of exponentiation.

Participants:

Andújar Guerrero, Pablo (University of Leeds)

Aschenbrenner, Matthias (University of Vienna)

Aslanyan, Vahagn (University of Manchester)

Bagayoko, Vincent (IMJ-PRG)

Bhardwaj, Neer (Weizmann Institute of Science)

Block Gorman, Alexi (McMaster University)

Borgard, Tyler (The Ohio State University)

Bradley-Williams, David (Czech Academy of Sciences)

Brown, Jordan (UC Berkeley)

D'Aquino, Paola (Universita della Campania)

De Mase, Anna (University of Campania)

Dmitrieva, Anna (University of East Anglia)

Dobrowolski, Jan (University of Manchester)

Eagles, Christine (University of Waterloo)

Ehrlich, Philip (Ohio University)

Eterovic, Sebastian (University of Leeds)

Fornasiero, Antongiulio (Universita degli studi di Firenze)

Fowler, Guy (Leibniz Universität Hannover)

Freitag, James (University of Illinois at Chicago)

Freni, Pietro (University of Leeds)

Gallinaro, Francesco (University of Freiburg)

Jaoui, Rémi (CNRS-Université Lyon 1)

Jones, Gareth (University of Manchester)

Kaplan, Elliot (McMaster)

Kesting, Christoph (McMaster University)

Kirby, Jonathan (University of East Anglia)

Krapp, Lothar Sebastian (University of Konstanz)

Kuhlmann, Salma (Universität Konstanz)

Lavi, Noa (Politecnico de Torino)

Mantova, Vincenzo (University of Leeds)

Marker, David (University of Illinois at Chicago)

Martinez, Nicolas (Institut de Mathématiques de Bordeaux)

Matusinski, Mickaël (Universite de Bordeaux)

McCulloch, Raymond (University of Manchester)

Mennuni, Rosario (Università di Pisa)

Miller, Chris (Ohio State)

O'Gorman, Ronan (University of California, Berkeley)

Padgett, Adele (McMaster University)

Panazzolo, Daniel (Université de Haute-Alsace)

Point, Francoise (Mons)

Pynn-Coates, Nigel (University of Vienna)

Scanlon, Thomas (University of California, Berkeley)

Serra, Michele (TU Dortmund)

Speissegger, Patrick (McMaster University)

Terzo, Giuseppina (Università degli Studi di Napoli "Federico II")

Thomas, Margaret (Purdue University)

Van Hille, Siegfried (McMaster University)

Vermeulen, Floris (KU Leuven)

Vogel, Lasse (University of Konstanz)

Wilkie, Alex (University of Oxford)

Wirth, Laura (University of Konstanz)

Zilber, Boris (Oxford University)

Statistical Aspects of Trustworthy Machine Learning

February 11 - 16, 2024

Organizers:

Jun Yan (University of Connecticut)

Xiaotong Shen (University of Minnesota)

Hao Zhang (University of Arizona)

Stephanie Hicks (Johns Hopkins)

Keegan Korthauer (University of British Columbia)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5284*

Machine learning algorithms are increasingly being deployed in a wide range of domains, including medicine, advertising, criminal justice, speech recognition, and computer vision. These applications have the potential for significant impacts on our daily lives, but widespread acceptance by society has lagged behind due to the lack of trust. While the field of statistics has played an integral role in the machine learning revolution, much of its attention has focused on developing accurate algorithms. In addition to being accurate, however, trustworthy machine learning methods must also be fair, transparent, and interpretable. This workshop brought together members of the statistical community to discuss recent progress and potential statistical solutions toward these understudied aspects of trustworthy machine learning.

Participants:

Allotey, Prince (University of Washington)

Baniecki, Hubert (University of Warsaw)

Barnett, Alina (Duke University)

Bi, Xuan (University of Minnesota)

Campbell, Trevor (University of British Columbia)

Chen, Pin-Yu (IBM Research)

Cheplygina, Veronika (ITU Copenhagen)

Colopy, Glen (Wildfell Software)

Columbus, Alyssa (Johns Hopkins University)

Ding, Caiwen (University of Connecticut)

Elliott, Lloyd (Simon Fraser University)

Ermis, Beyza (Cohere for AI)

Fokoue, Ernest (Rochester Institute of Technol)

Fu, Haoda (Eli Lilly and Company)

Gamal, Mai (German University in Cairo)

Hansen, Kasper (John Hopkins University)

Hicks, Stephanie (Johns Hopkins)

Hooker, Giles (University of Pennsylvania)

Hu, Joan (Simon Fraser University)

Ji, Yuan (The University of Chicago)

Jiang, Bei (University of Alberta)

Kong, Linglong (University of Alberta)

Kong, Dehan (University of Toronto)

Korthauer, Keegan (University of British Columbia)

Koyejo, Sanmi (Stanford University)

Kuchibhotla, Arun (Arun Kumar Kuchibhotla)

Lecuyer, Mathias (University of British Columbia)

Li, Xiaoxiao (University of British Columbia)

Li, Ying (University of Wisconsin-Madison)

Liang, Tengyuan (University of Chicago)

Liu, Yufeng (University of N. Carolina at Chapel Hill)

Liu, Chuanhai (Purdue University)

Liu, Juxin (University of Saskatchewan)

McGowan, Lucy (Wake Forest University)

Meng, Xiaoli (Harvard University)

Miao, Fei (University of connecticut)

Mohan, Karthika (Oregon State University)

Mondal, Debashis (Washington University in St Louis)

Mou, Wenlong (University to Toronto)

Neufeld, Anna (Fred Hutchinson Cancer Center)

Pan, Wei (University of Minnesota)

Perera, Deshan (University of Calgary)

Prates, Marcos (Universidade Federal de Minas Gerais)

Qi, Zhengling (The George Washington University)

Qu, Annie (University of California Irvine)

Reid, Nancy (University of Toronto)

Rudin, Cynthia (Duke)

Sankaran, Kris (UW-Madison)

Shen, Xiaotong (University of Minnesota)

Snoke, Joshua (RAND Corporation)

Sun, Will Wei (Purdue University)

Sutherland, Danica (University of British Columbia)

Tang, Weijing (Carnegie Mellon University)

Timbers, Tiffany (University of British Columbia)

Valdez, Emiliano A. (University of Connecticut)

Vallejos, Catalina (University of Edinburgh)

Vaswani, Sharan (Simon Fraser University)

Wang, Haiying (University of Connecticut)

Wang, Yuanjia (Columbia University)

Wang, Fei (Cornell University)

Wang, Naisyin (University of Michigan)

Wang, Xiao (Purdue University)

Wang, Wenjie (Eli Lilly and Company)

Wang, Linbo (University of Toronto)

Wang, Ding-Hao (University of Calgary)

Wassermann, Larry (Carnegie Mellon)

Witten, Daniela (University of Washington)

Yadav, Chhavi (UCSD)

Yan, Jun (University of Connecticut)

Yi, Grace (University of Western Ontario)

YU, Bin (UC Berkeley)

Zeng, Donglin (University of Michigan)

Zhang, Hao (University of Arizona)

Zhang, Qingrun (University of Calgary)

Zhou, Ying (University of Connecticut)

Zhu, Ji (University of Michigan)

Zhu, Hongtu (University of N. Carolina at Chapel Hill)

Structured Machine Learning and Time–Stepping for Dynamical Systems

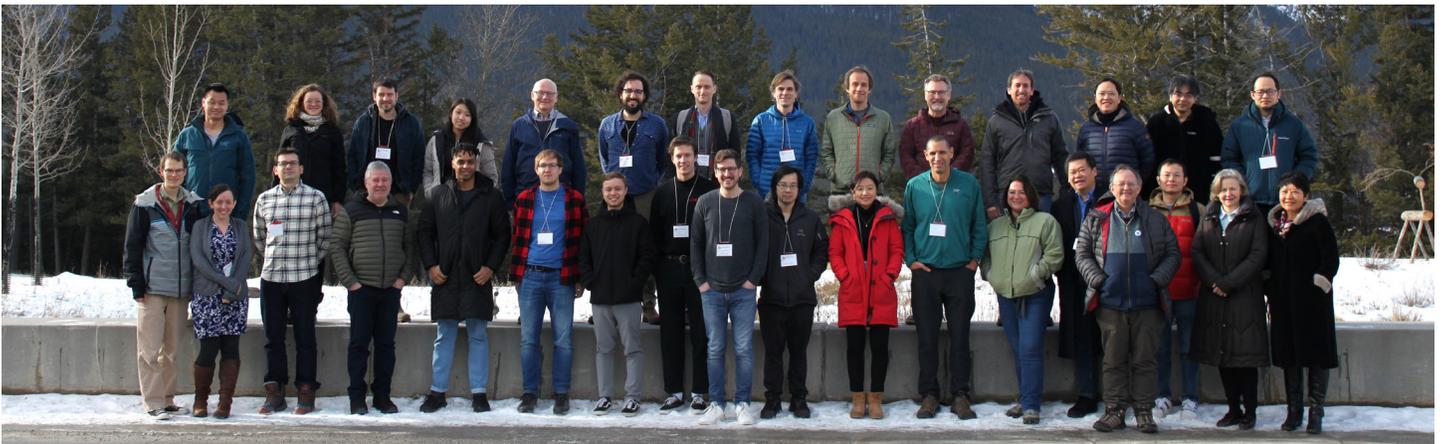## February 18 - 23, 2024

Organizers:

Andy Wan (University of California Merced)

Jason Bramburger (Concordia University)

Chris Budd (University of Bath)

Jingwei Hu (University of Washington)

Nathan Kutz (University of Washington)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5301*

This workshop aimed to bring together a diverse and multi-disciplinary group of researchers to cultivate exchange of ideas on structure-preserving time-stepping methods and structured machine learning techniques, with a common goal of achieving reliable, efficient and accurate predictions for data-driven dynamics. The key themes of this workshop are: i) structure-preserving discretizations; ii) structured machine learning; iii) applications of these methods. The participants of this workshop fostered new collaborations and a new community in sharing knowledge and working together at incorporating structures of dynamical systems within modern machine learning techniques. These exchanges and developments will no doubt result in long-lasting impacts at enabling more accurate and reliable machine learning techniques for forecasting dynamical systems and for their use in diverse applications.

Participants:

Bernier, Jean-Sebastien (UNBC)

Betcke, Marta (University College London)

Bhat, Harish (University of California, Merced)

Blomquist, Matt (UC Merced)

Bramburger, Jason (Concordia University)

Brugiapaglia, Simone (Concordia University)

Budd, Chris (University of Bath)

Celledoni, Elena (Norwegian University of Science and Technology)

Chau, Son (University of Northern British Columbia)

Constantinescu, Emil (Argonne National Laboratory)

Curbelo, Jesus (University of Saskatchewan)

Curiel, Pablo (UC Merced)

Curtis, Christopher (San Diego State University)

Deveney, Teo (University of Bath)

Dimarco, Giacomo (university of Ferrara)

Edjah, Cornelius (University of Northern British Columbia)

Fassler, Daniel (Concordia University)

Flouris, Kyriakos (ETH Zurich)

Furihata, Daisuke (Osaka University)

Gaudreault, Stephane (Environment and Climate Change Canada)

Graham, Michael (University of Wisconsin-Madison)

Haber, Eldad (UBC)

Hu, Jingwei (University of Washington)

Huang, Juntao (Texas Tech University)

Jackaman, James (Norwegian University of Science and Technology)

Karam, Samir (Concordia University)

Ketcheson, David (King Abdullah University of Science and Technology)

Kreusser, Lisa (Univeristy of Bath)

Kutz, Nathan (University of Washington)

Lee, Yolanne (UCL)

Leok, Melvin (University of California, San Diego)

Li, Tongtong (Dartmouth College)

Lin, Wu (Vector Institute)

Liu, Yuying (Amazon)

Loffeld, John (Lawrence Livermore National Laboratory)

Lusch, Bethany (Argonne National Laboratory)

McGregor, Geoffrey (University of Toronto)

Moayeri, Mahdi (University of Saskatchewan)

Murari, Davide (NTNU)

Offen, Christian (Paderborn University)

Owren, Brynjulf (NTNU)

Potgieter, Hannah (Simon Fraser University)

Rozza, Gianluigi (SISSA International School for Advanced Studies)

Ruuth, Steven (Simon Fraser University)

Salinas, Mario (University of Northern British Columbia)

Schratz, Katharina (Sorbonne Université)

Sharan, Shashwat (UC Merced)

Sharma, Aryan (University of Saskatchewan)

Spiteri, Ray (University of Saskatchewan)

Sprenger, Patrick (UC Merced)

Tao, Molei (Georgia Institute of Technology)

Taylor, Seth (McGill University)

Tokman, Mayya (University of California, Merced)

Tran, Brian (Los Alamos National Lab)

Tsai, Yen-Hsi (University of Texas at Austin)

Tsao, Steven (University of Northern British Columbia)

Venn, Daniel (Simon Fraser University)

Wan, Andy (University of California Merced)

Wang, Kening (University of North Florida)

Wang, Li (University of Minnesota)

wang, Liqi (University of Northern British Columbia)

Weber, Melanie (Harvard University)

Wei, Vicky (University of Saskatchewan)

Willis, Nathan (UC Merced)

Xiu, Dongbin (The Ohio State University)

Yaguchi, Takaharu (Kobe University)

Zhang, Hongkun (University of Massachusetts Amherst)

Zhang, Ruijie (UNBC)

Computational Complexity of Statistical Inference

February 25 - March 1, 2024

Organizers:

Tselil Schramm (Stanford)

Guy Bresler (MIT)

Sam Hopkins (MIT)

Luca Trevisan (Bocconi University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5214*

The two basic lines of inquiry in statistical inference have long been: (i) to determine fundamental statistical (i.e., information-theoretic) limits; and (ii) to find efficient algorithms achieving these limits. However, for many structured inference problems, it is not clear if statistical optimality is compatible with efficient computation. Statistically optimal estimators often entail an exponential-time exhaustive search. Conversely, for many settings the computationally efficient algorithms we know are statistically suboptimal, requiring higher signal strength or more data than is information-theoretically necessary. The objective of the workshop was to advance the methodology for reasoning about the computational complexity of statistical estimation. Over the last decade several disparate communities and lines of work have begun to make progress on these questions. This workshop aimed to stimulate work towards developing a deeper understanding and building a coherent theory by forming new collaborations between researchers in complexity theory, algorithms, statistics, learning theory, probability, information theory, and cryptography.

Participants:

Addario-Berry, Louigi (McGill University)

Applebaum, Benny (Tel Aviv university)

Bafna, Mitali (MIT)

Bangachev, Kiril (MIT)

Bogdanov, Andrej (University of Ottawa)

Bresler, Guy (MIT)

Chen, Sitan (Harvard University)

Compton, Spencer (Stanford University)

Gamarnik, David (MIT)

Grigorescu, Elena (Purdue University)

Hopkins, Sam (MIT)

Huang, Brice (MIT)

Ishai, Yuval (Technion)

Jagannath, Aukosh (University of Waterloo)

Jain, Aayush (Carnegie Mellon University)

Klivans, Adam (UT-Austin)

Koehler, Frederic (Stanford)

Kothari, Pravesh (Carnegie Mellon University)

Krzakala, Florent (EPFL)

Kunisky, Dmitriy (Johns Hopkins University)

Lange, Jane (MIT)

Lin, Rachel (University of Washington)

Liu, Siqi (Center for Discrete Mathematics and Theoretical Computer Science)

Manohar, Peter (CMU)

Meka, Raghu (University of California, Los Angeles)

Mohanty, Sidhanth (MIT)

Moitra, Ankur (Massachusetts Institute of Technology)

Moore, Cris (Santa fe Institute)

Moran, Shay (Technion)

Moshkovitz, Michal (Tel Aviv University)

Niles-Weed, Jonathan (Courant Institute of Mathematical Sciences, NYU)

Potechin, Aaron (University of Chicago)

Schramm, Tselil (Stanford)

Sellke, Mark (Harvard)

Skerman, Fiona (Uppsala University)

Steurer, David (ETH Zurich)

Sun, Nike (MIT)

Tiegel, Stefan (ETH Zurich)

Vaikuntanathan, Vinod (MIT)

Vuong, Thuy-Duong (June) (Stanford)

Wein, Alex (University of California, Davis)

Wu, David (UC Berkeley)

Xu, Jiaming (Duke University)

Zadik, Ilias (MIT)

Zdeborova, Lenka (EPFL)

Fundamental Limitations to Quantum Computation

March 3 - 8, 2024

Organizers:

Daniel Stilck Franca (ENS Lyon)

Angela Capel Cuevas (University of Tuebingen)

Raul Garcia-Patron Sanchez (University of Edinburgh)

Yihui Quek (Massachusetts Institute of Technology)

Salman Beigi (Institute for Research in Fundamental Sciences (IPM))

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5259*

The last years have seen remarkable progress in the field of quantum computing. The steady improvement of the hardware's size and quality has prompted the interest of both the quantum computing community and the general public in what can be achieved by this new technology in the next years. However, a quantum computer has not yet outperformed its classical counterpart for a practically relevant problem. The "Limitations of quantum computing" workshop gathered experts in quantum error correction and computation to discuss what are the known mathematical results that set the minimal requirements to scale these devices and put them to good use. This way, the community as a whole will have a clear picture of what to expect in the coming years and lay out much needed tools to separate hype from true potential.

Participants:

Albert, Victor (INIST & UMD)

Alhambra, Alvaro (Institute of Theoretical Physics, Madrid)

Baspin, Nouédyn (U. Sydney)

Beigi, Salman (Institute for Research in Fundamental Sciences (IPM))

Belzig, Paula (IQC Waterloo)

Bluhm, Andreas (Université Grenoble Alpes, CNRS)

Brown, Benjamin (IBM Quantum)

Buscemi, Francesco (Nagoya University)

Cao, Ningping (Perimeter Institute and Institute for Quantum Computing)

Capel Cuevas, Angela (University of Tuebingen)

Caro, Matthias C. (Freie Universität Berlin)

Chen, Chi-Fang (Caltech)

Chowdhury, Anirban (University of Waterloo)

Demarty, Marine (University of Edinburgh)

Eisert, Jens (Free University Berlin)

Faist, Philippe (FU Berlin)

Fanizza, Marco (Universitat Autònoma de Barcelona)

Fawzi, Omar (Inria)

Gao, Li (Wuhan University)

Gondolf, Paul (University of Tuebingen)

Gonzalez Garcia, Guillermo (Max Planck Institute of Quantum Optics)

Gosset, David (University of Waterloo and Perimeter Institute for Theoretical Physics)

Gu, Andi (Harvard University)

Gusarov, Sergey (National Research Council Canada)

Haferkamp, Jonas (Harvard University)

Hirche, Christoph (Leibniz Universität Hannover)

Hsieh, Min-Hsiu (Foxconn)

Jia, Yifan (Technical University of Munich)

Kastoryano, Michael (University of Copenhagen)

Kliesch, Martin (Hamburg University of Technology)

Kothari, Robin (Google)

Lancien, Cecilia (Université Grenoble Alpes & CNRS)

Leung, Debbie (University of Waterloo)

Lowe, Angus (MIT)

Ma, Xiongfeng (Tsinghua University)

Mandayam, Prabha (Indian Institute of Technology Madras)

Marvian, Milad (University of New Mexico)

Meyer, Johannes (FU Berlin)

Mueller-Hermes, Alexander (University of Oslo)

Perez-Garcia, David (Universidad Complutense de Madrid)

Quek, Yihui (Massachusetts Institute of Technology)

Rahimi-Keshari, Saleh (Institute for Research in Fundamental Sciences)

Singh, Shraddha (Yale)

Smith, Graeme (IQC)

Stilck Franca, Daniel (École Normale Supérieure de Lyon)

Sutter, David (IBM Research)

Takagi, Ryuji (University of Tokyo)

Tan, Xinyu (MIT)

Tang, Eugene (Massachusetts Institute of Technology)

Tautz, Barbara (Munich Center for Quantum Science and Technology)

Vasmer, Michael (Xanadu/Perimeter/IQC)

Wang, Samson (Caltech)

Zhou, Sisi (Perimeter Institute)

Algorithmic Structures for Uncoordinated Communications and Statistical Inference in Exceedingly Large Spaces

March 10 -15, 2024

Organizers:

Cynthia Rush (Columbia University)

Jean-Francois Chamberland (Texas A&M University)

Victoria Kostina (Caltech)

Yury Polyanskiy (MIT)

Wei Yu (University of Toronto)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5280*

This workshop was aimed at enabling the creation of novel algorithmic structures attuned to unsourced communications and inference in exceedingly large dimensional spaces. This, in turn, will be used as a foundation to devise new wireless access schemes for machine-driven data transfers. The impetus behind this research program is a realization that wireless traffic is increasingly heterogeneous, with growth coming primarily from unattended devices. This represents a formidable challenge for current infrastructures because these devices interact with the Internet in fundamentally different ways than humans. A recently proposed means to address this shortcoming is to introduce wireless schemes tailored to communication with small payloads and sporadic, bursty traffic. Key attributes of the envisioned architecture include random access and the ability to operate without explicitly acquiring device identities. This significant departure from past paradigm is crucial in eliminating the need for individualized feedback, which enabled high-throughput connections in the past, yet is rapidly becoming cost-prohibitive as a mechanism for machine-type data transfers.

Participants:

Art, Torosyan (SpaceX)

Atia, George (University of Central Florida)

Barbier, Jean (International Center for Theoretical Physics)

Bellili, Faouzi (University of Manitoba)

Calderbank, Robert (Duke university)

Chamberland, Jean-Francois (Texas A&M University)

Deppe, Christian (Technical University of Braunschweig)

Draper, Stark (University of Toronto)

Durisi, Giuseppe (Chalmers University of Technology)

Ebert, Jamison (Texas A&M University)

Effros, Michelle (California Institute of Technology)

Fengler, Alexander (MIT)

Frolov, Alexey (Skolkovo Institute of Science and Technology)

Ghaddar, Nadim (University of Toronto)

Guillaud, Maxime (Inria)

Guo, Dongning (Northwestern University)

Guo, Yuanxin (University of Toronto)

Huang, Shao-Lun (Tsinghua University)

Jorswieck, Eduard (Technical University of Braunschweig)

Juntti, Markku (Rice University)

Kalør, Anders E. (Aalborg University)

Kang, Justin (The University of California)

Kurkoski, Brian (Japan Advanced Institute of Science and Technology)

Kwan, Nick (University of Toronto)

Li, Yinghan (university of toronto)

Liu, Ya-Feng (Academy of Mathematics and Systems Science/Chinese Academy of Sciences)

Liu, Yuanwei (Queen Mary University of London)

Liu, Xiaoqi (University of Cambridge)

Liva, Gianluigi (German Aerospace Center (DLR))

Lu, Yue (Harvard University)

Mazumdar, Arya (UCSD)

Mezghani, Amine (University of Manitoba)

Mondelli, Marco (Institute of Science and Technology Austria (ISTA))

Munari, Andrea (German Aerospace Center (DLR))

Murthy, Chandra (Indian Institute of Science)

Narayanan, Krishna (Texas A&M University)

Nazer, Bobak (Boston University)

Ordentlich, Or (Hebrew University of Jerusalem)

Özgür, Ayfer (Stanford University)

Perlaza, Samir (Inria)

Pfister, Henry (Duke University)

Polyanskiy, Yury (MIT)

Ramesh, Lekshmi (Columbia University)

Reeves, Galen (Duke University)

Rini, Stefano (NYCU)

Rush, Cynthia (Columbia University)

Song, Ryan (University of Toronto)

Thrampoulidis, Christos (University of British Columbia)

Tirkkonen, Olav (Aalto University)

Utkovski, Zoran (Fraunhofer Heinrich Hertz Institute)

Venkataramanan, Ramji (University of Cambridge)

Wang, Lele (University of British Columbia)

Wootters, Mary (Stanford University)

Yiming, Liu (University of Toronto)

Yu, Wei (University of Toronto)

Zheng, William (The Chinese University of Hong Kong)

Zou, Yinan (University of Toronto)

The Crossroads of Topology, Combinatorics and Biosciences

March 17 - 22, 2024

Organizers:

Margherita Maria Ferrari (University of Manitoba)

Natasha Jonoska (University of South Florida)

Chris Soteros (University of Saskatchewan)

Mariel Vazquez (University of California Davis)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5267*

DNA and RNA molecules are involved in many biological and cellular processes, such as recombination, replication and transcription. Due to the specificity of their nucleic acid bases they are also used as templates for nanostructures built through bottom-up self-assembly. All these mechanisms can involve the formation of multi-stranded nucleic acid structures. Over the last few decades, knot theory and combinatorics have emerged as powerful tools to "zoom" in on entanglements and interactions involving nucleic acids. This workshop aims to answer the question of what structural information can be discovered by applying models that integrate these two disciplines together and are informed by experimental data. To this end, this workshop connected mathematicians having expertise in low-dimensional topology with those having expertise in combinatorics, as well as with experimentalists in biology, chemistry and physics, with the overarching goal of deciphering the entanglement of multi-stranded nucleic acids.

Participants:

Aggarwal, Mudit (University of British Columbia)

Arsuaga, Javier (University of California,Davis)

Beaton, Nicholas (University of Melbourne)

Bonizzoni, Paola (University of Milano-Bicocca)

Brasher, Reuben (Terra Quantum AG)

Chang, Jonathan (UC Davis)

Chedin, Frederic (University of California)

Christiani, Tamara (University of California)

Cruz, Brian (UC Berkeley)

Ellis-Monaghan, Joanna (University of Amsterdam)

Fajardo Goméz, Lina (University of South Florida)

Ferrari, Margherita Maria (University of Manitoba)

Figueroa, Francisco (UC Davis)

Gamill, Max (University of Sheffield)

Geary, Cody (Aarhus University)

Harris, Sarah (University of Leeds)

Heitsch, Christine (Georgia Institute of Technology)

Holleman, Ethan (University of California, Davis)

Hsieh, Claire (UC Davis)

Ishihara, Kai (Yamaguchi university)

Jonoska, Natasha (University of South Florida)

Kari, Lila (University of Waterloo)

Kauffman, Louis (University of Illinois at Chicago)

Liu, Pengyu (University of California, Davis)

Lusk, Jacob (UC Davis)

Martinez Figueroa, Francisco (University of South Florida)

Meier, Markus (University of Manitoba)

Mohammed, Abdulmelik (San Jose State University)

Moltmaker, Wout (University of Amsterdam)

Nicodemi, Mario (Università di Napoli "Federico II")

Panagiotou, Eleni (Arizona State University)

Park, Jane (UC Davis)

Pekoske Fulton, Abby (Wentworth Institute of Technology)

Pham, Van (University of South Florida)

Pongtanapaisan, Puttipong (Arizona State University)

Portet, Stéphanie (University of Manitoba)

Poznanovic, Svetlana (Clemson University)

Prévost, Chantal (CNRS)

Price, Candice (Smith College)

Pyne, Alice (University of Sheffield)

Rainford, Penn (University of York)

Ravi, Ananth (TU Delft)

Rawdon, Eric (University of St. Thomas)

Rechnitzer, Andrew (Ubc)

Riehl, Manda (Rose-Hulman Institute of Technology)

Saito, Masahico (University of South Florida)

Scharein, Robert (Hypnagogic Software)

Schmirler, Matthew (University of Saskatchewan)

Sha, Ruojie (New York University)

Shimokawa, Koya (Ochanomizu University)

Shoura, Massa (Stanford University Medical Center and Phinomics, Inc.)

Soteros, Chris (University of Saskatchewan)

Storici, Francesca (Georgia Institute of Technology)

Vazquez, Mariel (University of California Davis)

Vecchioni, Simon (New York University)

Zechiedrich, Lynn (Baylor College of Medicine)

Optimal Transport and Distributional Robustness

March 24 - 29, 2024

Organizers:

Silvana Pesenti (University of Toronto)

Marc Henry (The Pennsylvania State University)

Yanqin Fan (University of Washington)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5163*

The objective of this workshop was to bring together researchers from computer science, economics, finance, mathematics, statistics, and operations research, whose work develops optimal transport and distributional robust optimization tools and applies those methodologies to causal inference, inequality measurement, partial identification, option pricing, risk and uncertainty management, robust decision making.

Participants:

Acciaio, Beatrice (ETH Zurich)

Ansari, Jonathan (University of Salzburg)

Bernard, Carole (Grenoble Ecole de Management)

Blanchet, Jose (Stanford)

Bonhomme, Stephane Olivier (University of Chicago)

Boussim, Onil (Pennsylvania State University)

Charpentier, Arthur (UQAM)

Chen, Xiaohong (Yale University)

Cheng, Ziteng (University of Toronto)

Cheung, Hang (University of Calgary)

Coache, Anthony (University of Toronto)

d'Haultfoeuille, Xavier (CREST-ENSAE)

Deb, Nabarun (Booth School of Business, University of Chicago)

Duchi, John (Stanford)

Eckstein, Stephan (ETH Zurich)

Fan, Yanqin (University of Washington)

Galichon, Alfred (New York University)

Gao, Rui (University of Texas at Austin)

Ghossoub, Mario (University of Waterloo)

Gunsilius, Florian (University of Michigan)

Hallin, Marc (Université libre de Bruxelles)

Hansen, Lars (University of Chicago)

Henry, Marc (The Pennsylvania State University)

Hiew, Joshua Zoen-Git (University of Alberta)

Kpotufe, Samory (Columbia University)

Kroell, Emma (University of Toronto)

Lin, Liyuan (University of Waterloo)

Mao, Tiantian (University of Science and Technololgy of China)

Miao, Kathleen (University of Toronto)

Moresco, Marlon (Concordia University)

Nguyen, Viet Anh (Chinese University of Hong Kong)

Pass, Brendan (University of Alberta)

Pesenti, Silvana (University of Toronto)

Qi, Alice (University of Washington)

Qu, Zhaonan (Stanford University)

Raghunathan, Aditi (Carnegie Mellon University)

Rankin, Cale (University of Toronto)

Ruschendorf, Ludger (University Freiburg)

Sun, Xiaoting (Simon Fraser University)

Tam, Brandon (University of Toronto)

Tomiyama, Hideyuki (Pennsylvania State University)

Vanduffel, Steven (Solvay Business School - Vrije Universiteit Brussel)

Wang, Ruodu (University of Waterloo)

Wiesel, Johannes (Carnegie Mellon University)

Wiesel, Johannes (Carnegie Mellon University)

Wong, Ting Kam Leonard (University of Toronto)

Xie, Yao (Georgia Institute of Technology)

Xu, Gaoqian (University of Washington)

Xue, Wendao (University of Washington)

Yang, Yang (University of Calgary)

Zhang, Kelvin Shuangjian (Fudan University)

Zhao, Yidi (Pennsylvania State University)

Zhao, Jiwei (University of Wisconsin-Madison)

Zozoungbo, Christelle (Pennsylvania State University)

Knot Theory Informed by Random Models and Experimental Data

March 31 - April 5, 2024

Organizers:

Anastasiia Tsvietkova (Rutgers University, Newark)   Joel Hass (UC - Davis)

Chaim Even-Zohar (Technion)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5217*

Over its history, knot theory has yielded many questions and conjectures that drove the development not only of this field of study, but also of several other fields of mathematics. However even taken together, these questions and conjectures do not fully describe the wealth of surprising intrinsic properties of knots and links, of underlying graphs related to link projections, of the 3-manifolds that are link complements, and of the simplicial complexes that correspond to decompositions of such manifolds. One of way to generate new questions is through a probabilistic viewpoint and experimental data. The main topic of the workshop was probabilistic and experimental study of geometric and topological properties of links, and the interplay of such properties with probability and combinatorics. We also looked at other new directions that this mixing of research fields can lead to.

Participants:

Adams, Colin (Williams College)

Aidan, McCue (University of Arkansas)

Budney, Ryan (University of Victoria)

Burton, Benjamin (The University of Queensland)

Cantarella, Jason (University of Georgia)

Cohen, Moshe (State University of New York at New Paltz)

Deutch, Roy (Technion)

Diao, Yuanan (University of North Carolina Charlotte)

Doig, Margaret (Creighton University)

Dunfield, Nathan (University of Illinois at Urbana-Champaign)

Ernst, Claus (Western Kentucky University)

Eudave Muñoz, Mario (UNAM)

Even-Zohar, Chaim (Technion)

Flapan, Erica (American Mathematical Society)

Haider, Touseef (Rutgers University - Newark)

Hass, Joel (UC - Davis)

Hughes, Mark (Brigham Young University)

Jaeyun, Bae (Rutgers University - Newark)

Kalfagianni, Efstratia (Michigan State University)

Kaplan-Kelly, Rose (George Mason University)

Kwon, Alice (SUNY Maritime)

Lambropoulou, Sofia (National Technical University of Athens)

Madras, Neal (York University)

Maher, Joseph (CUNY College of Staten Island)

Martinez Figueroa, Francisco (University of South Florida)

Newman, Andrew (Carnegie Mellon University)

Palmer, Rebekah (Unaffiliated)

Patáková, Zuzana (Charles University)

Petersen, Kate (UM Duluth)

Petri, Bram (Sorbonne University)

Porti, Joan (Universitat Autònoma de Barceloa)

Purcell, Jessica (Monash University)

Rechnitzer, Andrew (Ubc)

Rieck, Yoav (University of Arkansas)

Roig Sanchis, Anna (Sorbonne Université, the laboratory IMJ-PRG)

Schleimer, Saul (University of Warwick)

Shonkwiler, Clayton (Colorado State University)

Sumners, De Witte (Florida State University)

Tham, Ying Hong (University of Hamburg)

Thompson, Abigail (University of California, Davis)

Thurston, Dylan (Indiana University)

Tsvietkova, Anastasiia (Rutgers University, Newark)

Ville, Marina (CNRS, Université Paris-Est Créteil)

Wagner, Uli (Institute of Science and Technology Austria (IST Austria))

Wolf, Thomas (Brock University)

Yarmola, Andrew (Yale University)

Ziegler, Uta (Western Kentucky University)

Representation Theory and Topological Data Analysis

April 7 - 12, 2024

Organizers:

Thomas Brüstle (Université de Sherbrooke and Bishop's University)

Claire Amiot (Université Grenoble Alpes)

Sergio Estrada (Universidad de Murcia)

Steve Oudot (Inria)

Luis Scoccola (University of Oxford)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5241*

Fundamental challenges in data analysis, such as the choice of scale or the presence of noise, make it necessary to go beyond the use of numerical summaries on a single topological space. This need has given rise to the emerging area of topological data analysis, and to its mathematical foundations called persistence theory, whose aim is to define and study homological invariants for parametrized families of topological spaces the aim of this workshop was to bring together leading researchers as well as emerging scholars from topological data analysis and from representation theory, in order to enhance the growing connections between both areas, in particular, but not limited to, new methods in multi-parameter persistence..

Participants:

Angeleri Hügel, Lidia (University of Verona)

Arya, Shreya (Duke University)

Asgari, Mohammad Sadegh (Islamic Azad University Central Tehran Branch)

Bauer, Ulrich (TUM)

Baur, Karin (University of Leeds)

Bender, Matías (INRIA Saclay)

Bennett-Tennenhaus, Raphael (Aarhus University)

Bhatia, Tanishq (Northeastern)

Bjerkevik, Håvard (TU Munich)

Botnan, Magnus (VU Amsterdam)

Brüstle, Thomas (Université de Sherbrooke and Bishop's University)

Bubenik, Peter (University of Florida)

Cantürk, Uğur (Middle East Technical University)

Carrière, Mathieu (Centre Inria d'Université Côte d'Azur)

Chacholski, Wojciech (KTH Royal Institute of Technology)

Chindris, Calin (University of Missouri)

DePaul, Greg (University of California, Davis)

Desrochers, Justin (Sherbrooke University)

Dey, Tamal (Purdue University)

Elchesen, Alex (Colorado State University)

Escolar, Emerson (Kobe University)

Estrada, Sergio (Universidad de Murcia)

Fersztand, Marc (Oxford)

Fluhr, Benedikt (Bielefeld University)

Gagnon, Jérémy (Université de Sherbrooke)

Giunti, Barbara (Graz University of Technolog)

Gratz, Sira (Aarhus University)

Guidolin, Andrea (KTH)

Hanson, Eric (North Carolina State University)

Herbera, Dolors (Universitat Autònoma de Barcelona)

Hiraoka, Yasuaki (Kyoto University)

Keller, Bernhard (City University of Paris)

Kerber, Michael (Graz University of Technology)

Kim, Woojin (KAIST)

Kinser, Ryan (University of Iowa)

Laking, Rosanna (University of Verona)

Landi, Claudia (Università di Modena e Reggio Emilia)

Leblanc, Samuel (Sherbrooke University)

Lesnik, Michael (UAlbany)

Levi, Ran (University of Aberdeen)

Metya, Nilava (Rutgers University)

Miller, Ezra (Duke University)

Morozon, Dmitriy (Lawrence Berkeley National Laboratory)

Mouadi, Hassan (Ibnou Zohr University)

Mousavand, Kaveh (Okinawa Institute of Science and Technology)

Mousavand, Kaveh (Okinawa Institute of Science and Technology)

Mousavand, Kaveh (Okinawa Institute of Science and Technology)

Muchtadi-Alamsyah, Intan (Institut Teknologi Bandung)

Müller, Jannek (Bonn University)

Oudot, Steve (Inria)

Patel, Amit (Colorado State University)

Petit, François (Inserm)

Ren, Isaac (KTH Royal Institute of Technology)

Rognerud, Baptiste (Institut de Mathématiques de Jussieu - Paris Rive Gauche)

Roy, Sunny (Sherbrooke University)

Rozenblit, Jennifer (UT Austin)

Schroll, Sibylle (University of Cologne)

Scoccola, Luis (University of Oxford)

Scolamiero, Martina (KTH Royal institute of technology)

Stojisavljevic, Vukasin (Université de Montréal)

Thomas, Hugh (Université du Québec à Montréal)

Thompson, Peder (Mälardalen University)

Todorov, Gordana (Northeastern University)

Vélez Marulanda, Jose (Valdosta State University/ Fundacion Universitaria Konrad Lorenz)

Wanditra, Lucky Cahya (Institut Teknologi Bandung)

Bootstrap Percolation and its Applications

April 14 - 19, 2024

Organizers:

Brett Kolesnik (University of Oxford)

Jozsef Balogh (UIUC)

Janko Gravner (University of California, Davis)

Karen Gunderson (University of Manitoba)

Rob Morris (IMPA)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5300*

Bootstrap percolation is a mathematical model for the spread of an infection (or, e.g., information, beliefs, behavior, etc.) throughout a network over time. Initially, a subset of a population is infected. There is a local rule by which the virus spreads thereafter (e.g., once a vertex has at least a certain number of infected neighbors). If all of the population is infected eventually, we say that the process percolates. This workshop was the first large-scale international meeting devoted entirely to this subject, and brought together leading experts, young researchers and relevant interdisciplinary figures alike, to help sustain and accelerate the successful development of this area of research into the future.

Participants:

Adler, Joan (Technion)

Ahlberg, Daniel (Stockholm University)

Aizenman, Michael (Princeton University)

Alves, Caio (Oak Ridge National Laboratory)

Angel, Omer (UBC)

Araujo, Igor (UIUC)

Balister, Paul (University of Oxford)

Balogh, Jozsef (UIUC)

Bartha, Zsolt (Alfréd Rényi Institute of Mathematics)

Blanquicett, Daniel (University of Sucre)

Campos, Marcelo (University of Cambridge)

Candellero, Elisabetta (Roma Tre University)

Çiçeksiz, Altar (Umeå Universitet)

Collares, Mauricio (Technische Universität Graz)

De Gaspari, Damiano (Technical University of Vienna)

De La Riva Massaad, Daniel (UBC)

Detering, Nils (Heinrich-Heine University Düsseldorf)

Diskin, Sahar (Tel-Aviv University)

Dong, Dingding (Harvard University)

Dubroff, Quentin (Rutgers University)

Erde, Joshua (TU Graz)

Espuny Díaz, Alberto (Universität Heidelberg)

Falgas-Ravry, Victor (Umeå Universitet)

Fountoulakis, Nikolaos (University of Birmingham)

Ganguly, Shirshendu (UC Berkeley)

Garcia Alvarez, Ramon Ivan (University of Illinois at Urbana-Champaign)

Geisler, Anna (TU Graz)

Gravner, Janko (University of California, Davis)

Gunby-Mann, Benjamin (Rutgers University)

Gunderson, Karen (University of Manitoba)

Hambardzumyan, Lianna (Hebrew University)

Hartarsky, Ivailo (Technische Universität Wien)

Heckel, Annika (Uppsala University)

Hedžet, Jaka (Institute of Mathematics, Physics and Mechanics - Ljubljana)

Hoffman, Christopher (University of Washington)

Holmgren, Cecilia (Uppsala University)

Holroyd, Alexander (University of Bristol)

Kamcev, Nina (University of Zagreb)

Kang, Mihyun (Graz University of Technology)

Kolesnik, Brett (University of Oxford)

Krivelevich, Michael (Tel Aviv University)

Kronenberg, Gal (University of Oxford)

Krueger, Bob (UIUC)

Leader, Imre (Cambridge)

Lichev, Lyuben (University Jean Monnet Saint Etienne)

Lidický, Bernard (Iowa State University)

Liebenau, Anita (UNSW Sydney)

Łuczak, Tomasz (Adam Mickiewicz University)

Makai, Tamas (LMU München)

Mani, Nitya (MIT)

Marêché, Laure (University of Strasbourg)

Martin, James (Oxford University)

Martinez, Carlos (Instituto de Matemática y Ciencias Afines)

Mattos, Letícia (Universität Heidelberg)

Maura, Christian (IMPA)

Michelen, Marcus (University of Illinois, Chicago)

Mitsche, Dieter (Univ. Jean Monnet, Univ. de Lyon)

Mond, Adva (University of Cambridge)

Moreno Alonso, Yago (Fields Institute)

Morris, Rob (IMPA)

Morris, Patrick (Universitat Politecnica de Cataluyna)

Mycroft, Richard (University of Birmingham)

Narayanan, Bhargav (Rutgers University)

Olesker-Taylor, Sam (University of Warwick)

Peled, Yuval (Hebrew University of Jerusalem)

Pete, Gábor (Alfréd Rényi Institute of Mathematics, and TU Budapest)

Pokrovskiy, Alexey (University College London)

Reichmann, Daniel (WPI)

Rolla, Leonardo (University of São Paulo)

Sarantis, Mihalis (Carnegie Mellon University)

Sarkar, Amites (Western Washington University)

Schmid, Dominik (TU Graz)

Schonmann, Roberto (UCLA)

Schreiber, Nir (Bar Ilan University)

Scott, Alex (University of Oxford)

Scruton, Alexander (University of Oxford)

Sivakoff, David (The Ohio State University)

Slivken, Erik (UNC Wilmington)

Smith, Paul (Clerkenwell, London)

Souza, Victor (University of Cambridge)

Spiro, Sam (Rutgers University)

Stauffer, Alexandre (King's College London)

Szabó, Tibor (Freie Universität Berlin)

Szabo, Reka (University of Groningen)

Teixeira, Augusto (IMPA)

Toninelli, Cristina (CNRS- University Paris Dauphine - PSL)

Toninelli, Fabio (Technical University of Vienna)

Torrisi, Giovanni Luca (Cnr)

Treglown, Andrew (University of Birmingham)

Valesin, Daniel (University of Warwick)

van Enter, Aernout (University of Groningen)

Velasco, Sonia (Université Paris-Cité)

Walters, Mark (Queen Mary University of London)

Wesolek, Alexandra (Technische Universität Berlin)

Wigal, Michael (University of Illinois at Urbana-Champaign)

Zhukovskii, Maksim (University of Sheffield)

Modern Methods for Differential Equations of Quantum Mechanics

April 21 - 26, 2024

Organizers:

Karolina Kropielnicka (Polish Academy of Sciences)

Arieh Iserles (University of Cambridge)

Caroline Lasser (Technische Universitaet Muenchen)

Weizhu Bao (National University of Singapore)

Katharina Schratz (Sorbonne Université)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5227*

Quantum mechanics has been originally motivated by fundamental questions in theoretical physics, it now plays central role in applications: from control theory to quantum computing, physical chemistry, material theory and increasingly biology and drug design. Yet, equations of quantum mechanics present a formidable computational challenge, which will form a core of the workshop. The last few years have witnessed the emergence of a raft of modern computational methodologies that allow for very precise computational approximation of the equations of quantum mechanics while respecting features of physical significance. The new computational technologies bring together ideas from numerical mathematics, but also from differential geometry, harmonic analysis and other branches of pure mathematics, as well as ideas that have emerged in the applied community. The interdisciplinary workshop "Modern methods for differential equations of quantum mechanics" gathered leading world authorities in computational mathematics together with experts in quantum physics and physical chemistry.

Participants:

Alama Bronsard, Yvonne (Sorbonne Université, LJLL)

Bao, Weizhu (National University of Singapore)

Bergold, Paul (University of Surrey)

Blanes, Sergio (Universitat Politècnica de València)

Bruned, Yvain (University of Lorraine)

Cances, Eric (Ecole des Ponts and Inria Paris)

Cardenas Lopez, Silvia (Columbia University)

Carrington, Tucker (Queen's University)

Casas, Fernando (Universitat Jaume I)

Cui, Jianbo (Polyu)

Dai, Xiao-Ying (Institute of Computational Mathematics and Scientific/Engineering Computing)

Danaila, Ionut (University of Rouen Normandy)

del Valle Rosales, Juan Carlos (Drake University)

Fang, Di (Duke University)

Feng, Yue (Xi'an Jiaotong University)

Freibert, Antonia (Universität Hamburg)

Gao, Jing (Xi'an Jiaotong University)

Geracitano, Niccolò (Gran Sasso Science Institute)

Henning, Patrick (Ruhr-University Bochum)

Hu, Jiashun (The Hong Kong Polytechnic University)

Iserles, Arieh (University of Cambridge)

Jahnke, Tobias (Karlsruher Institut für Technologie (KIT))

Kevrekidis, Panayotis (University of Massachusetts, Amherst)

Kropielnicka, Karolina (Polish Academy of Sciences)

Kuprov, Ilya (University of Southampton)

Kvaal, Simen (University of Oslo)

Lasser, Caroline (Technische Universitaet Muenchen)

Li, Buyang (The Hong Kong Polytechnic University)

Maierhofer, Georg (Sorbonne University)

Marciniak, Marcin (University of Gdańsk)

Martin de Diego, David (ICMAT)

Ostermann, Alexander (University of Innsbruck)

Paterek, Tomasz (Xiamen University Malaysia & University of Gdańsk)

Peterseim, Daniel (University of Augsburg)

Płociniczak, Łukasz (Wrocław University of Science and Technology)

Qiao, Zhonghua (The Hong Kong Polytechnic University)

Saleh, Yahya (Universität Hamburg)

Sanz-Serna, Jesús María (Universidad Carlos III de Madrid)

Schratz, Katharina (Sorbonne Université)

Schwarze, Oliver (Technical University of Munich)

Thalhammer, Mechthild (Leopold-Franzens Universität Innsbruck)

Vanicek, Jiri (Ecole Polytechnique Federale de Lausanne (EPFL))

Wang, Chushan (National University of Singapore)

Webb, Marcus (University of Manchester)

Worth, Graham (University College London)

Yang, Chao (Lawrence Berkeley National Laboratory)

Yin, Jia (Lawrence Berkeley National Laboratory)

Building and Enhancing Mathematical Reasoning

April 28 - May 3, 2024

Organizers:

Andie Burazin (University of Toronto Mississauga)

Vincent Bouchard (University of Alberta)

Veselin Jungic (Simon Fraser University)

Miroslav Lovric (McMaster University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5212*

The main objective of the five-day BIRS workshop was to generate specific suggestions for possible larger-scale modifications in enhancing the teaching and learning of MR in universities, and in the transition from the secondary to post-secondary mathematics. These modifications will aim to move us onward toward the creation of a modern mathematics curriculum which will challenge the traditional organization into subject boxes (courses); it will be built around big ideas, one of which is the development or MR skills through a vertical integration into undergraduate math curriculum. Borrowing from successful strategies employed at the Canadian Mathematics Education Study Group annual meetings, and at the recent (August 2022) BIRS UBCO workshop in Kelowna, a significant part of the workshop was based on working groups, tasked with specific objectives. To inform our work and assist us in reaching the workshop objectives, we invited international colleagues, researchers in mathematics education, and cognitive psychologists.

Participants:

Archibald, Jana (University of Lethbridge)

Au, Gary (University of Saskatchewan)

Bhaskara, Kieran (McMaster)

Bouchard, Vincent (University of Alberta)

Broley, Laura (Concordia University)

Bruni, Carmen (University of Waterloo)

Burazin, Andie (University of Toronto Mississauga)

Buteau, Chantal (Brock University)

Carter, Rebecca (Queen's University)

Causley, Broderick (Montreal)

Chow, Amenda (York University)

Côté, Christian (Cégep de Lanaudiere)

Curgus, Branko (Western Washington University)

Davidson, Michelle (University of Manitoba)

DeDieu, Lauren (University of Calgary)

Desaulniers, Shawn (University of Alberta)

Duff, Ana (Ontario Tech University)

Ezzat, Shannon (Cape Breton University)

Fitzpatrick, Sean (University of Lethbridge)

Forrest, Brian (University of Waterloo)

Forrest, Barbara (University of Waterloo)

Freiman, Viktor (Université de Moncton)

Galvao-Sousa, Bernardo (University of Toronto)

Gannon, Terry (University of Alberta)

Garaschuk, Kseniya (University of the Fraser Valley)

Gula, Taras (George Brown College)

Hughes Hallett, Deborah (University of Arizona/ Harvard)

Jungic, Veselin (Simon Fraser University)

Karp, Dagan (Harvey Mudd College)

Krogh Arnesen, Kristin (Norwegian University of Science and Technology (NTNU))

Lagu, Indy (Mount Royal University)

Leung, Fok-Shuen (University of British Columbia)

Lovric, Miroslav (McMaster University)

Lovrić, Jakov (Industry)

Matthews, Asia (Quest University)

Meehan, Maria (University College Dublin)

Núñez, Rafael (University of California, San Diego)

Oikkonen, Juha (University of Helsinki)

Paton, Kelly (University of British Columbia)

Plante, Julie (Vanier College)

Postnikoff, Derek (University of Saskatchewan)

Radzimski, Vanessa (University of the Fraser Valley)

Saint-Aubin, Yvan (University de Montréal)

Sangwin, Chris (University of Edinburgh)

Sargent, Pam (University of Toronto)

Skelton, Andrew (York University)

Smith, Jerrod (University of Calgary)

Sodhi, Asmita (University of Victoria)

Taylor, Peter (Queen's University)

Thangarajah, Pamini (Mount Royal University)

Tretiakova, Kateryna (McMaster University)

Tsopmene, Paul (University of British Columbia Okanagan)

Walls, Patrick (The University of British Columbia)

Wolzuck, Dan (University of Waterloo)

Yan, Kitty (University of Toronto)

Skew Braces, Braids and the Yang-Baxter Equation

May 5 - 10, 2024

Organizers:

Ilaria Colazzo (University of Leeds)

Eric Rowell (Texas A&M University)

Julia Plavnik (Indiana University)

Leandro Vendramin (Vrije Universiteit Brussel)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5201*

The YBE originates in statistical mechanics in studying models known as integrable systems from the late 1960s and 1970s. Despite its somewhat technical beginnings, it soon spawned critical new ideas and whole areas of research. Quantum groups, quantum topology, and topological quantum field theory all owe much to the YBE. Indeed, the work cited for 3 of the 4 1990 Fields medalists' is deeply interwoven with the YBE. In the intervening years, the interest in the YBE has not waned as new applications and connections are discovered. Although the equation can now be regarded as classical, we know very little about the full landscape of its solutions. Several independent research groups have developed some promising ideas for making progress on both the classification problem and on interesting new applications. This workshop brought together these disparate groups for a week to exchange ideas and initiate new collaborations on projects surrounding the YBE.

Participants:

Angiono, Ivan (Universidad Nacional de Córdoba)

Ballester-Bolinches, Adolfo (Universitat de València)

Bell, Jason (University of Waterloo)

Bellingeri, Paolo (University of Caen)

Bloomquist, Wade (Morningside University)

Brzezinski, Tomasz (Swansea University)

Caranti, Andrea (University of Trento)

Catino, Francesco (Università del Salento)

Colazzo, Ilaria (University of Leeds)

Crespo, Teresa (Universitat de Barcelona)

Cui, Xingshan (Purdue University)

Czenky, Agustina (University of Oregon)

Damiani, Celeste (Istituto Italiano di Tecnologia)

Darlington, Andrew (Exeter University)

Delaney, Colleen (UC Berkeley)

Doikou, Anastasia (Heriot-Watt University)

Edie-Michell, Cain (University of New Hampshire)

Esteban Romero, Ramon (Universitat de València)

Faria Martins, Joao (University of Leeds)

Feingesicht, Edouard (Caen University)

Ferri, Davide (Università di Torino)

Galindo, Cesar (Universidad de los Andes)

Gateva-Ivanova, Tatiana (American University in Bulgaria)

Godelle, Eddy (Universite de Caen)

Greenfeld, Be'eri (University of Washington)

Heckenberger, István (University of Marburg)

Janssens, Geoffrey (UCLouvain)

Jespers, Eric (Vrije Universiteit Brussel)

Jones, Corey (North Carolina State University)

Kubat, Łukasz (University of Warsaw)

Lebed, Victoria (Université de Caen-Normandie)

Letourmy, Thomas (Université Libre de Bruxelles)

Lopes Rocha, Monique Müller (Federal University of São João del-Rei)

Martin, Paul (University of Leeds)

Martin-Lyons, Isabel (Keele University)

Mazzotta, Marzia (Università del Salento)

McGovern, Emily (North Carolina State University)

Meir, Ehud (University of Hamburg)

Molander, Melody (UCSB)

NIKSHYCH, Dmitri (University of New Hampshire)

Patnaik, Manish (University of Alberta)

Pena Pollastri, Hector Martin (Indiana University)

Pérez Calabuig, Vicent (Universitat de València)

Piterman, Kevin (Philipps-Universität Marburg)

Plavnik, Julia (Indiana University)

Properzi, Silvia (Vrije Universiteit Brussel)

Puljic, Dora (The University of Edinburgh)

Ramirez, Santiago (Universidad de Buenos Aires)

Rathee, Nishant ((IISER Mohali, India)

Rio, Anna (Universitat Politècnica de Catalunya)

Roelants, Charlotte (Vrije Universiteit Brussel)

Rowell, Eric (Texas A&M University)

Sanford, Sean (Ohio State University)

Sanmarco, Guillermo (University of Washington)

Schopieray, Andrew (Marquette University)

Smoktunowciz, Agata (University of Edinburgh)

Snyder, Noah (Indiana University)

Stefanelli, Paola (Università del Salento, Lecce, Italy)

Stefanello, Lorenzo (Università di Pisa)

Sussan, Joshua (Medgar Evers College)

Torzewska, Fiona (University of Bristol)

Trombetti, Marco (University of Naples "Federico II")

Tsang, Cindy (Sin Yi) (Ochanomizu University)

Van Antwerpen, Arne (Universiteit Gent)

Vasquez, Jennifer (The University of Scranton)

Vendramin, Leandro (Vrije Universiteit Brussel)

Warren, Benjamin (Texas A&M University)

Wenzl, Hans (University of California, San Diego)

Wiertel, Magdalena (University of Warsaw)

Wong, Helen (Claremont McKenna)

Yadav, Manoj Kumar (Harish-Chandra Research Institute)

Yang, Tian (Texas A&M University)

Zhang, Qing (University of California, Santa Barbara)

Analysis of Complex Data: Tensors, Networks and Dynamic Systems

May 12 - 17, 2024

Organizers:

Cun-Hui Zhang (Rutgers University)

Elynn Chen (New York University)

Aukosh Jagannath (University of Waterloo)

Tracy Ke (Harvard University)

Marc Hallin (Université libre de Bruxelles)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5263*

This workshop focused on recent developments in the statistical analysis of tensors and networks, especially on the dynamics under temporal dependence. Such data have become widely available only recently, with applications to fields such as biological science, climate science, economics, finance, genetic analysis, image analysis, social networks, social sciences and transportation etc. This gathering of both world-renowned scholars and junior researchers, in the sublime and tranquil environment of Baff and BIRS, stimulated new ideas and foster collaboration of the participants, for the challenging and inspiring problem of modeling and analyzing dynamic tensors and networks. The participants were from many countries, with diverse backgrounds, and with expertise in a wide range of statistical and mathematical branches and applications. The workshop consisted of lectures, poster sessions and panel discussions.

Participants:

Allen, Genevera, Ama (Rice University)

Ampadu-Kissi-Owusu, Ama (Rutgers University)

Auddy, Arnab (University of Pennsylvania)

Baranwal, Aseem (University of Waterloo)

Barigozzi, Matteo (Universita' di Bologna)

Bolivar, Stevenson (Rutgers University)

Cai, Chencheng (Washington State University)

Chakraborty, Nilanjana (Indian Institute of Management Udaipur)

Chang, Jinyuan (Southwestern University of Finance and Economics)

Chen, Elynn (New York University)

Chen, Rong (Rutgers University)

Chen, Bin (University of Rochester)

Fan, Jianqing (Princeton University)

Feng, Long (Hong Kong University)

Giannerini, Simone (University of Bologna)

Hallin, Marc (Université libre de Bruxelles)

Han, Yuefeng (University of Notre Dame)

Hoff, Peter (Duke University)

Jagannath, Aukosh (University of Waterloo)

Jin, Jiashun (Carnegie Mellon University)

Jirak, Johannes Moritz (University of Vienna)

Ke, Tracy (Harvard University)

Ko, Justin (University of Waterloo)

Kong, Linglong (University of Alberta)

Ling, Shiqing (Hongÿ Kong University of Science and Technology)

Liu, Xialu (San Diego State University)

Michailidis, George (UCLA)

Pena, Daniel (Universidad Carlos III de Madrid)

Pensky, Marianna (University of Central Florida)

Robeva, Elina (University of British Columbia)

Roy, Samrat (Indian Institute of Management Ahmedabad)

Sen, Subhabrata (Harvard University)

Shi, Zhaoyang (UC Davis)

Wang, Jingming (Harvard University)

Wang, Wanjie (National University of Singapore)

Wu, Wei Biao (University of Chicago)

Xia, Dong (Hong Kong University of Science and Technology)

Xiao, Han (Rutgers University)

Xu, Yiming (University of Waterloo)

Yang, Dan (University of Hong Kong)

Yao, Qiwei (London School of Economics)

Yuan, Ming (Columbia University)

Zhang, Cun-Hui (Rutgers University)

Zhang, Anru (Duke University)

Modeling and Theory in Population Biology

May 19 - 24, 2024

Organizers:

Noah Rosenberg (Stanford University)

Mark Broom (University of London)

Emilia Huerta-Sanchez (Brown University)

Ailene MacPherson (Simon Fraser University)

Sally Otto (University of British Columbia)

Maria Servedio (University of North Carolina)

John Wakeley (Harvard University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24htp001*

This Hybrid Thematic Program focused on advancing the field of mathematical population biology, with an emphasis on building a strong community of researchers in the field. It develops scientific links between the mathematical aspects of ecology, demography, epidemiology, evolution, and population genetics. Further, it enhances mentorship and training in mathematical population biology, including for many trainees newly inspired by the highly visible role of the field during the COVID-19 pandemic.

Participants:

Achaz, Guillaume (University Paris-Cité)

Aeschbacher, Simon (University of Zurich)

Agarwal, Ipsita (University of Oxford)

Agranat-Tamir, Lily (Stanford University)

Agwamba, Kennedy (UC Berkeley)

Akcay, Erol (University of Pennsylvania)

Al-Shammari, Abdullah (Kuwait University)

Alcala, Nicolas (International Agency for Research on

Cancer - World Health Organization)

Alexander, Helen (University of Edinburgh)

Allen, Benjamin (Emmanuel College)

Altenberg, Lee (University of Hawaii at Mānoa)

Amarasekare, Priyanga (University of California, Los Angeles)

Andreasen, Viggo (Roskilde University)

Argasinski, Krzysztof (Warsaw University)

Arthur, Ronan (Stanford University)

Ashby, Ben (SFU)

Aubier, Thomas (CNRS)

Avila, Piret (Institute For Advanced Study in Toulouse)

Baake, Ellen (Universität Bielefeld)

Bank, Claudia (University of Bern)

Bansept, Florence (Aix-Marseille Université, Turing Center for Living Systems, CNRS)

Banuelos, Mayra (Brown University)

Barton, Nicholas (IST Austria)

Bauch, Chris (University of Waterloo)

Bauman, Daniel (Stanford University)

Baumdicker, Franz (University of Tuebingen)

Beerli, Peter (Florida State University)

Ben-Oren, Yotam (Hebrew University of Jerusalem)

Bergstrom, Carl (University of Washington)

Bhattacharyya, Samit (Shiv Nadar Institution of Eminence)

Bienvenu, Francois (Laboratoire de Mathématiques de Besançon)

Blancas, Airam (ITAM)

Borofsky, Talia (Princeton University)

Braichenko, Svitlana (University of St. Andrews)

Broom, Mark (University of London)

Bryant, David (University of Otago)

Burger, Reinhard (University of Vienna)

Buzbas, Erkan (ERKAN BUZBAS)

Canterbury, Tristan (University of Exeter)

Carja, Oana (Carnegie Mellon University)

Chalub, Fabio (Universidade Nova de Lisboa)

Chang-Cuello, William (Los Alamos National Laboratory)

Charlesworth, Deborah (University of Edinburgh)

Charlesworth, Brian (University of Edinburgh)

Chesson, Peter (University of Arizona)

Chevin, Luis-Miguel (CNRS)

Chevy, Elizabeth (Brown University)

Choi, Haysun (Yale University)

Chowell, Gerardo (Georgia State University School of Public Health)

Clark, Andrew (Cornell University)

Clement, Dale (Washington State University)

Cohen, Joel E. (Rockefeller University)

Colijn, Caroline (Simon Fraser University)

Connallon, Tim (Monash University)

Cooney, Daniel (University of Illinois)

Cordero, Fernando (University of Bielefeld)

Coste, Christophe (Swansea University)

Cotto, Olivier (INRAE)

Creanza, Nicole (Vanderbilt University)

Cressman, Ross (Wilfrid Laurier University)

Czekanski-Moir, Jesse (SUNY-ESF)

Dall, Sasha (University of Exeter)

Daniel, Wegmann (Université de Fribourg)

Day, Troy (Queen's University)

Denton, Kaleda (Stanford University)

Deraje, Puneeth (University of Toronto)

Desai, Michael (Harvard University)

Devi, Archana (Arizona State University)

DeWitt, William (University of California, Berkeley)

Diaz-Papkovich, Alex (Brown University)

Dushoff, Jonathan (McMaster U)

Early, Angela (Broad Institute)

Earn, David (McMaster University)

Edge, Michael (University of Southern California)

Egan, Noah (Georgia Institute of Technology)

Erovenko, Igor (University of North Carolina, Greensboro)

Fagan, Brennen (University of York)

Feder, Alison (University of Washington)

Feldman, Marcus (Stanford University)

Felsenstein, Joe (University of Washington)

Foo, Jasmine (University of Minnesota)

Forsythe, Amy (University of British Columbia)

Fouqueau, Louise (ISTA)

Foutel-Rodier, Felix (University of Oxford)

Fumagalli, Matteo (Queen Mary University of London)

Gamblin, Jasmine (College de France)

Gandon, Sylvain (CNRS)

Garay, Jozsef (HUN-REN Centre for Ecological Research, Institute of Evolution)

Gardner, Andy (University of St. Andrews)

Garud, Nandita (University of California, Los Angeles)

Gokhale, Chaitanya (Center for Computational and Theoretical Biology, University of Wuerzburg)

Goldberg, Amy (Duke University)

Gonzalez Casanova, Adrian (UC Berkeley)

Gopalan, Shyamalika (Clemson University)

Gravel, Simon (McGill University)

Greenbaum, Gili (Hebrew University of Jerusalem)

Greenspoon, Philip (University of Edinburgh)

Guez, Jeremy (MGH, Harvard Medical School)

Hadany, Lilach (Tel-Aviv University)

Haller, Ben (Cornell University)

Harpak, Arbel (University of Texas at Austin)

Hayward, Laura (Institute of Science and Technology, Austria)

Heinrich Mora, Elisa (Stanford University)

Hermisson, Joachim (University of Vienna)

Hert, Zoe (Indiana University)

Hilbe, Christian (Max Planck Institute for Evolutionary Biology)

Hitchcock, Thomas (RIKEN)

Holland, Barbara (University of Tasmania)

Hoyle, Rebecca (University of Southampton)

Huerta-Sanchez, Emilia (Brown University)

Innan, Hideki (Sokendai)

Irving-Pease, Evan (Copenhagen University)

Izarraras-Gomez, Alan (UNAM)

Jain, Kavita (Jawaharlal Nehru Centre for Advanced Scientific Research)

Jamshidpey, Arash (Columbia University)

Jansen, Vincent (Royal Holloway, University of London)

Jay, Flora (Interdisciplinary Laboratory of Numerical Sciences)

Jenkins, Paul (University of Warwick)

Kelleher, Jerome (University of Oxford)

Kendal, Jeremy (Durham University)

Kerdoncuff, Elise (University of California, Berkeley)

Kern, Andrew (University of Oregon)

Kieshnina, Maria (Institute For Advanced Study in Toulouse)

Kim, Jaehee (Cornell University)

King, Aaron (University of Michigan)

Kirkpatrick, Mark (University of Texas, Austin)

Kisdi, Eva (University of Helsinki)

Kiss, Istvan (Northeastern University London)

Kobayashi, Yutaka (Kochi University of Technology)

Koelle, Katia (Emory University)

Kolodny, Oren (Hebrew University of Jerusalem)

Kopp, Michael (Aix-Marseille Université)

Kosiol, Carolin (University of St. Andrews)

Krivan, Vlastimil (University of South Bohemia)

Kubatko, Laura (Ohio State)

Lafont, Pierre (University of Edinburgh)

Lambert, Amaury (Ecole Normale Superiure)

Lampert, Adam (Hebrew University)

Lansch-Justen, Lucy (University of Edinburgh)

Lappo, Egor (Stanford University)

Laurin, Peter (UCLA)

Lee, Charlotte (Duke University)

Lehmann, Laurent (University of Lausanne)

Leimar, Olof (Stockholm University)

Lenormand, Thomas (CNRS)

Lessard, Sabin (Université de Montréal)

Levin, Simon (Princeton University)

Liberles, David (Temple University)

Lin, Qianying (Los Alamos National Laboratory)

Liu, Xiran (Brown University)

Lutscher, Frithjof (University of Ottawa)

Lyu, Nan (Beijing Normal University)

Lyubarskaja, Anna (Stanford University)

M'Gonigle, Leithen (Simon Fraser University)

Macdonald, Joshua (Tel Aviv University)

MacPherson, Ailene (Simon Fraser University)

Marcou, Thomas (University of South Bohemia in Ceské Budejovice)

Marrec, Loïc (Universität Bern)

Martignoni, Maria (Hebrew University of Jerusalem)

Masel, Joanna (University of Arizona)

Matheson, Joseph (University of California, San Diego)

Mawass, Walid (University of Chicago)

McAvoy, Alex (University of North Carolina)

McCandlish, David (Cold Spring Harbor Laboratory)

McGee, Ryan (Washington University in St Louis)

Mehta, Rohan (Emory)

Mellis, Sophia-Marie (University of Bielefeld)

Meszéna, Géza (Eötvös Loránd University, Budapest, Hungary)

Metz, J. A. J. (Leiden University)

Metzger, Lukas (TU Munich)

Meyer, Diogo (University of São Paulo)

Mideo, Nicole (University of Toronto)

Miller, Joel (La Trobe University)

Min, Jiseon (University of Oregon)

Miyagi, Mia (Brown University)

Mohamadichamgavi, Javad (University of Warsaw)

Mooney, Jazlyn (University of Southern California)

Moorjani, Priya (University of California, Berkeley)

Morrison, Maike (Stanford University)

Mulberry, Nicola (ETH Zurich)

Mullon, Charles (University of Lausanne)

Nielsen, Rasmus (University of California)

Novembre, John (University of Chicago)

Nwankwo, Emmanuel Chibuike (Queen Mary University of London)

Ogbunu, Brandon (Yale University)

Ohtsuki, Hisashi (SOKENDAI, The Graduate University for Advanced Studies)

Olah, Jaden (Stanford University)

Orive, Maria (University of Kansas)

Ortega Del Vecchyo, Diego (UNAM)

Osmond, Matthew (University of Toronto)

Ostling, Annette (University of Texas)

Otto, Sally (University of British Columbia)

Palacios, Julia (Stanford University)

Palau, Sandra (IIMAS, UNAM)

Pavard, Samuel (Museum of Natural History, Paris)

Payseur, Bret (University of Wisconsin - Madison)

Peede, David (Brown University)

Pelizzola, Marta (Aarhus University)

Peña, Jorge (Toulouse School of Economics)

Penman, Bridget (University of Warwick)

Pennings, Pleuni (San Francisco State University)

Peter, Benjamin (University of Rochester)

Petr, Martin (Copenhagen University)

Pfaffelhuber, Peter (University of Freiburg)

Pichugin, Yuriy (Princeton University)

Pipes, Lenore (UC Berkeley)

Pires, Diogo (City, University of London)

Poloni, Silas (University of Victoria)

Priego Espinosa, Daniel (University of Kentucky)

Proulx, Stephen (UC Santa Barbara)

Ragsdale, Aaron (University of Wisconsin)

Ralph, Peter (University of Oregon)

Ram, Yoav (Tel Aviv University)

Ramachandran, Sohini (Brown University)

Reluga, Tim (Penn State)

Reyes, Elijah (Simon Fraser University)

Rohlfs, Rori (University of Oregon)

Rosenberg, Noah (Stanford University)

Roze, Denis (Centre national de la recherche scientifique)

Rueffler, Claus (Uppsala University)

Ruzicka, Filip (IST Austria)

Saad-Roy, Chadi (University of California, Berkeley)

Sankararaman, Sriram (UCLA)

Scheiner, Samuel (National Science Foundation)

Schreiber, Sebastian (University of California, Davis)

Sella, Guy (Columbia University)

Servedio, Maria (University of North Carolina)

Sharkey, Kieran (University of Liverpool)

Shiff, Chloe (Stanford University)

Simons, Yuval (University of Chicago)

Siri-Jegousse, Arno (UNAM)

Slatkin, Montgomery (University of California, Berkeley)

Smith, Reginald (Ronin Institute/Supreme Vinegar)

Smith, Daniel (University of Arizona)

Spencer, Hamish (University of Otago)

Stadler, Tanja (ETH - Zurich)

Stein, Alex (Queen Mary University London)

Steiner, Ulrich (Free University of Berlin)

Stewart, Alexander (University of St Andrews)

Sturm, Anja (University of Göttingen)

Szpiech, Zachary (Penn State University)

Tanaka, Mark (University of New South Wales)

Tarnita, Corina (Princeton University)

Tavaré, Simon (Columbia University)

Terry, Chris (University of Oxford)

Thompson, Elizabeth (University of Washington)

Tugrul, Murat (Free University of Berlin)

Turley, Lydia (University of Otago)

Uecker, Hildegard (Max Planck Institute for Evolutionary Biology)

Uyenoyama, Marcy (Duke University)

Van Cleve, Jeremy (University of Kentucky)

van den Berg, Naomi (University of Cambridge)

Veber, Amandine (Paris Cité University)

Volz, Erik (Imperial College London)

Wahl, Lindi (University of Western Ontario)

Wakano, Joe Yuichiro (Meiji University)

Wakeley, John (Harvard University)

Waxman, David (Fudan University)

Wei, April (Cornell University)

Weinreich, Daniel (Brown University)

Weir, Bruce (University of Washington)

Weissman, Daniel (Emory University)

Whitlock, Mike (University of British Columbia)

Wiehe, Thomas (University of Cologne)

Wiley, Bryn (University of British Columbia)

Yuksel, Mete (University of Toronto)

Zhao, Lei (Copenhagen University)

Advances in Hierarchical Hyperbolicity

May 26 - 31, 2024

Organizers:

Jacob Russell (Rice University)   Jason Behrstock (CUNY)

Carolyn Abbott (Brandeis University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5254*

The recent introduction of hierarchical hyperbolicity has provided a powerful tool for understanding a wide variety of spaces and groups which exhibit non-positive curvature. This has allowed for exciting progress over the past few years on a number of long-standing questions concerning mapping class group, 3-manifold groups, cubulated groups, and others. As the study of hierarchical hyperbolicity grows and connections are made with other areas of geometry and topology, this workshop brought together a diverse group of mathematicians to discuss recent advances and future directions. This was the first major international conference on this topic and it included a number of junior participants to reflect the youthful growth of the area.

Participants:

Abbott, Carolyn (Brandeis University)

Arana-Herrera, Francisco (University of Maryland)

Badre, Carol (CUNY GC)

Behrstock, Jason (CUNY)

Berlyne, Daniel (University of Bristol)

Bongiovanni, Eliot (Rice University)

Casals, Montserrat (Ikerbasque and University of the Basque Country)

Chavan, Shaivi (CUNY GC)

Cisneros, Bruno (CONAHCYT - UNAM)

Cumplido, María (Universidad de Sevilla)

Dahmani, Francois (Université Grenoble Alpes)

Domat, George (Rice University)

Dowdall, Spencer (Vanderbilt University)

Durham, Matthew (University of California, Riverside)

Garcia, Jacob (University of California, Riverside)

Gupta, Radhika (Tata Institute of Fundamental Research Mumbai)

Hagen, Mark (University of Bristol)

Huang, Jingyin (Ohio State University)

Jiang, Yushan (CUNY, Graduate Center)

Kazachkov, Ilya (Ikerbasque - Basque Foundation for Science)

Kerr, Alice (University of Bristol)

Koberda, Thomas (University of Virginia)

Kudlinska, Monika (University of Oxford)

Leininger, Christopher (Rice University)

Lin, Weiyan (CUNY GC)

Mangioni, Giorgio (Heriot-Watt University)

Minsky, Yair (Yale university)

Mj, Mahan (Tata Institute of Fundamental Research)

Morris-Wright, Rose (Middlebury College)

Mu, Zhihao (CUNY Graduate Center)

Ng, Thomas (Brandeis University)

Perlmutter, Joshua (Brandeis University)

Petyt, Harry (University of Oxford)

Qing, Yulan (University of Tennessee at Knoxville)

Rafi, Kasra (University of Toronto)

Ragosta, Kaitlin (Brandeis University)

Russell, Jacob (Rice University)

Sisto, Alessandro (Heriot-Watt University)

Spriano, Davide (University of Oxford)

Talbott, Henry (University of Michigan)

Tang, Robert (Xi'an Jiaotong-Liverpool University)

Udall, Brian (Rice University)

Valiunas, Motiejus (University of Wrocław)

Weisman, Theodore (U Mich)

Wright, Alex (University of Michigan)

Yang, Wenyuan (Peking University)

Zalloum, Abdul (University of Toronto)

Zbinden, Stefanie (Heriot-Watt University)

Bridging Prediction and Intervention Problems in Social Systems

June 2 - 7, 2024

Organizers:

Lydia Liu (Princeton University)

Angela Zhou (University of Southern California)

Inioluwa Deborah Raji (UC Berkeley)

Arvind Narayanan (Princeton)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5283*

Data-driven machine learning and algorithmic tools are increasingly employed in critical decision-making processes, in healthcare, education, criminal justice, and social welfare. Many of the involved models are often framed as isolated prediction problems - with the goal of capturing relevant information about one sample of the population and extrapolating those learned patterns to any another relevant sample within the same population. However, in reality, these models actually operate more like holistic policy interventions once deployed. In this workshop, we re-visited the limitations of relying on the prediction paradigm description of machine learning to describe its design, development and influence within social systems. Offering statistical tools to analyze the impact of the model beyond its prediction outcomes, we we brought together an inter-disciplinary cohort to explore alternative views of adopting a more intervention-based lens to machine learning design, development and evaluation.

Participants:

Adam, Hammaad (MIT)

Barocas, Solon (Microsoft Research; Cornell University)

Ben-Michael, Eli (Carnegie Mellon University)

Coston, Amanda (Microsoft Research, UC Berkeley)

Feller, Avi (UC Berkeley)

Gerchick, Marissa (ACLU)

Gillis, Talia (Columbia University)

Guerdan, Luke (CMU)

Guha, Shion (University of Toronto)

Ho, Daniel (Stanford University)

Hu, Lily (Yale University)

Hullman, Jessica (Northwestern University)

Imai, Kosuke (Harvard University)

Kapoor, Sayash (Princeton University)

Korolova, Aleksandra (Princeton University)

Laufer, Ben (Cornell Tech)

Liu, Lydia (Princeton University)

Loftus, Joshua (London School of Economics)

Malinsky, Daniel (Columbia University)

Mark, Sendak (Duke University)

Nabi, Razieh (Emory University)

Narayanan, Arvind (Princeton)

Nwanko, Ezinne (UC Berkeley)

Perdomo, Juan Carlos (Harvard)

Raghavan, Manish (MIT)

Raji, Inioluwa Deborah (University of California - Berkeley)

Recht, Benjamin (University of California, Berkeley)

Sahoo, Roshni (Stanford University)

Salganik, Matthew (Princeton)

Subbaswamy, Adarsh (FDA)

Tolbert, Alexander (Emory University)

Ustun, Berk (University of California San Diego)

Venkatasubramanian, Suresh (Suresh Venkatasubramanian)

Wang, Angelina (Princeton University)

Wilder, Bryan (Carnegie Mellon University)

Zanger-Tishler, Michael (Harvard)

Zhang, Simone (New York University)

Zhou, Angela (University of Southern California)

On the Interface of Geometric Measure Theory and Harmonic Analysis

June 9 - 14, 2024

Organizers:

Krystal Taylor (The Ohio State University)

Eyvindur Palsson (Virginia Tech)

Alexia Yavicoli (University of British Columbia)

Ben Jaye (Georgia Tech)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5264*

With a history dating back to Leibniz, the modern study of fractals is of interest to a broad range of scientific communities; applied applications include describing Brownian motion of a particle, turbulence in fluids, MR diffusion data, and vascularity of tumors. The development of new tools and systematic methods to study these sets is in demand. The Fourier transform is a powerful tool in classical analysis, geometric measure theory, mathematical physics, dynamical systems, and has varied applications. There has been substantial progress on understanding the geometry of fractal sets using Fourier analysis, and the arising problems have attracted people from diverse fields of mathematics including number theory, dynamical systems, combinatorics, and harmonic analysis. This workshop set the stage for further progress on understanding the geometry of fractal sets and broader connections to harmonic analysis and other areas of mathematics.

Participants:

Agora, Elona (CUNEF Universidad)

Aleksandar, Bulj (Zagreb)

Alexander, Andrew (University of British Columbia)

Algom, Amir (The University of Haifa)

Ali, Ahsan (Montana State University)

Altaf, Iqra (University of Chicago)

Anurag Prasad, Srijanani (Indian Institute of Technology Tirupati)

Asgari, Mohammad Sadegh (Central Tehran Branch, Islamic Azad University in Tehran)

Baker, Simon (Loughborough University)

Banaji, Amlan (Loughborough University)

Barany, Balazs (Budapest University of Technology and Economics)

Beltran, David (Universitat de València)

Bennett, Ayesha (University Of Cambridge)

Boone, Zack (University of Connecticut)

Borges, Tainara (Brown University)

Bright, Paige (Massachusetts Institute of Technology)

Bromberg, Elad (The University of British Columbia)

Brown, Bailey (The University of British Columbia)

Bruce, Benjamin (University of British Columbia)

Buczolich, Zoltán (Eötvös Lóránd University)

Bull-Weizel, Matthew (The University of British Columbia)

Bushling, Ryan (University of Washington)

Carnovale, Marc (Nationwide)

Chang, Alan (Washington University in St. Louis)

Christ, Michael (UC Berkeley)

Chuah, Chian Yeong (The Ohio State University)

Cohen, Alex (MIT)

Corso, Emilio (Pennsylvania State University)

Cruz, Angel (University of British Columbia)

Csornyei, Marianna (University of Chicago)

Dabrowski, Damian (University of Jyvaskyla)

Davey, Blair (Montana State University)

de Orellana, Ana Emilia (University of St Andrews)

DEJUN, FENG (Chinese University of Hong Kong)

Denson, Jacob (University of Wisconsin)

Du, Xiumin (Northwestern University)

Duggan, Aria (University of British Columbia)

Duncan, Jennifer (ICMAT)

Durcik, Polona (Chapman University)

Erdogan, Burak (University of Illinois at Urbana Champaign)

Falconer, Kenneth (University of St Andrews)

Fässler, Katrin (University of Jyväskylä)

Fecteau, Kainen (The University of British Columbia)

Fleschler, Ian (Princeton University)

Forbes, Madeline (The University of British Columbia)

Foster, Benjamin (Stanford University)

Fragkos, Anastasios (Washington University)

Fraser, Jonathan (University of St Andrews)

Fraser, Rob (Wichita State University)

Galanos, Yannis (The University of Edinburgh)

Gan, Shengwen (University of Wisconsin-Madison)

Garcia, Ignacio (Universidad de Mar del Plata)

Gáspár, Attila (Eötvös Loránd University (ELTE))

Gopalakrishnan, Harsha (Indian Institute of Technology - India)

Green, John (University of Pennsylvania)

Greenleaf, Allan (University of Rochester)

Hare, Kevin (University of Waterloo)

Harris, Terence (University of Wisconsin-Madison)

Hu, Yixuan (University of Wisconsin, Madison)

Huang, Kaiyi (University of Wisconsin-Madison)

Iliopoulou, Marina (National and Kapodistrian University of Athens)

Iosevich, Alex (University of Rochester)

Jarvenpaa, Esa (University of Oulu)

Jaye, Ben (Georgia Tech)

Jiaou, Gao (Hubei University)

Jin, Xiong (University of Manchester)

Jordan, Thomas (University of Bristol)

Jorgensen, Palle (University of Iowa)

Jung, Yeonwook (San Francisco State University)

Jurga, Natalia (University of st andrews)

Kaenmaki, Antii (University of Oulu)

Keleti, Tamás (Eötvös Loránd University)

Kittle, Samuel (University College London)

Klukas, Dominic (The University of British Columbia)

Kolossváry, István (Alfréd Rényi Institute of Mathematics)

Kolountzakis, Mihalis (University of Crete)

Kombrik, Sabrina (University of Birmingham)

Kovac, Vjekoslav (University of Zagreb)

Laba, Izabella (University of British Columbia)

Lai, Chun-Kit (San Francisco State University)

Li, Zane (North Carolina State University)

Li, Jianhui (Northwestern University)

Lin, Young (The University of British Columbia)

Liu, Bochen (Southern University of Science and Technology)

Liu, Jiayin (University of Jyväskyla)

Livshyts, Galyna (Georgia Institute of Technology)

Lyall, Neil (University of Georgia)

Magyar, Akos (University of Georgia)

Maldague, Dominique (MIT)

Marshall, Caleb (University of British Columbia)

Matzke, Ryan (Vanderbilt University)

Mayeli, Azita (CUNY/ The Graduate Center and Queensborough)

McDonald, Alex (The Ohio State University)

McDonald, Brian (University of Georgia)

Medina, Juan Miguel (University of Buenos Aires)

Mooroogen, Yuveshen (University of British Columbia)

Morris, Ian (Queen Mary University of London)

Mosquera, Carolina Alejandra (University of Buenos Aires)

Najafian, Arsam (The University of British Columbia)

Nathan, Hari (University of Rochester)

Olivo, Andrea (Basque Center of Applied Mathematics)

Olsen, Lars (University of St Andrews)

Orgoványi, Vilma (Budapest University of Technology and Economics)

Orponen, Tuomas (University of Jyväskylä)

Ou, Yumeng (University of Pennsylvania)

Ou, Winston (Scripps College)

Palsson, Eyvindur (Virginia Tech)

Passant, Jonathan (University of Bristol)

Paternostro, Victoria (University of Buenos Aires)

Patil, Lekha (UC Irvine)

Pei, Coco (The University of British Columbia)

Pertti, Mattila (University of Helsinki)

Pohoata, Andrei (Emory University)

Pollicott, Mark (Warwick University)

Pramanik, Malabika (UBC)

Prokaj, Rudolf Dániel (Alfréd Rényi Institute of Mathematics)

Pyörälä, Aleksi (University of Jyväskylä)

Rai Choudhuri, Mukul (The University of British Columbia)

Rakhmonov, Firdavs (University of Rochester)

Rapaport, Ariel (Technion)

Raz, Orit (Hebrew University)

Rees, Nicholas (University of British Columbia)

researcher, Megala (IIT Tirupati, India)

Romero, Jose Luis (University of Vienna)

Romero Acosta, Francisco (Australian National University)

Roope, Anttila (University of Oulu)

Roos, Joris (University of Massachusetts Lowell)

Rutar, Alex (University of St Andrews)

Ryou, Donggeun (University of Rochester)

Sahlsten, Tuomas (University of Helsinki)

Saito, Kota (University of Tsukuba)

Samuel, Tony (University of Birmingham)

Sandberg, Samantha (The Ohio State University)

Seeger, Andreas (University of Wisconsin-Madison)

Senger, Steven (Missouri State University)

Sethi, Rahul (Georgia Tech)

Seuret, Stephane (Université Paris Est Créteil)

Shaoming, Guo (University of Wisconsin Madison)

Shen, Hui-An (University of Bern)

Shmerkin, Pablo (University of British Columbia)

Simon, Karoly (Budapest University of Technology and Economics)

Sinclair, Shona (University of British Columbia)

Solomyak, Boris (Bar-Ilan University)

Speight, Gareth (University of Cincinnati)

Srivastava, Rajula (University of Bonn/Max Planck Institute for Mathematics at Bonn)

Stovall, Betsy (University of Wisconsin-Madison)

Sun, Wenbo (Virginia Polytechnic Institute and State University)

Suomala, Ville (University of Oulu)

Szarek, Tomasz Z. (University of Georgia)

Tadwalkar, Sushrut (The University of British Columbia)

Takahashi, Yuki (Saitama University)

Taylor, Krystal (The Ohio State University)

Tolsa, Xavier (ICREA, Universitat Autonoma de Barcelona, and CRM)

Troscheit, Sascha (University of Oulu)

Tsang, Kin Ming (UBC)

Vardakis, Dimitrios (Universität Würzburg)

Varju, Peter (University of Cambridge)

Velani, Sanju (University of York)

Vellis, Vyron (University of Tennessee, Knoxville)

Vizconde, Giovanni (University of British Columbia)

Volberg, Alexander (Michigan State U)

Wang, Hong (NYU)

Wang, Chenjian (University of British Columbia)

Wilson, Bobby (The University of Washington)

Withanachchi, Mahishanka (Laval University)

Wu, Meng (University of Oulu)

Wu, Shukun (Indiana University Bloomington)

Yang, Tongou (University of California, Los Angeles)

Yao, Liding (The Ohio State University)

Yavicoli, Alexia (University of British Columbia)

Young, Amanda (University of British Columbia)

Yu, Han (University of Warwick)

Zahl, Joshua (University of British Columbia)

Zhang, Junda (South China University of Technology)

Zhang, Kevin (The University of British Columbia)

Zhu, Junjie (The University of British Columbia)

Zuberman, Leandro (Universidad de Mar del Plata)

Mathematics of Multiscale and Multiphysics Phenomena in Materials Science

June 16 - 21, 2024

Organizers:

Yekaterina Epshteyn (University of Utah) Chun Liu (Illinois Institute of Technology)

Rustum Choksi (McGill University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5159*

In this workshop, we focused on multiscale and multi-physics problems that emerge in various areas of materials science with the main focus on three interconnected themes: Polycrystals and Materials Microstructures; Smart Materials and Materials with Unusual Properties; and Complex Fluids and Biomaterials. For instance, the modeling of grain boundary evolution in polycrystalline materials will be discussed in detail. In particular, the important question of how to incorporate elasticity and temperature effects into the model of grain growth while considering other physical properties of the system will be considered. Such couplings can completely change the behavior of the grain boundary networks and have not yet been systematically studied. Using new approaches and tools, we are now in a better position to address some of these central problems in materials science. Furthermore, as a part of the meeting, we discussed current efforts and future ways to attract much more diverse participation in the cross-disciplinary areas and respective departments represented in the workshop.

Participants:

Acharya, Amit (Carnegie Mellon University)

Albers, Caleb (University of Utah)

Ayala, Miguel (Mcgill University)

Barmak, Katayun (Columbia University)

Bhattacharya, Kaushik (California Institute of Technology)

Bocea, Marian (National Science Foundation)

Bronsard, Lia (McMaster University)

Brown, Henry (Temple University)

Calderer, Carme (University of Minnesota)

Ceniceros, Hector (University of California Santa Barbara)

Chen, Chi-An (IIT)

Chen, Long-Qing (The Pennsylvania State University)

Choksi, Rustum (McGill University)

Collins, Carson (University of California, Los Angeles)

Dayal, Kaushik (Carnegie Mellon University)

Degond, Pierre (Imperial College London)

Du, Qiang (Columbia Univ)

Epshteyn, Yekaterina (University of Utah)

Feldman, Will (University of Utah)

Fonseca, Irene (Carnegie Mellon University)

Fu, Guosheng (University of Notre Dame)

Gorb, Yuliya (NSF)

Grabovsky, Yury (Temple University)

Gusarov, Sergey (National Research Council Canada)

Holmes-Cerfon, Miranda (University of British Columbia)

Kinderlehrer, David (Carnegie Mellon University)

Kirshtein, Arkadz (Tufts University)

Klobusicky, Joe (University of Scranton)

Kohn, Robert (New York University)

Laux, Tim (University of Regensburg)

Lazar, Emanuel (Menachem) (Bar Ilan University)

Leoni, Giovanni (Carnegie Mellon University)

Li, Xuenan (Columbia University)

Li, Shuwang (IIT)

Liu, Chun (Illinois Institute of Technology)

Lopez-Pamies, Oscar (University of Illinois Urbana-Champaign)

Luskin, Mitchell (University of Minnesota)

Mathews, Samuel (McGill University)

Mengesha, Tadele (University of Tennessee Knoxville)

Mizuno, Masashi (Nihon University)

Muddamallappa, Mallikarjunaiah (Texas A&M University - Corpus Christi)

Novack, Michael (Carnegie Mellon University)

Ortner, Christoph (UBC)

Patrick, Matthew (Columbia University)

Peszynska, Malgorzata (Oregon State University)

Rickman, Jeffrey (Lehigh University)

Shahani, Ashwin (University of Michigan)

Sharma, Natasha (The University of Texas at El Paso)

Srolovitz, David (The University of Hong Kong)

Takasao, Keisuke (Kyoto University)

Tarabeh, Rawan (Technion)

Venkatraman, Raghavendra (Courant Institute)

Wang, Yiwei (University of California, Riverside)

Wei, Juncheng (University of British Columbia)

Xia, Qing (Xiangtan University)

Xiang, Yang (Hong Kong University of Science and Technology)

Yousefi, Pooya (McMaster University)

Zarnescu, Arghir Dani (Basque Center for Applied Mathematics)

Cross-Community Collaborations in Combinatorics

June 23 - 28, 2024

Organizers:

Natasha Morrison (University of Victoria)

Jozef Skokan (London School of Economics)

Marthe Bonamy (CNRS, Université de Bordeaux)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5204*

In recent years some of the most exciting breakthroughs in Combinatorics on longstanding conjectures have resulted from innovative applications of established techniques to areas where they have not necessarily been used before. We wanted to harness the power of collaboration and bring together open-minded participants with different areas of expertise to produce novel research in a number of globally studied areas including. We aspired to create new productive long-term bonds between members of the global community. A large focus of the workshop was on the training and career enhancement of junior researchers. This was achieved through their fostering new collaborations with world-leading members of the global community during our focused small group work sessions. This gave junior participants opportunities to learn about and work in areas outside of their PhD/postdoctoral focus, gaining invaluable skills and knowledge. This also enabled them to forge meaningful relationships with senior members of the community outside their home institution, who will become informal 'mentors' for future career development.

Participants:

Baumann, Stacie (College of Charleston)

Böttcher, Julia (London School of Economics and Political Science)

Currier, Gabriel (UBC)

Das, Shagnik (National Taiwan University)

Ferber, Asaf (University of California, Irvine)

Granet, Bertille (University of Heidelberg)

Gujgiczer, Anna (Budapest University of Technology and Economics)

Heath, Emily (Iowa State University)

Henderson, Cece (University of Waterloo)

Hyde, Joseph (University of Victoria)

Lee, Jae-baek (University of Victoria)

McGinnis, Daniel (Iowa State University)

Morrison, Natasha (University of Victoria)

Narayanan, Bhargav (Rutgers University)

Pavez-Signe, Matias (University of Chile)

Potukuchi, Aditya (York University)

Sgueglia, Amedeo (UCL)

Skokan, Jozef (London School of Economics)

Smith-Roberge, Evelyne (Georgia Institute of Technology)

Spirkl, Sophie (University of Waterloo)

Whitman, Rebecca (UC Berkeley)

Computational Geometry
June 23 - 28, 2024

Organizers:

Emre Can Sertöz (Leiden University)

Alessio Corti (Imperial College London)

Elana Kalashnikov (University of Waterloo)

Alexander Kasprzyk (University of Nottingham)

Marta Panizzut (UiT - The Artic University of Norway)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5229*

Computational algebraic geometry is a fundamental tool in modern mathematics. At its core, computational geometry is the algorithmic solution of systems of polynomial equations. Applications span pure and applied mathematics, linking many diverse areas of science and drawing upon a wide range of techniques. Recently, a new class of algorithms and software tools have started to emerge. Built around the principles of large-scale distributed parallel computation, High Performance Computing, and database fluency, these new tools have the potential to transform research in mathematics. This workshop was the first to bring together the diverse groups of researchers working on large-scale parallel computations and Big Data in geometry. It addressed the theoretical and practical aspects of these new computational tools; the challenges of sharing large mathematical datasets; the difficulties of designing systems accessible to a wider audience of scientists who are not programmers; and the implications for future directions of research. Parallel computational geometry is still very-much in its infancy; this pioneering workshop helped build the foundations for a new generation of advances in geometry.

Participants:

Bohnert, Martin (Tübingen)

Breuer, Thomas (RWTH Aachen)

Bruin, Nils (Simon Fraser Univeristy)

Brysiewicz, Taylor (University of Western Ontario)

Corti, Alessio (Imperial College London)

Costa, Edgar (MIT)

Cueto, Maria Angelica (The Ohio State University)

Cummings, Joseph (Notre Dame)

Degtyarev, Alex (Bilkent University)

Della Vecchia, Antony (TU Berlin)

Dokchitser, Tim (Bristol)

Fieker, Claus (RPTU Kaiserslautern Landau)

Frühbis-Krüger, Anne (Oldenburg)

Hofmann, Tommy (Universität Siegen)

Hofscheier, Johannes (Nottingham)

Kalashnikov, Elana (University of Waterloo)

Kasprzyk, Alexander (University of Nottingham)

Lairez, Pierre (Inria)

Molin, Pascal (Institut de Mathématiques de Jussieu Paris Rive Gauche)

Paffenholz, Andreas (Technical University Darmstadt)

Panizzut, Marta (UiT - The Artic University of Norway)

Qureshi, Muhammad Imran (King Fahd University of Petroleum and Minerals)

Regan, Margaret (College of the Holy Cross)

Ren, Yue (Durham University)

Roe, David (MIT)

Sayrafi, Mahrud (MPI MIS)

Schaller, Karin (Freie Universität Berlin)

Sertöz, Emre Can (Leiden University)

Sijsling, Jeroen (Universität Ulm)

Sottile, Frank (Texas A&M University)

Veneziale, Sara (Imperial College London)

Voight, John (Dartmouth College)

Yahl, Thomas (University of Wisconsin - Madison)

Yu, Josephine (Georgia Tech)

Zach, Matthias (University of Kaiserslautern-Landau)

Mathematical Analysis of Soft Matter

June 30 - July 5, 2024

Organizers:

Lia Bronsard (McMaster University)

Carme Calderer (University of Minnesota)

Daniel Beller (Johns Hopkins University)

Arghir Zarnescu (BCAM)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5249*

Soft matter covers a broad spectrum of materials, from liquid crystals to foams and granular matter. Liquid crystals, for example, can flow like liquids but also exhibit elastic effects associated with orientational order. Although continuum mechanics typically deals with smooth fields, an orientational order parameter describing a nematic generally exhibits topological singularities so that classical equations can not hold everywhere. The static configurations of these materials are typically described using a singularly perturbed energy that depends on the gradient of the order parameter and penalizes deviations of the order parameter from a limiting manifold. The principal mathematical difficulties that arise in the analysis of models arising in soft matter research deal with description of singular sets of energy minimizers as well as their evolution. The group of researchers that took part in this workshop outlined main challenges in the field, methods for tackling them, as well as presented significant recent developments.

Participants:

Aguirre Salazar, Lorena (Lakehead University)

Bauman, Patricia (Purdue University)

Beller, Daniel (Johns Hopkins University)

Bronsard, Lia (McMaster University)

Calderer, Carme (University of Minnesota)

Canevari, Giacomo (Università di Verona)

Dipasquale, Federico Luigi (Università degli studi di Napoli "Federico II")

Doré, Claire (University of Pennsylvania)

Garcia, Jane Bernadette Denise (Johns Hopkins University)

Geng, Zhiyuan (Purdue University)

Gimenez-Pinto, Vianney (Lincoln University of Missouri)

Golovaty, Dmitry (The University of Akron)

Guillen-Gonzalez, Francisco (Universidad de Sevilla)

Head, Louise (Johns Hopkins University)

Ignat, Radu (Université de Toulouse)

Ignes-Mulol, Jordi (University of Barcelona)

Kamien, Randall (University of Pennsylvania)

Klein, Brandon (Johns Hopkins University)

Kumari, Priyanka (kent state university)

Lamy, Xavier (University of Toulouse)

Lavrentovich, Oleg (Kent State University)

Lavrentovich, Maxim (Worcester State University)

Louizos, Dean (McMaster University)

Mertelj, Alenka (J. Stefan Institute)

Nguyen, Luc (University of Oxford)

Novack, Michael (Carnegie Mellon University)

Orlandi, Giandominico (University of Verona)

Phillips, Daniel (Purdue University)

Pisante, Adriano (University of Roma "La Sapienza")

Ravnik, Miha (Unviersity of Ljubljana)

Rodriguez Bellido, Maria Angeles (University of Sevilla, Spain)

Sagues, Francesc (Universitat de Barcelona)

Sandier, Etienne (Université paris est Créteil)

Schimming, Cody (Los Alamos National Laboratory)

Severino, Paul (University of Pennsylvania)

Slastikov, Valeriy (University of Bristol)

Smalyukh, Ivan (University of Colorado Boulder)

Stantejsky, Dominik (McMaster University)

Sternberg, Peter (Indiana Univeristy)

Stroffolini, Bianca (University of Naples Federico II)

Sussman, Daniel (Emory University)

Taylor, Jamie (CUNEF Universidad)

Tran, Lisa (Utrecht University)

Venkatraman, Raghavendra (Courant Institute)

Virga, Epifanio (University of Pavia)

Zarnescu, Arghir (Basque Center for Applied Mathematics)

Formation of Looping Networks - from Nature to Models

July 7 - 12, 2024

Organizers:

Annemiek Cornelissen (CNRS & Université de Paris)

Eugenia Corvera (UNAM)

Giulio Facchini (Université Libre de Bruxelles)

Eleni Katifori (University of Pennsylvania)

Sharon Lubkin (North Carolina State University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5315*

Networks are all around us: there are river networks, streets, cracks patterns, veins of leaves, ants nests, social networks. But they are also within us, for instance our blood vessels. Apart of the social networks, the particularity of these networks is to be drawn in physical space. Some are branched like trees, rivers networks or lightning, but many, especially in living matter, form loops. These loops are very useful in case of a disturbance, for instance when a blood vessel blocks or a street jamms, the flow can turn around and keep circulating.

What is surprising is that these networks are not well described. We start to know pretty well how to describe trees, or social networks, but we are missing a lot of information by not using the presence of these loops and their position in space. There is also no understanding of how they grow and appear. This is why this meeting happened: to bring together experts of these up to now separated subjects, to form a new community and bring discoveries around this common object.

Participants:

Bordeu, Ignacio (Universidad de Chile)

Boyce, C. Kevin (Stanford University)

Chatterjee, Purba (University of Pennsylvania)

Cieslak, Mik (University of Calgary)

Cornelissen, Annemiek (CNRS & Université de Paris)

Corvera, Eugenia (UNAM)

Desai-Chowdhry, Paheli (University of Pennsylvania)

Devauchelle, Olivier (Université de Paris)

Douady, Stéphane (CNRS - Université de Paris)

Facchini, Giulio (Université Libre de Bruxelles)

Fleury, Vincent (CNRS/Université de Paris)

Gounaris, Georgios (University of Pennsylvania)

Harris, Samuel (University College London)

Janssen, Jeannette (Dalhousie University)

Julien, Laureline (MSC)

Katifori, Eleni (University of Pennsylvania)

Kot, Maciej (Old Technologies)

Ladd, Anthony (University of Florida)

Lagesse, Claire (University of Franche-Comté)

Le Scao, Camille (Université Paris-Cité)

Lisicki, Maciej (University of Warsaw)

Lubkin, Sharon (North Carolina State University)

Modes, Carl (Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG))

Nakagaki, Toshiyuki (Hokkaido University)

Perna, Andrea (IMT School for Advanced Studies in Lucca)

Petroff, Alexander (Clark University)

Popović, Predrag (University of Belgrade)

Prusinkiewicz, Przemyslaw (University of Calgary)

Ragno, Niccolò (University of Trento)

Sarpangala, Niranjan (University of Pennsylvania)

Secomb, Timothy (University of Arizona)

Seybold, Hansjoerg (ETH Zurich)

Sharma, Rishabh Prakash (University of Warsaw)

Shaw, John (University of Arkansas)

Sintavanuruk, Chanoknun (Aiden) (University of Pennsylvania)

Song, Solène (Université Aix-Marseille)

Szawełło, Tomasz (Universtity of Warsaw)

Szymczak, Piotr (University of Warsaw)

Tauber, Justin (Harvard John A. Paulson School Of Engineering And Applied Sciences)

Torres, Aimee (Facultad de Química, Universidad Nacional Autónoma de México (UNAM))

Travasso, Rui (University of Coimbra)

Ucar, Mehmet Can (Institute of Science and Technology Austria (ISTA))

Villoutreix, Paul (INSERM)

Wrzos, Antoni (University of Warsaw)

Żukowski, Stanisław (University of Warsaw/Université Paris Cité)

Non-Newtonian Flows in Porous Media

July 14 - 19, 2024

Organizers:

Ian Frigaard (University Of British Columbia)

Arezoo Ardekani (Purdue University)

Sujit Datta (Princeton University)

Alex Hansen (NTNU, Norway)

Laurent Talon (CNRS, Univeristé-Paris-Saclay)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5230*

In some contexts, such as environmental, bio-medical or energy, such fluids flow in porous structures like soils, biological tissues for example. These structures are often very heterogeneous and random. The study of the flow of such fluids in porous media is therefore faced with a coupling between two complexities, that of rheology with that of the porous structure. This meeting brought together experts in different fields, complex fluids mechanics, porous media, statistical physics to share their different approaches and advances.

Participants:

Abitbol, Nathan (FAST)

Ali Shah, Rehman (Purdue University)

Amorim, Clarice (PUC-Rio)

Apte, Tanvi (Purdue University)

Ardekani, Arezoo (Purdue University)

Arratia, Paulo (University of Pennsylvania)

Bararpour, Fatemeh (UBC)

Beechey-Newman, Ilaria (NTNU, Norway)

Beitollahi, Armin (Université Laval)

Beneitez, Miguel (University of Cambridge)

Biswal, Sibani Lisa (Rice University)

Bowers, Christopher (N. Carolina State University)

Braz, Wanderson (PUC-Rio)

Browne, Christopher (U. Penn.)

Carrasco Teja, Mariana (UBC)

Chaparian, Emad (University of Strathclyde)

Chen, Emily (Princeton University)

Cook, Emily (UCL)

Cruz, Gabriel (PUC-Rio)

Cummings, Joshua (University of Strathclyde)

Cuttle, Callum (University of Oxford)

Daripa, Prabir (Texas A&M University)

Davit, Yohan (CNRS)

de Rosso, Nezia (UTFPR)

Dutta, Som (Utah State University)

Dzanic, Vedad (Queensland University of Technoloy)

Eiser, Erika (NTNU, Norway)

Elfring, Gwynn (The University of British Columbia)

Fonte, Claudio (The University of Manchester)

Frigaard, Ian (University of British Columbia)

Gandhi, Rishu (Purdue University)

Ge, Zhouyang (UBC/KTH)

Goral, Martyna (UBC)

Grassia, Paul (University of Strathclyde)

Hadizadeh, Anita (UBC)

Hajieghrary, Omid (UBC)

Hansen, Alex (NTNU, Norway)

Hassanzadeh, Hossein (University of Laval)

Hewett, James (University of Canterbury)

Hewitt, Duncan (University of Cambridge)

Hormozi, Sarah (Cornell University)

Izadi, Mahdi (UBC)

Joulaei, Amir (Laval University)

Junqueira, Silvio (UTFPR)

Karimfazli, Ida (Concordia University)

Krol, Quirine (NTNU)

Lanza, Federico (University of Oslo)

Li, Zhibo (ESPCI)

Lima, Nicolle (PUC-Rio)

López-Aguilar, J. Esteban (UNAM)

Martins Duarte Júnior, Roque (UTFPR)

Mashhadian, Ali (Purdue University)

Mirbod, Parisa (University of Illinois at Chicago)

Mohammadigoushki, Hadi (Florida State University)

Moura, Marcel (University of Oslo)

Narayanan, Sabarish (Cornell University)

Narsimhan, Vivek (Purdue University)

Natale, Giovanniantonio (University of Calgary)

Oliveira, Monica (University of Strathclyde)

Olivier, Marie-Laure (NTNU, Norway)

Ortin, Jordi (Universitat de Barcelona)

Pahlavan, Amir (Yale University)

Picchi, Davide (University of Brescia)

Pincus, Isaac (Massachusetts Institute of Technology)

Poletto, Vinícius Gustavo (UTFPR)

Ponte Castañeda, Pedro (University of Pennsylvania)

Poole, Rob (University of Liverpool)

Rahmani, Hossein (University of British Columbia)

Rezaei, Yosef (UBC)

Rodrigues, Tomás (University of Porto)

Rosti, Marco Edoardo (OIST)

Sanjay, Vatsal (University of Twente)

Sasmal, Chandi (Indian Institute of Technology Ropar)

Shaik, Vaseem (UBC)

Sinha, Santanu (NTNU, Norway)

Soares de Andrade Jr., José (UFC)

Stark, Holger (Technische Universität Berlin)

Stoeber, Boris (The University of British Columbia)

Taghavi, Seyed Mohammad (Université Laval)

Talon, Laurent (CNRS, Univeristé-Paris-Saclay)

Tammisola, Outi (KTH Royal Institute of Technology)

Ubal, Sebastian (PUC-Rio)

Ullah, Rizwan (Purdue University)

Wu, Qianwen (JHU)

Xia, Jun (Brunel University)

Zare, Davoud (Nestle R&D)

Zare, Marjan (MIT)

Zhu, Lu (University of Cambridge)

Statistical, Computational, Translational, and Ethical Challenges in Biobank Data Analysis
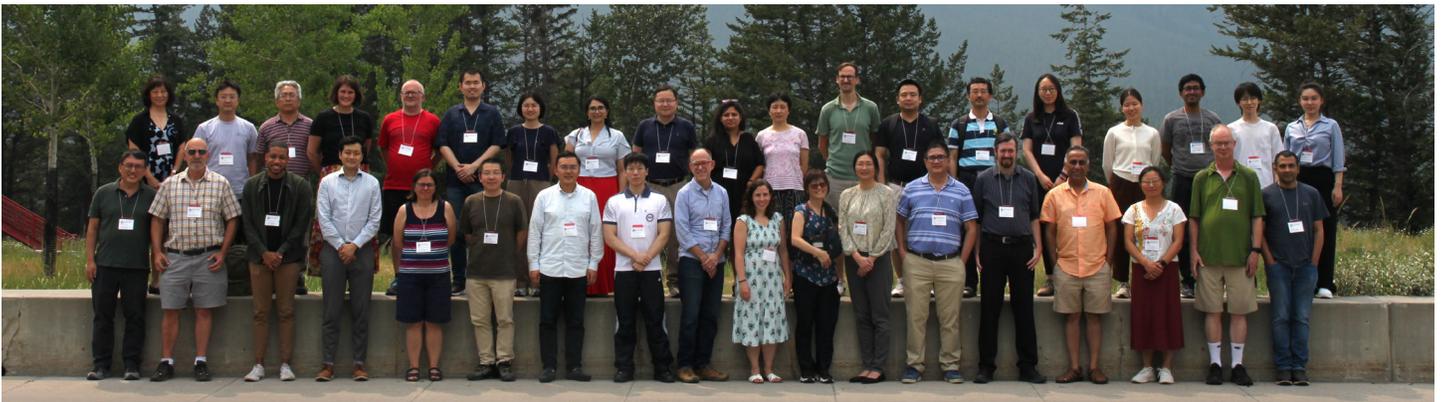
July 21 - 26, 2024

Organizers:

Hongyu Zhao (Yale University)

Lorin Crawford (Microsoft Research)

Alicia Martin (MGH & Broad Institute)

Lei Sun (University of Toronto)

Celia Greenwood (LDI)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5292*

Recent years have seen the establishments of many biobanks at national, regional, and local levels, some with hundreds of thousands of participants. Rich information is being collected from the participants, including electronic health records, diverse types of -omics data, imaging data, wearable device data, and behavioral and lifestyle information. These biobanks have already led to many scientific discoveries and offered valuable information to improve patient care and public health. However, the biobank data also present great computational, statistical, informatics, and ethical challenges that have not been well addressed. The objective of this workshop was to bring together international leaders in diverse disciplines including mathematical, statistical, computational, biological and medical fields in a collaborative atmosphere to tackle the great challenges in biobank studies.

Participants:

Acharya, Sandesh (University of Calgary)

Alkhairo, Hasan (UCSF)

Awasthi, Raghav (Case Western Reserve University)

Blair, David (University of California San Francisco)

Cai, Yanwei (Fred Hutchinson Cancer Center)

Cao, Jingjing (U Toronto)

Chatterjee, Nilanjan (Johns Hopkins University)

Chen, Yiheng (McGill University)

Chen, Yuxuan (U Calgary)

Cheng, Youshu (Yale University)

Crawford, Lorin (Microsoft Research)

Dudbridge, Frank (University of Leicester)

Dupras, Charles (Université de Montréal)

Dupuis, Josee (McGill University)

Dutta, Diptavo (National Cancer Institute)

Enoma, David (U Calgary)

Fuller, Harriet (Fred Hutchinson Cancer Center)

Gamazon, Eric (Vanderbilt University and University of Cambridge)

Gan, Ziming (University of Chicago)

Greenwood, Celia (Lady Davis Institute for Medical Research)

Gu, Jasmine (University of Sydney)

Guo, Boya (University of Washington)

He, Ruoyu (U Minnesota)

Hiraki, Linda (U Toronto)

Hsu, Li (Fred Hutchinson Cancer Center)

Ilboudo, Yann (McGill)

Im, Hae Kyung (University of Chicago)

Ionita-Laza, Iuliana (Columbia University)

Kang, Ilsuk (Chungbuk National University)

Kim, Daniel (University of Sydney)

Kleinbrink, Erica (McGill)

Kong, Dehan (University of Toronto)

Kooperberg, Charles (Fred Hutchinson Cancer Center)

Kraft, Peter (National Cancer Institute)

Kumarasinghe, Yohhan (UNC Chapel Hill)

Lewis, Anna (Brigham and Women's Hospital and Harvard Medical School)

Li, Yun (University of North Carolina)

Li, Xihao (University of North Carolina at Chapel Hill)

Li, Ruowang (Cedars Sinai Medical Center)

Li, Zheng (University of Michigan)

Li, Weili (Hospital for Sick Children)

Li, Mengxuan (Case Western Reserve University)

Li, Hui (Case Western Reserve University)

Li, Caifeng (U Calgary)

Liao, Huiling (U Minnesota)

Lin, Boxi (U Toronto)

Lin, Zhaotong (University of Minnesota)

Lin, Yingxin (Yale University)

Liu, Dajiang (Penn State University)

Liu, Lu (University of Michigan)

Liu, Yang (U Minnesota)

Long, Quan (University of Calgary)

Lu, Tianyuan (University of Wisconsin-Madison)

Malakhov, Mykhaylo (University of Minnesota)

Martin, Alicia (Massachusetts General Hospital & Broad Institute)

Martschenko, Daphne (Stanford University)

Mavura, Yusuph (UCSF)

McPherson, Brent (McGill University)

Najera, James (UCSF)

Ning, Chao (University of Michigan)

Ohno-Machado, Lucila (Yale University)

Oros Klein, Kathleen (FALSE)

Pan, Wei (University of Minnesota)

Paterson, Andrew (The Hospital for Sick Children)

Risch, Neil (UCSF)

Russ, Daniel (National Cancer Institute)

Sabatello, Maya (Columbia University)

Sankararaman, Sriram (UCLA)

Sheikh, Tuhin (Yale University)

Shen, Cathy (McGill)

Shu, Matthew (University of Sydney)

St. Pierre, Julien (McGill)

Su, Chen-Yang (McGill University)

Sun, Ning (Yale University)

Tan, Alina (McGill University)

Thomas, Minta (Fred Hutch)

Verma, Shefali (U Penn)

Wang, Gao (Columbia University)

Wang, Fan (Columbia University)

Wang, Ming (Case Western Reserve University)

Wang, Wenbo (UNC Chapel Hill)

Wang, Lijun (Yale University)

Wang, Gefei (Yale University)

Weeraman, Janith (U Calgary)

Weinstein, Stephanie (National Cancer Institute)

Williams, Jacob (National Cancer Institute)

Xie, Yuhan (Yale University)

Xu, Hua (Yale University)

Xu, Leqi (Yale University)

Xue, Haoran (City University of Hong Kong)

Yang, Jian (Westlake University)

Yang, Jean Yee Hwa (The University of Sydney)

Yang, Jingjing (Emory University)

Yang, Can (The Hong Kong University of Science and Technology)

Yang, Tianzhong (U Minnesota)

Yang, Yihe (Case Western Reserve University)

Yu, Lijia (The University of Sydney)

Zekavat, Maryam (Harvard University)

Zeng, Yixiao (McGill University)

Zhang, Qingrun (University of Calgary)

Zhang, Haoyu (National Cancer Institute)

Zhang, Wenmin (Montreal Heart Institute)

Zhang, Ziang (U Toronto)

Zhang, Jingwen (Boston University School of Public Health)

Zhang, Xinyi (Johns Hopkins University)

Zhang, Lijun (Case Western Reserve Univ)

Zhang, Yiyan (UNC Chapel Hill)

Zhao, Hongyu (Yale University)

Zhao, Qingyuan (University of Cambridge)

Zhao, Kaiqiong (York University)

Zhao, Jia (Yale University)

Zheng, Jerry (University of Sydney)

Zhou, Xiang (University of Michigan)

Zhou, Geyu (Yale Unversity)

Zhu, Xiaofeng (Case Western Serve University)

Zhu, Hongtu (The University of North Carolina at Chapel Hill)

Combinatorics and Geometry of Moduli Spaces of Curves

July 28 - August 2, 2024

Organizers:

Jake Levinson (Université de Montréal)

Vance Blankers (Northeastern University)

Sean Griffin (University of California at Davis)

Diane Maclagan (University of Warwick)

Maria Monks Gillespie (Colorado State University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5200*

Curves are among the most ubiquitous mathematical objects; they have deep connections to algebra, geometry, topology, and mathematical physics. Moduli spaces of curves allow one to study curves in families, where each point of the moduli space corresponds to a curve. Recent years have seen rapid advances on geometric questions about moduli spaces of curves, many of which have introduced new and intriguing combinatorial objects of study. The purpose of this workshop was to work to answer such questions by bringing together experts in algebraic geometry and experts in modern combinatorics. Participants were organized into working groups, each with a mix of mathematical specialty areas, led by researchers in geometry who each proposed an unresolved combinatorial problem stemming from their work.

Participants:

Afandi, Adam (WWU Münster - University of Münster)

Blankers, Vance (Northeastern University)

Bruce, Juliette (University of California, Berkeley)

Castravet, Ana-Maria (University of Versailles)

Cavalieri, Renzo (Colorado State University)

Chen, Linda (Swarthmore College)

Clader, Emily (San Francisco State University)

Damiolini, Chiara (University of Texas at Austin)

Fry, Andy (Lewis and Clark College)

Gibney, Angela (University of Pennsylvania)

Griffin, Sean (University of California at Davis)

Halacheva, Iva (Northeastern University)

Hodges, Reuven (University of Kansas)

Huang, Daoji (University of Minnesota)

Huang, Yifeng (UBC)

Ji, Caleb (Columbia University)

Kalashnikov, Elana (University of Waterloo)

Larson, Matt (Stanford University)

Levinson, Jake (Université de Montréal)

Li, Shiyue (Institute for Advanced Study)

Liu, Haggai (Simon Fraser University)

Maclagan, Diane (University of Warwick)

Monks Gillespie, Maria (Colorado State University)

Ning, Haoming (University of Washington)

Pappe, Joseph (Colorado State University)

Pechenik, Oliver (University of Waterloo)

Pflueger, Nathan (Amherst College)

Pixton, Aaron (University of Michigan)

Precup, Martha (Washington University in St. Louis)

Pries, Rachel (Colorado State University)

Ramadas, Rohini (University of Warwick)

Reimer-Berg, Andrew (Colorado State University)

Richman, Harry (Fred Hutch Cancer Center)

Robichaux, Colleen (University of California, Los Angeles)

Ross, Dusty (San Francisco State University)

Silversmith, Rob (University of Warwick)

Tarasca, Nicola (Virginia Commonwealth University)

Tewari, Vasu (University of Toronto)

Tommasi, Orsola (Università di Padova)

Vlad, Raluca (Brown University)

Vogt, Isabel (Brown University)

Weigandt, Anna (University of Minnesota)

Xu, Weihong (Virginia Tech)

Yang, Yirong (University of Washington)

Young, Benjamin (University of Oregon)

What's your trick? A Non-Traditional Conference in Low-Dimensional Topology
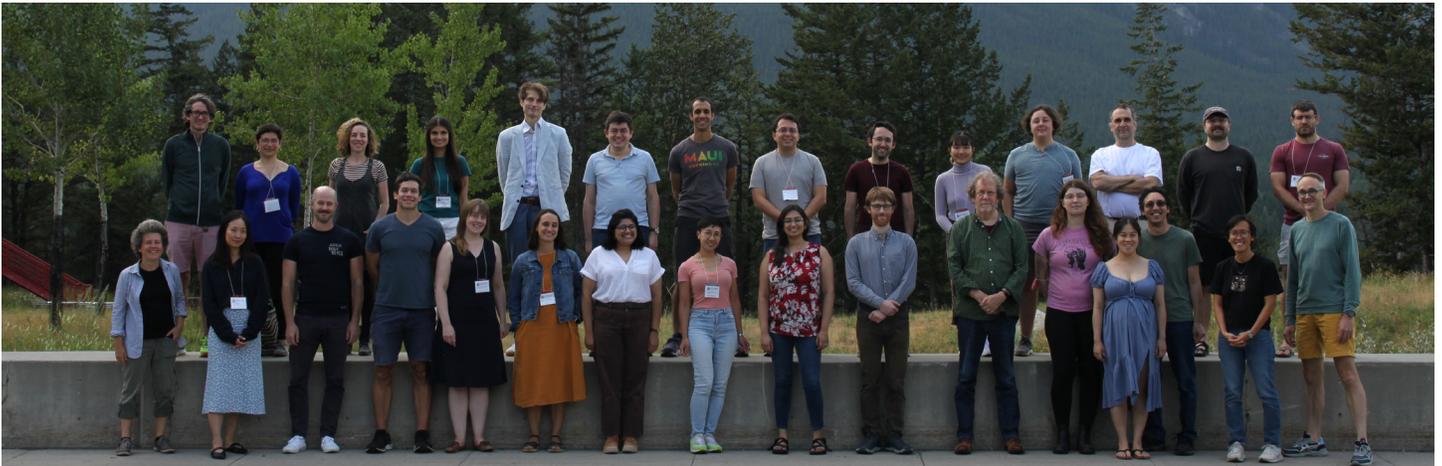
August 4 - 9, 2024

Organizers:

Andrew Lobb (Durham)

John Baldwin (Boston College)

Lisa Piccirillo (MIT)

Liam Watson (University of British Columbia)

Maggie Miller (University of Texas at Austin)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5291*

Low-dimensional topology is the study of spaces of three and four dimensions. This workshop brought together researchers from around the world to share their knowledge and expertise in pushing this area forward.

Participants:

Ablondi, Timothy (North Carolina State University)

Ali, Danish (Dalian University of Technology)

Alishahi, Akram (University of Georgia)

Aranda, Roman (University of Nebraska - Lincoln)

Aylaian, Ezra (Duke University)

Azarpendar, Soheil (University of Oxford)

Azdoud, Abdellah (Hassan I University Settat Morocco)

Baburam, Rakhal Chandran (Michigan State U.)

Bais, Valentina (SISSA)

Baldwin, John (Boston College)

Barber, Adam (Durham)

Bascape, Giacomo (Université du Québec à Montréal)

Beke, Márton (Budapest University of Technology and Economics)

Benyahia, Younes El Maamoun (Scuola Internazionale Superiore di Studi Avanzati)

Bezbarua, Ipsa (CUNY)

Bhat, Deeparaj (MIT)

Bhuvaraghamoorthy, Aadhishwaran (U. Buffalo)

Bianchi, Filippo (Università di Pisa)

Bohm, Remy (University of Texas at Austin)

Boninger, Joseph (Boston College)

Boyer, Steven (UQAM)

Brejevs, Vitalijs (University of Vienna)

Brod, Elise (University of Texas at Austin)

Buchanan, Lizzie (University of Iowa)

Chande, Maya (Stanford University)

Chen, Joye (Massachusetts Institute of Technology)

ÇİM, Kaan (Koç University)

Dai, Xinle (Harvard University)

Day, Rajesh (Indian Institute of Science Education and Research Bhopal)

de Paiva Souza, Thiago (Monash University)

Deep, Prerak (IISER Bhopal)

Di Prisa, Alessio (Scuola Normale Superiore (Pisa))

Du, Alan (California Institute of Technology)

Dunkerley, Gary (The University of Georgia)

Edson, Nzaganya (Stellenbosch University)

El-Khalf, kaoutar (Faculty of sciences Moulay Ismail)

Epelde, Alex (Harvard)

Fan, Caifei (Georgia Tech)

Fanelle, Sophia (Boston College)

Földvári, Viktória (HUN-REN Alfréd Rényi Institute of Mathematics)

Fragoso, Duarte (Universiteit van Amsterdam)

Fushida-Hardy, Shintaro (Stanford University)

Geist, Nathan (Boston College)

Ghaswala, Tyrone (University of Waterloo)

Gong, Sherry (Texas A&M University)

Gopal, Abhishek (Indiana University Bloomington)

Gordon, Cameron (University of Texas at Austin)

Greene, Joshua (Boston College)

Grlj, Jernej (University of Southern California)

Hadi, Isnayni (University of Georgia)

Hanselman, Jonathan (Princeton University)

Hayden, Kyle (Rutgers University - Newark)

Hedden, Matthew (Michigan State University)

Hendricks, Kristen (Rutgers University)

Hernández López, Leydi Guadalupe (UNAM)

Hom, Jen (Georgia Tech)

Hsu, Ching-Chia (Washington University in St. Louis)

Hsueh, Chun-Sheng (Humboldt University of Berlin)

Hubbard, Diana (Brooklyn College - City University of New York)

Imori, Hayato (KAIST)

Johnson, Chris (Durham University)

Joshi, Amey (Michigan State University)

Kang, Sungkyung (University of Oxford)

Kar, Krishnendu (Louisiana State University)

Karadereli, Şeyma (Boğaziçi University)

Karmakar, Biswadeep (IISER Mohali)

Khan, Isabella (Princeton University)

Khanna, Harshul (Boston College)

Kim, Geunyoung (McMaster University)

Kim, Sung (University of Southern California)

Kim, Byeorhi (POSTECH)

Kirk, Paul (Indiana University)

Kivanc, Saliha (Hacettepe University)

Kjuchukova, Alexandra (University of Notre Dame)

Kohn, Michael (Durham University)

Krishna, Siddhi (Columbia University)

Kubasch, Alexander Arnd (Alfréd Rényi Institute of Mathematics)

Kuhrman, Judson (Stanford)

Kujawski, Mateusz (University of Warsaw)

Lan, Rebecca (Duke)

Lee, Dongsoo (KAIST)

Lee, Jaewon (KAIST)

Lescop, Christine (CNRS)

Levine, Adam (Duke University)

Li, Zhenkun (USF.)

Li, Lily (Princeton University)

Li, Jiakai (Harvard University)

Liao, Wenbo (Chinese University of Hong Kong)

Liles, Louisa (University of Virginia)

Lindblad, Ayodeji (MIT)

Lipshitz, Robert (University of Oregon)

Lobb, Andrew (Durham)

Lyu, Qingfeng (Boston College)

Manikandan, Naageswaran (Humboldt University of Berlin)

Manko, Maks (University of Zurich)

Manolescu, Ciprian (Stanford University)

Marian, Mihai (University of British Columbia)

Marshall, Lavender (Monash University)

Martin, Gage (Harvard)

Matic, Gordana (University of Georgia)

McCoy, Duncan (Université du Québec à Montréal)

Miller, Maggie (University of Texas at Austin)

Moazzeni, Mahan (McMaster University)

Monika, Monika (Indian Institute of Technology (IIT) Gandhinagar)

Montoya Vega, Gabriel (CUNY Graduate Center and University of Puerto Rico-Rio Piedras)

Moore, Allison (Virginia Commonwealth University)

Moulai, Joris (Université de Montpellier)

Mousseau, Léo (Humboldt Universität zu Berlin)

Mukherjea, Aru (University of Texas Austin)

Munoz Ruiz, Steven (University of Miami)

Nahm, Gheehyun (Princeton University)

Nakamura, Kai (Stanford University)

Naseri Sadr, Ali (Boston College)

Naughton, John (Washington University in Saint Louis)

Nersisyan, Sergey (Columbia University)

Novak, Connor (University of Georgia)

Ochen, John (Makerere University)

Papadopoulos, Panagiotis (LMU München)

Park, Harahm (UCLA)

Paul, Arijit (Indiana University Bloomington)

Pencovitch, Mark (University of Glasgow)

Petkova, Ina (Dartmouth)

Petrou, Andreani (Okinawa Institute of Science and Technology)

Pfaff, Ella (University of Notre Dame)

Phillips, Lucy (Imperial College London)

Pinzon-Caicedo, Juanita (University of Notre Dame)

Plamenevskaya, Olga (Stony Brook University)

Pritchard, Stanley (Duke University)

Qin, Qianhe (Stanford University)

Raghunath, Sriram (Rutgers University New Brunswick)

Ramirez Ruiz, Andres David (University of Miami)

Ray, Arunima (Max Planck Institute for Mathematics)

Ruberman, Daniel (Brandeis University)

Rushworth, William (Newcastle University)

Rutter, Susan (CUNY Graduate Center)

Rysiński, Piotr (Jagiellonian University)

Santoro, Diego (University of Vienna)

Saraf, Deepanshi (Indian Institute of Science Education and Research (IISER) Mohali)

Sarkar, Sucharit (UCLA)

Savk, Oguz (CNRS, Laboratoire de Mathématiques Jean Leray)

Scott, Evan (CUNY Graduate Center)

Seaton, Luke (Michigan State University)

Sethi, Shikhin (Princeton University)

Sha, Yi (Peking University)

Shah, Pamela (University of British Columbia)

Shapiro, Benjamin (Dartmouth College)

Shivkumar, Abhishek (UT Austin)

Simian, Gaëtan (Université de Genève)

Simon, Christopher-Lloyd (The Pennsylvania State University)

Smith, Aislinn (The University of Texas at Austin)

So, Ivan (Michigan State University)

Sorya, Patricia (Université du Québec à Montréal)

Sridhar, Shruthi (Princeton University)

Stipsicz, Andras (Rényi Institute of Mathematics)

Storzer, Matthias (Max Planck Institute for Mathematics)

Sullivan, Ian (UC Davis)

Svoboda, Josef (Caltech)

Tatsuoka, Alison (Princeton University)

Thakar, Ollie (Harvard University)

Wakelin, Laura (Max Planck Institute for Mathematics)

Wang, Luya (Stanford University)

Wang, Zhihao (University of Groningen)

Watson, Liam (University of British Columbia)

Wattal, Mira (Boston College)

Willis, Michael (Texas A&M University)

Xu, Alex (Columbia University)

Yakupov, Sardor (Université Grenoble-Alpes)

Yan, Jiajun (University of Virginia)

Yang, Hongjian (Stanford University)

Yao, Wenxi (Harvard University)

Ye, Fan (Harvard University)

Yeh, Kevin (Boston College)

Yeh, Kevin (Boston College)

Zampa, Sarah (BME & Alfréd Rényi Institute)

Zbida, Sarah (Université du Québec à Montréal)

Zemke, Ian (Princeton University)

Zhan, Fang-Rong (North Carolina State University)

Zhang, Suixin (Cindy) (University of California, Davis)

Zhou, Hugo (Max Planck Institute for Mathematics)

Zhu, Kejia (University of California at Riverside)

Zibrowius, Claudius (Ruhr-Universität Bochum)

Frontiers of Statistical Mechanics and Theoretical Computer Science

August 11 - 16, 2024

Organizers:

Tyler Helmuth (Durham University)

Jane Gao (University of Waterloo)

Marcus Michelen (UIUC)

Will Perkins (Georgia Institute of Technology)

Geronimo Uribe Bravo (UNAM)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5169*

A fundamental technological and scientific task is to approximately sample from very high-dimensional probability distributions. This is also a central question in a fundamental field of physics known as statistical mechanics, where the goal is instead to understand the basic properties of matter based on the fact that matter is comprised of an enormous number of interacting constituent pieces (e.g., atoms, molecules, etc.). In recent years there have been profound discoveries of deeper ties between the subjects of computation, sampling, and mathematically rigorous statistical mechanics. The discoveries of the past years have shown that the differing perspectives and tools of these fields can lead to new and powerful insights when applied to one another. This workshop was dedicated to taking advantage of this interdisciplinary viewpoint to make progress both within individual fields, and in our understanding of how different notions of phase transitions are theoretically (and practically) related to one another.

Participants:

Addario-Berry, Louigi (McGill University)

Altschuler, Dylan (CMU)

Anari, Nima (Stanford University)

Angel, Omer (UBC)

Bowtell, Candida (University of Warwick)

Briceño, Raimundo (Pontificia Universidad Católica de Chile)

Brito, Gerandy (Georgia Institute of Technology)

Cannon, Sarah (Claremont McKenna College)

Carlson, Charlie (UC Santa Barbara)

Chen, Joseph (NYU)

Chin, Byron (MIT)

Collins-Woodfin, Elizabeth (McGill)

Davies, Ewan (Colorado State University)

Eslava, Laura (IIMAS, UNAM)

Gao, Jane (University of Waterloo)

Gheissari, Reza (Northwestern University)

Hadas, Daniel (Tel Aviv University)

Helmuth, Tyler (Durham University)

Hernández-Torres, Saraí (Universidad Nacional Autónoma de México (UNAM))

Huang, Brice (MIT)

Jagannath, Aukosh (University of Waterloo)

Jain, Vishesh (University of Illinois Chicago)

Jenssen, Matthew (King's College London)

Kotecky, Roman (Charles University)

Kuchukova, Aiya (Georgia Tech)

Lee, Holden (Johns Hopkins University)

Li, Shuangping (Stanford University)

Mani, Nitya (MIT)

Michelen, Marcus (University of Illinois, Chicago)

Molloy, Michael (University of Toronto)

Oveis Gharan, Shayan (University of Washington)

Park, Jinyoung (NYU)

Perkins, Will (Georgia Institute of Technology)

Randall, Dana (Georgia Tech)

Ray, Gourab (University of Victoria)

Regts, Guus (University of Amsterdam)

Samotij, Wojciech (Tel Aviv University)

Sellke, Mark (Harvard)

Shriver, Christopher (MITRE)

Sun, Nike (MIT)

Uribe Bravo, Geronimo (Universidad Nacional Autónoma de México)

Vuong, Thuy-Duong (June) (Stanford)

Wein, Alex (University of California, Davis)

Yap, Corrine (Georgia Institute of Technology)

Zeng, Edward (NYU)

Causal Inference and Prediction for Network Data

August 18 - 23, 2024

Organizers:

Tianxi Li (University of Minnesota)

Eric Kolaczyk (McGill University)

Liza Levina (University of Michigan)

Elizabeth Ogburn (Johns Hopkins University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5244*

Advances in data collection have made network data available in many areas, including social sciences, biological sciences, and engineering. Understanding and modeling network structure and conducting rigorous statistical inference to assess uncertainty can provide crucial insights into the dynamics and interaction mechanisms of the system. This workshop focused on modeling and inferring causal relations in network data and leveraging these model inference for predictions. Causal inference between variables based on observations in a network has been an extremely challenging problem, requiring adapting existing inference frameworks to networks. This workshop brought researchers from theory, computation, and different applications together, to help theoreticians and methodologists focus on real problems, and to alert application researchers to the newest developments in methods.

Participants:

Arbour, David (Adobe Research)

Arroyo, Jesús (Texas A&M University)

Athreya, Avanti (Johns Hopkins University)

Bhattacharyya, Sharmodeep (OSU)

Bickel, Peter (University of California Berkeley)

Bloem-Reddy, Benjamin (University of British Columbia)

Bong, Heejong (University of Michigan)

Bu, Fan (University of Michigan)

Chakrabarty, Sayan (University of Michigan)

Chandrasekhar, Arun (Stanford University)

Chatterjee, Shirshendu (City University of New York)

Chen, Yuguo (UIUC)

Chicago, University (University of Illinois at Chicago)

Choi, Dave (Carnegie Mellon University)

Crawford, Forrest (Yale University)

Eckles, Dean (MIT)

Fan, Jianqing (Princeton University)

Fan, Yingying (University of Southern California)

Fang, Fei (Yale University)

Faruk, Ahmed Sayeed (UIUC)

Fogarty, Colin (University of Michigan)

Ghahramani, Melody (University of Winnipeg)

Gleich, Aidan (Duke University)

Ham, Dae Young (University of Minnesota)

Harshaw, Christopher (Columbia University)

Hayes, Alex (University of Wisconsin)

He, Yinqiu (University of Wisconsin)

Heydari, Tiam (UBC)

Hong, Anni (Carnegie Mellon University)

Hossain, Shakhawat (U of Winnipeg)

Islam, MD Aminul (University of Illinois at Chicago)

Jeonghwan, Lee (University of Minnesota)

Kagan, Alexander (University of Michigan)

Ke, Tracy (Harvard University)

Khani, Nooshin (Imam Reza International University)

Kojevnikov, Denis (Tilburg University)

Kolaczyk, Eric (McGill University)

Kreiss, Alexander (Leipzig University)

Le, Can (University of California, Davis)

Lei, Jing (Carnegie Mellon University)

Lei, Lihua (Stanford University)

Lerdputtipongporn, Peem (Carnegie Mellon U.)

Levin, Keith (University of Wisconsin-Madison)

Levina, Liza (University of Michigan)

Li, Tianxi (University of Minnesota)

Loomba, Sahil (MIT)

Lopez Ortiz, Eduardo (Center for Research in Infectious Diseases of the National Institute of Respiratory Diseases)

Lyzinski, Vince (University of Maryland)

McNealis, Vanessa (McGill University)

Moodie, Erica (McGill University)

Morgan, Carlyle (University of Michigan)

Niezink, Nynke (Carnegie Mellon University)

Ogburn, Elizabeth (Johns Hopkins University)

Olhede, Sofia (EPFL)

Paul, Subhadeep (The Ohio State University)

Posmik, Daniel (Brown University)

Priebe, Carey (Johns Hopkins University)

Rinaldo, Alessandro (UT - Austin)

Rohe, Karl (UW Madison)

Sussman, Daniel (Boston University)

Tang, Weijing (Carnegie Mellon University)

Tang, Tiffany (University of Notre Dame)

Toulis, Panagiotis (University of Chicago)

Vinciotti, Veronica (University of Trento)

Volfovsky, Alexander (Duke University)

Wang, Rachel (University of Sydney)

Wit, Ernst (Università della Svizzera italiana)

Xiong, Yibin (Harvard University)

Yao, Qiwei (London School of Economics)

Yauck, Mamadou (Université du Québec à Montréal)

Yu, Jingtian (Oregon State University)

Yuan, Yubai (Pennsylvania State University)

Zhang, Jingfei (Emory University)

Zhang, Zifeng (Colorado State University)

Zhang, Maoyu (Emory University)

Zheleva, Elena (University of Illinois Chicago)

Zhou, Wen (New York University)

Zhu, Ji (University of Michigan)

Enumerative Geometry Beyond Spaces

August 25 - 30, 2024

Organizers:

Balazs Szendroi (University of Vienna)

Kirsten Wickelgren (Duke University)

Jim Bryan (UBC)

Maria Yakerson (Oxford University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5258*

The classical paradigm for getting enumerative invariants out of a space is to extract numbers (or vector spaces, or motivic classes, or categories) from a moduli space of obects defined on the original space. One of the lessons of the last three decades is that the notions of "space" can be replaced by some more general constructions in this process, such as a category or derived space, and the resulting invariants can also be further refined, e.g. by taking account of the underlying field. This leads to new connections between enumerative geometry, the theory of derived categories and derived and homotopical algebraic geometry. The main aim of our workshop is to explore these emerging links. The aim of the workshop was to bring together, in a hybrid format, a group of senior experts in the different fields with younger mathematicians, creating an atmosphere that allows for a free interaction and cross-fertilization of ideas.The travel of some participants from the Global South was partially supported by the K-theory Foundation.

Participants:

Arguz, Hulya (University of Georgia Athens)

Artacho, Diego (Imperial College London)

Azouri, Ran (Sorbonne Paris Nord University)

Bachmann, Tom (University of Mainz)

Behrend, Kai (UBC)

Bertsch, Lukas (University of Vienna)

Bethea, Candace (Duke University)

Binda, Federico (University of Milano)

Bousseau, Pierrick (University of Georgia)

Brazelton, Thomas (Harvard University)

Bryan, Jim (UBC)

Bu, Chenjing (University of Oxford)

Caldararu, Andrei (University of Wisconsin-Madison)

Elmanto, Elden (University of Toronto)

Erwan, Brugallé (Université de Nantes)

Feyzbakhsh, Soheyla (Imperial College London)

Gant, Sebastian (University of British Columbia)

Haine, Peter (University of California, Berkeley)

Heuts, Gijs (Utrecht University)

Hornslien, William (Norwegian University of Science and Technology)

Hoskins, Victoria (Radboud University)

Jaramillo Puentes, Andrés (Univ Duisburg Essen)

Jelisiejew, Joachim (University of Warsaw)

Khan, Adeel (Academia Sinica)

Kikwai, Benjamin (Machakos University)

Kool, Martijn (Utrecht University)

Korde, Atharva (UBC)

Levine, Marc (Universität Duisburg-Essen)

McKean, Stephen (Harvard University)

Mok, Siao Chi (University of Cambridge)

Nabijou, Navid (Queen Mary University of London)

Oberdieck, Georg (KTH Royal Institute of Technology)

Padurariu, Tudor (MPIM Bonn and CNRS-Jussieu)

Pajwani, Jesse (University of Canterbury/University of Bath)

Pal, Ambrus (Imperial College London)

Pauli, Sabrina (Universität Duisburg-Essen)

Pepin Lehalleur, Simon (University of Amsterdam)

Porta, Mauro (Université de Strasbourg)

Ranganathan, Dhruv (University of Cambridge)

Ravi, Charanya (Indian Statistical Institute, Bangalore)

Rohrbach, Herman (University of Duisburg-Essen)

Shen, Junliang (Yale University)

Shi, Yun (Brandeis University)

Shoemaker, Mark (Colorado State)

Solomon, Jake (Hebrew University)

Song, Terry (University of Cambridge)

Szendroi, Balazs (University of Vienna)

Thimm, Felix (UBC Vancouver)

Thomas, Richard (Imperial College London)

Wickelgren, Kirsten (Duke University)

Williams, Ben (UBC)

Yakerson, Maria (Oxford University)

Yu, Tony Yue (California Institute of Technology)

Combinatorial Nonpositive Curvature

September 1 - 6, 2024

Organizers:

Piotr Przytycki (McGill University)   Kasia Jankiewicz (University of California Santa Cruz)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5179*

The curvature is a measure of how bent a shape is. For example, the surface of a ball has positive curvature, a flat plane has zero curvature, and the surface of a Pringle chip has negative curvature. Combinatorial nonpositive curvature refers to easily computable notions capturing certain aspects of the former two examples. There is a strong connection between the curvature of an object, and the algebraic structure of the group of its symmetries. The workshop focused on recent developments and future directions in the study of combinatorial nonpositive curvature.

Participants:

Abrams, Aaron (Washington and Lee University, and University of Virginia)

Antolin, Yago (Universidad Complutense de Madrid)

Arenas, Macarena (University of Cambridge)

Bader, Shaked (Oxford University)

Barmak, Jonathan (Universidad de Buenos Aires)

Blufstein Garcia, Martin Axel (University of Copenhagen)

Brody, Nic (University of California Santa Cruz)

Chang, Yu-Chan (Wesleyan University)

Chepoi, Victor (Aix-Marseille Université)

Cumplido, María (Universidad de Sevilla)

Dani, Pallavi (Louisiana State University)

Dhanauta, Maninder (McGill University)

Dougherty, Michael (Lafayette College)

Duda, Karol (IMPAN)

Fernos, Talia (Vanderbilt University)

Fioravanti, Elia (Karlsruhe Institute of Technology)

Giocanti, Ugo (G-SCOP lab, Grenoble)

Goldman, Katherine (McGill University)

Groves, Daniel (University of Illinois Chicago)

Hoda, Nima (Cornell University)

Huang, Jingyin (Ohio State University)

Hughes, Sam (University of Oxford)

Jankiewicz, Kasia (UC Santa Cruz)

Karpinski, Christopher (McGill University)

Karrer, Annette (Ohio State University)

Kristof-Tessier, Carl (McGill University)

Lang, Urs (ETH Zurich)

Lazarovich, Nir (Technion)

Li, Changqian (Ohio State University)

Linton, Marco (University of Oxford)

Lonjou, Anne (University of the Basque Country/ Ikerbasque)

Manning, Jason (Cornell University)

Martin, Alexandre (Heriot-Watt University)

Martínez Pedroza, Eduardo (Memorial University)

McCammond, Jon (University of California Santa Barbara)

Montee, MurphyKate (Carleton College)

Munro, Zachary (McGill University)

Ng, Thomas (Brandeis University)

Osajda, Damian (University of Wroclaw)

Paolini, Giovanni (California Institute of Technology)

Przytycki, Piotr (McGill University)

Schillewaert, Jeroen (University of Auckland)

Schreve, Kevin (Louisiana State University)

Schwer, Petra (Heidelberg University)

Shepherd, Sam (Vanderbilt University)

Soergel, Mireille (ETH Zürich)

Soroko, Ignat (University of North Texas)

Thomas, Anne (University of Sydney)

Urech, Christian (Ecole Polytechnique Federale de Lausanne)

Valiunas, Motiejus (University of Wrocław)

Varghese, Olga (OVGU Magdeburg)

Vaskou, Nicolas (University of Bristol)

Walsh, Genevieve (Tufts University)

Wiest, Bert (University Rennes)

Wilton, Henry (University of Cambridge)

Stochastics and Geometry

September 8 - 13, 2024

Organizers:

Masha Gordina (University of Connecticut)

Todd Kemp (UC San Diego)

Tai Melcher (University of Virginia)

Jing Wang (Purdue University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5314*

The workshop brought together some of the world's top experts and early career mathematicians working at the interface of \emph{Stochastics and Geometry}, broadly understood. Through expository talks and research presentations, the workshop gave a vibrant overview of the most recent developments in the interaction between analysis, geometry and stochastic analysis. The focus of the workshop was different approaches to random processes in geometric settings, with emphasis on problems on heat kernel analysis on finite-and infinite-dimensional manifolds, often equipped with degenerate geometries, as well as random matrices and non-commutative probability and geometric rough paths. Another objective of the workshop was to identify fundamental open problems in this area that are motivated by mathematical physics and other potential applications. We planned to maintain geographic diversity and invite many promising early career mathematicians.

Participants:

Albert, Michael (University of Connecticut)

Ang, Morris (UC San Diego)

Bailleul, Ismael (Universite Bretagne Occidentale)

Baudoin, Fabrice (University of Connecticut)

Brailovskaya, Tatiana (Duke University)

Carfagnini, Marco (UCSD)

Cass, Thomas (Imperial College London)

Charalambous, Nelia (University of Cyprus)

Chen, Li (Louisiana State University)

Chevyrev, Ilya (University of Edinburgh)

Dahlqvist, Antoine (University of Sussex)

Eberle, Andreas (Bonn University)

Eldredge, Nathaniel (University of Northern Colorado)

Elworthy, David (University of Warwick)

Flaim, Marco (University of Bonn, Germany)

Friz, Peter (Technische Universität and WIAS Berlin)

Geng, Xi (University of Melbourne)

Gordina, Masha (University of Connecticut)

Gross, Leonard (Cornell)

Habermann, Karen (University of Warwick)

Hall, Brian (University of Notre Dame)

Haslhofer, Robert (University of Toronto)

Herzog, David (Iowa State University)

Ho, Ching Wei (Academia Sinica, Taiwan)

Hsu, Elton (Northwestern University)

Jekel, David (University of Copenhagen)

Kemp, Todd (UC San Diego)

Kennedy, Christopher (Queen's University, Canada)

Kim, Jina (Trinity University)

Kopfer, Eva (Hausdorff Center for Mathematics - Bonn)

Lacaux, Céline (University of Avignon)

Lörler, Francis (University of Bonn)

Luo, Liangbing (Lehigh University)

Maida, Mylene (Université de Lille, France)

Maini, Leonardo (University of Milano-Bicocca, Italy)

Mariano, Phanuel (Union College)

Mattingly, Jonathan (Duke University)

Melcher, Tai (University of Virginia)

Mikulincer, Dan (University of Washington)

Murugan, Mathav (University of British Columbia)

Neel, Robert (Lehigh University)

Nikitopoulos, Evangelos (University of Michigan)

Norris, James (University of Cambridge)

Oberdörster, Stefan (University of Bonn)

Ouyang, Cheng (University of Illinois at Chicago)

Perruchaud, Pierre (University of Luxembourg)

Rossi, Maurizia (Università di Milano-Bicocca)

Saha, Archishman (University of Ottawa)

Sarkar, Rohan (University of Connecticut)

Shen, Hao (University of Wisconsin-Madison)

Sturm, Karl-Theodor (University of Bonn)

Teplyaev, Alexander (University of Connecticut)

Thalmaier, Anton (Université du Luxembourg)

Wang, Jing (Purdue University)

SocioEconomic Mathematical Epidemiology: Developing Mathematical Modelling Theory

September 15 - 20, 2024

Organizers:

Rebecca Claire Tyson (UBC Okanagan)

Bert Baumgaertner (University of Idaho)

Jane Heffernan (York University)

Bouchra Nasri (ESPUM)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5286*

Throughout the pandemic, mathematicians were working hard to predict how the epidemic would evolve given the best information available about the transmissibility of the virus, and the extent to which people would willingly adopt protective behaviours. While mathematicians have an excellent understanding of disease spread when behaviours are static, our understanding of opinion dynamics is much more elementary. Researchers in the social sciences, however, have been working hard to try and understand the way opinions and behaviours evolve in a human population, and so the time is ripe to bring mathematicians and social scientists together. The social scientists have theories that help explain human behaviour in qualitative ways, while mathematical models are powerful tools for developing predictions that can be tested in experiments or used to guide policy. At this workshop, mathematicians learned from social scientists how emotions and internal biases drive the way human opinions change over time, and then will be equipped to figure out how to translate this knowledge into mathematical equations. Ultimately, the participants will create a new set of fundamental, realistic, disease-and-opinion-dynamics models that can form the basis of future epidemic modelling.

Participants:

Adu-Boahen, George (Memorial University)

Aghaeeyan, Azadeh (Brock University)

Agusto, Folashade (University of Kansas)

Arino, Julien (University of Manitoba)

Ashby, Ben (Simon Fraser University)

Baky Haskuee, Mortaza (York University)

Bauch, Chris (University of Waterloo)

Baumgaertner, Bert (University of Idaho)

Beckage, Brian (University of Vermont)

Bélair, Jacques (Université de Montréal)

Bizyaeva, Anastasia (Cornell University)

Cardenas, Diana (Université de Montréal)

Caron-Diotte, Mathieu (Université de Montréal)

Childs, Lauren (Virginia Tech)

Cojocaru, Monica (University of Guelph)

Coombs, Daniel (University of British Columbia)

Das, Haridas Kumar (Oklahoma State University)

de la Sablonnière, Roxane (Université de Montréal)

Deardon, Rob (University of Calgary)

Delehanty, Megan (University of Calgary)

Dogra, Rajni (Queen's University)

Foxall, Eric (University of British Columbia Okanagan)

French Bourgeois, Laura (Western University)

Garain, Koushik (National Taiwan University)

Garstka, Teri (University of Kansas)

Glasser, John (US Centers for Disease Control and Prevention)

Greenwood, Priscilla (UBC)

Greer, Amy (Trent University)

Gross, Louis (University of Tennessee - Knoxville)

Heffernan, Jane (York University)

Jafari, Behnaz (University of Calgary)

Lacasse, Katherine (Rhode Island College)

Lacourse, Eric (Université de Montréal)

Laliberté, Félix (Université de Montréal)

Lenhart, Suzanne (University of Tennessee)

Li, Jing (California State University Northridge)

Machado-Marques, Sarah (York University)

Martignoni, Maria (Hebrew University of Jerusalem)

Martin, Hugo (Université de Rennes)

McConnell-Soong, Lindsey (University of Idaho)

Moyles, Iain (York University)

Nasri, Bouchra (ESPUM)

Njagarah, Hatson John Boscoh (Botswana International University of Science and Technology)

O'Connor, Cailin (UC Irvine)

Ordorica Arango, Marcela (Princeton University)

Papagelis, Manos (York University)

Pelletier-Dumas, Mathieu (Université de Montréal)

Pujo-Menjouet, Laurent (Université de Lyon)

Rahman, Md Mijanur (UBC - Okanagan)

Ramazi, Pouria (Brock University)

Ranson, Grégoire (York University/Université de Lyon)

Reynolds, Katherine (University of Melbourne & Australian National University)

Rost, Gergely (University of Szeged)

Saad-Roy, Chadi (University of California, Berkeley)

Sadhu, Susmita (Georgia College and State University)

Sarathchandra, Dilshani (University of Idaho)

Schwartz, Elissa (Washington State University)

Sims, Charles (University of Tennessee)

Smith, Stacey (The University of Ottawa)

Spiteri, Ray (University of Saskatchewan)

Stockdale, Jessica (Simon Fraser University)

Tovissode, Chenangnon (University of Idaho)

Tyson, Rebecca (UBC - Okanagan)

Varughese, Marie (Institute of Health Economics)

Velasco-Hernandez, Jorge (UNAM)

Ward, Madeline (University of Calgary)

Watmough, James (University of New Brunswick)

Woldegerima, Woldegebriel Assefa (York University)

Woodman, Deborah (Algoma University)

Yanushkevich, Svetlana (University of Calgary)

Yedomonhan, Elodie (Laboratoire de Biomathématiques et d'Estimations Forestières (LABEF-UAC))

Zhu, Huaiping (York University)

Group Operator Algebras: Classification, Structure and Rigidity

September 22 - 27, 2024

Organizers:

Adrian Ioana (University of California, San Diego)

Matthew Kennedy (University of Waterloo)

Ionut Chifan (The University of Iowa)

Tatiana Shulman (University of Gothenburg)

Cyril Houdayer (Ecole normale supérieure)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5174*

Operator algebras are collections of certain infinite matrices, called Hilbert space operators. They were originally introduced in the 1920s in order to formalise quantum mechanics and understand representation theory of groups. Operator algebras (C*-algebras and von Neumann algebras) arise naturally from representations of groups as unitary operators on a Hilbert space. A fundamental problem is to classify and investigate the structure of these so-called group operator algebras. The workshop focused on this problem and related applications of operator algebras to groups and their representations. This is a broad and exciting research program, which has deep interactions with several areas of mathematics including (geometric and measured) group theory, ergodic theory and topological dynamics. The workshop built on these connections and recent spectacular developments to generate further interaction and progress.

Participants:

Arimoto, Ryoya (Kyoto University)

Ariza Mejia, Juan Felipe (University of Iowa)

Arzhantseva, Goulnara (University of Vienna)

Bray, Thomas (University of Waterloo)

Chifan, Ionut (The University of Iowa)

Courtney, Kristin (University of Southern Denmark)

Dadarlat, Marius (Purdue University)

Ding, Changying (UCLA)

Dogon, Alon (Weizmann Institute of Science)

Donvil, Milan (KU Leuven)

Drimbe, Daniel (University of Oxford)

Eckhardt, Caleb (Miami University)

Elkiær, Emilie (University of Oslo)

Fernández Quero, Adriana (University of Iowa)

Gao, David (University of California San Diego)

Geffen, Shirly (University of Münster)

Glebe, Forrest (University of Hawai`i Manoa)

Hartman, Yair (Ben Gurion University)

Hayes, Benjamin (University of Virginia)

Houdayer, Cyril (Ecole normale supérieure)

Ioana, Adrian (University of California, San Diego)

Jekel, David (University of Copenhagen)

Kennedy, Matthew (University of Waterloo)

Kroell, Larissa (University of Waterloo)

Kunnawalkam Elayavalli, Srivatsav (UCSD)

Levit, Arie (Tel Aviv University)

Musat, Magdalena (University of Copenhagen)

Osin, Denis (Vanderbilt University)

Oyakawa, Koichi (Vanderbilt University)

Ozawa, Narutaka (Kyoto University)

Patchell, Gregory (UC San Diego)

Peterson, Jesse (Vanderbilt University)

Popa, Sorin (UCLA)

Reznikoff, Sarah (Virginia Tech)

Séguin, Erik (University of Waterloo)

Sehnem, Camila (University of Waterloo)

Slofstra, William (University of Waterloo)

Strung, Karen (Institute of Mathematics - Czech Academy of Sciences)

Suzuki, Yuhei (Hokkaido University)

Tan, Hui (University of California San Diego)

Toyosawa, Kai (Vanderbilt University)

Ursu, Dan (University of Münster)

Vaes, Stefaan (KU Leuven)

Vigdorovich, Itamar (University of California San Diego)

Viola, Maria Grazia (Lakehead University)

Wang, Yanyu (Vanderbilt University)

Wiersma, Matthew (University of Winnipeg)

Yang, Dilian (University of Windsor)

Zheng, Tianyi (University of California, San Diego)

Zhou, Shuoxing (ENS Paris)

Zucker, Andy (University of Waterloo)

New Perspectives in Colouring and Structure

September 29 - October 4, 2024

Organizers:

Alex Scott (University of Oxford)

Carla Groenland (TU Delft)

Bojan Mohar (Simon Fraser University)

Paul Seymour (Princeton University)

Sophie Spirkl (University of Waterloo)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5272*

The study of graph colouring is a central theme in combinatorics, with a rich theory and many important open problems. The colouring of graphs also has connections and applications in many other areas, including algorithm design, scheduling and resource allocation, statistical physics, and social choice theory. A common theme in colouring problems is the relationship between chromatic number and graph structure. In the last few years, there have been some important steps forward on Hadwiger's Conjecture, and major progress on some of the many other questions on graph colouring, as well as a wide array of new structural tools.

This workshop brought together most of the originators of these new developments, as well as both junior and senior researchers with interests in the field, to explore recent breakthroughs and the new territory they have opened up.

Participants:

Bastide, Paul (LaBRI Bordeaux and TU Delft)

Blanco, Pablo (Rutgers University)

Bonnet, Edouard (ENS de Lyon)

Bucic, Matija (Princeton University)

Carter, Daniel (Princeton University)

Chaniotis, Aristotelis (University of Waterloo)

Chudnovsky, Maria (Princeton)

Clow, Alexander (Simon Fraser University)

Codsi, Julien (Princeton University)

Cook, Linda (University of Amsterdam (starting Aug 1), Currently at Institute for Basic Science in Korea)

Davies, James (University of Cambridge)

Delcourt, Michelle (Toronto Metropolitan University)

Dujmović, Vida (University of Ottawa)

Duron, Julien (ENS Lyon)

Dvorak, Zdenek (Charles University)

Esperet, Louis (CNRS)

Fan, Xinyue (University of Waterloo)

Feghali, Carl (CNRS, Ens Lyon)

Georgakopoulos, Agelos (University of Warwick)

Girao, Antonio (University of Oxford)

Groenland, Carla (TU Delft)

Hajebi, Sepehr (Princeton University [soon -- currently at the University of Waterloo])

Hajebi, Sahab (University of Waterloo)

Hatzel, Meike (Institute for Basic Science (IBS))

Haxell, Penny (University of Waterloo)

Hilaire, Claire (University of Primorska)

Hogan, Emma (University of Oxford)

Illingworth, Freddie (University College London)

Johnston, Tom (University of Bristol)

Kim, Eunjung (CNRS, Paris-Dauphine University)

Kim, Seokbeom (KAIST & IBS DIMAG)

Koerts, Hidde (University of Waterloo)

Kucheriya, Gaurav (Charles University)

Kumar, Hitesh (Simon Fraser University)

LaGrange, Taite (University of Waterloo)

Li, Michael (Princeton University)

Lin, Andrew (Princeton University)

Liu, Chun-Hung (Texas A&M University)

Marin, Malory (ENS Lyon)

McCarty, Rose (Princeton University)

Merker, Laura (Karlsruhe Institute of Technology)

Michel, Lukas (University of Oxford)

Milanic, Martin (University of Primorska)

Mohar, Bojan (Simon Fraser University)

Moore, Benjamin (ISTA)

Morrison, Natasha (University of Victoria)

Nguyen, Tung (Princeton University)

Norin, Sergey (McGill University)

Oum, Sang-il (Institute for Basic Science)

Pach, Janos (Alfred Renyi Institute of Mathematics)

Pilipczuk, Marcin (University of Warsaw)

Postle, Luke (University of Waterloo)

Rambaud, Clément (Université Côte d'Azur)

Reed, Bruce (Academia Sinica)

Rundstrom, Mathieu (University of Waterloo)

Sadhukhan, Arpan (TU Eindhoven)

Scott, Alex (University of Oxford)

Seymour, Paul (Princeton University)

Song, Zi-Xia (University of Central Florida)

Spirkl, Sophie (University of Waterloo)

Stein, Maya (University of Chile)

Steiner, Raphael (ETH Zurich)

Tamitegama, Youri (University of Oxford)

Tan, Jane (University of Oxford)

Trotignon, Nicolas (CNRS, France)

Walczak, Bartosz (Jagiellonian University)

Watrigant, Rémi (Université de Lyon)

Wei, Fan (Duke University)

Wesolek, Alexandra (Technische Universität Berlin)

Wollan, Paul (University of Rome)

Wood, David (Monash University)

Wu, Hehui (Fudan University)

Yepremyan, Liana (Emory University)

Dynamical Models Inspired by Biology

October 6 - 11, 2024

Organizers:

Adrian Lam (The Ohio State University)

Vincent Calvez (CNRS)

Bei Hu (University of Notre Dame)

Yuan Lou (Shanghai Jiao Tong University)

Bo Zhang (Oklahoma State University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5209*

This interdisciplinary workshop combined discussions of recent progress in the study of systems of PDEs and other dynamical models that are inspired by biology. There were three main areas of focus:

- Understanding the role of dispersal in a changing environment;

- Selection-mutation models in evolutionary biology;

- Free boundary models coming from bio-medicine.

We facilitated the exchange of mathematical tools and ideas across the research areas spanned by the participants. This workshop brought together mathematicians and biologists, each using different approaches to tackle the biological problem at hand.

Participants:

Abreu, Daniel (Universidade Federal do ABC)

Afful, Bernard (Utah State University)

Beaudin, Joshua (University of Manitoba)

Beckman, Noelle (Utah State University)

Beckman, Erin (Utah State University)

Calvez, Vincent (Centre National de la Recherche Scientifique)

Cantrell, Robert Stephen (University of Miami)

Castellano, Keoni (Virginia Tech)

Chen, Renfei (Shanxi Normal University)

Choi, Kyunghan (University of Alberta)

Chu, Jia-Wei (Hong Kong Polytechnic University)

Cooney, Daniel (University of Illinois)

Cosner, Chris (University of Miami)

Dawes, Adriana (The Ohio State University)

De Angelis, Donald (University of Miami)

Dekens, Léonard (Francis Crick Institute)

Demircigil, Mete (University of Arizona)

Ellinwood, Nick (Eli Lilly)

Fagan, William (University of Maryland)

Farrior, Caroline (University of Texas at Austin)

Farsad, Ali (Ohio State University)

Fatheddin, Parisa (Ohio State University)

Feng, Zhilan (National Science Foundation)

Friedman, Avner (Ohio State University)

Gao, Daozhou (Cleveland State University)

Garain, Koushik (National Taiwan University)

Goddard II, Jerome (Auburn University Montgomery)

Gomez, Daniel (University of Pennsylvania)

Gumel, Abba (University of Maryland)

Hao, Wenrui (Penn State University)

Hastings, Alan (University of California Davis)

Henderson, Chris (University of Arizona)

Hillen, Thomas (University of Alberta)

Holt, Robert (University of Florida)

Hu, Bei (University of Notre Dame)

Kang, Yun (Arizona State University)

Kao, Chiu-Yen (Claermont McKenna College)

Lam, Adrian (The Ohio State University)

Lewis, Mark (University of Victoria)

Li, Rui (Shenzhen Technology University)

Liao, Kang-Ling (University of Manitoba)

Liu, Junqi (Western University)

Lou, Yuan (Shanghai Jiao Tong University)

Lu, Yuanming (University of Florida)

Lutscher, Frithjof (University of Ottawa)

Lyberger, Kelsey (Stanford University)

Maringoli Cardoso, Jorge Franco (Utah State U.)

McClure, Jake (Utah State University)

Murphy, Quiyana (Virginia Tech)

Parshad, Rana (Iowa State University)

Poloni, Silas (University of Victoria)

Romanos, Michele (CNRS)

Salako, Rachidi (University of Nevada Las Vegas)

Schreiber, Sebastian (University of California, Davis)

Senthilnathan, Athma (Dartmouth College)

Shuai, Zhisheng (University of Central Florida)

Siewe, Nourridine (Rochester Institute of Technology)

Singh, Sudhir (GITAM University)

Singh, Sudhir (GITAM University, Bengaluru, India)

Sundus, Aneequa (Indiana University Bloomington)

Thiessen, Ryan (University of Alberta)

Tripathi, Priyambada (Vidyashilp University)

Turanova, Olga (Michigan State University)

Tyson, Rebecca (UBC Okanagan)

Wang, Hao (University of Alberta)

Wang, Lin (University of Ottawa)

Wang, Yangyang (Brandeis University)

Wei, Ning (Purdue University)

Witzel, Laura (North Carolina State University)

Wu, Chang-Hong (National Yang Ming Chiao Tung University)

Wu, Ruiwen (Jinan University)

Xu, Linhao (University of Miami)

Yu, Xiao (South China Normal University)

Zhang, Bo (Oklahoma State University)

Zhang, Ying (Northeastern University)

Zhao, Xinyue (University of Tennessee Knoxville)

Zhao, Ruijun (Minnesota State University, Mankato)

Zhao, Rujing (Western University)

Zou, Xingfu (University of Western Ontario)

Symmetry and Geometry in Neural Representations
October 13 - 18, 2024 (Cancelled)

Organizers:

Sophia Sanborn (University of British Columbia) Christian Shewmake (UC Berkeley)

Nina Miolane (UC Santa Barbara)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5269*

In recent years, there has been a growing appreciation for the importance of modeling the geometric structure in data - a perspective that has developed in both the geometric deep learning and geometric statistics communities. In parallel, an emerging set of findings in neuroscience suggests that group-equivariance and the preservation of geometry and topology may be fundamental principles of neural coding in biology. This workshop will bring together researchers from applied geometry and geometric machine learning with theoretical and empirical neuroscientists whose work reveals the elegant implementation of geometric structure in biological neural circuitry. Group theory and geometry were instrumental in unifying models of fundamental forces and elementary particles in 20th-century physics. Likewise, they have the potential to unify our understanding of how neural systems form useful representations of the world. The goal of this workshop is to unify the emerging paradigm shifts towards structured representations in deep neural networks and the geometric modeling of neural data, while promoting a solid mathematical foundation in differential geometry and group theory.

New Directions in Machine Learning Theory

October 20 - 25, 2024

Organizers:

Karbasi Amin (Yale University)

Ellen Vitercik (Stanford University)

Shai Ben-David (University of Waterloo)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5308*

Machine learning and artificial intelligence have shown tremendous growth in the last few years. However, much of the success has been driven by empirical research and heuristic methods. In this workshop, we are aiming to bring the theory and practice of ML closer in 3 important directions, all of which center on human-in-the-loop ML. First, it has become clear that the traditional learning theory does not explain the success of the novel training methods, and that interactive learning can accelerate the learning process. Second, ML methods are part of a bigger and interconnected ecosystem and are rarely used in isolation. Third, when ML methods are used in high-stake scenarios, not only their predictions but also how they reached such predictions are important. This workshop aimed to make a rigorous step toward a better understanding of the aforementioned limitations and proposing solid solutions.

Participants:

Amin, Karbasi (Yale University)

Baek, Jackie (NYU Stern School of Business)

Balkanski, Eric (Columbia)

Ben-David, Shai (University of Waterloo)

Bordt, Sebastian (University of Tübingen)

Bradley, Arwen (Apple)

Brânzei, Simina (Purdue)

Cai, Yang (Yale)

Choo, Davin (National University of Singapore)

Dasgupta, Sanjoy (UCSD)

Flanigan, Bailey (Harvard)

Haghtalab, Nika (University of California, Berkeley)

Ikeokwu, Christian (UC Berkeley)

Kamath, Gautam (University of Waterloo)

Khodak, Mikhail (Princeton University)

Kontonis, Vasilis (UT Austin)

Larsen, Kasper Green (Aarhus University)

Lechner, Tosca (Vector Institute)

Littwin, Etai (Apple)

Ma, Will (Columbia University)

Mazumdar, Eric (California Institute of Technology)

Morgenstern, Jamie (University of Washington)

Nakkiran, Preetum (Apple)

Paes Leme, Renato (Google Research)

Podimata, Chara (MIT)

Ruiz, Luana (JHU)

Sabato, Sivan (McMaster University)

Saha, Barna (UCSD)

Schneider, Jon (Google)

Sharan, Vatsal (USC)

Shetty, Abhishek (UC Berkeley)

Sorrell, Jess (Johns Hopkins University)

Syrgkanis, Vasilis (Stanford University)

Vitercik, Ellen (Stanford University)

Zampetakis, Manolis (Yale University)

Zrnic, Tijana (Stanford University)

Nonlinear Water Waves: Rigorous Analysis and Scientific Computing

October 27 - November 1, 2024

Organizers:

Mark Groves (Universität des Saarlandes)

Emilian Parau (University of East Anglia)

Olga Trichtchenko (University of Western Ontario)

Mariana Haragus (Université de Franche-Comté)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5207*

There have been research programmes at leading mathematical institutes around the world, workshops at major conferences and an explosion in the numbers of highly talented early career researchers. It thus appeared timely to convene a further workshop in Banff to review the state of the art (including in particular a number of recent unexpected breakthroughs using methods from apparently unconnected areas of mathematics). The workshop distinguished itself from other events by concentrating on the interaction between researchers with expertise on rigorous mathematical analysis and experts on scientific computing for the exact hydrodynamic equations, bridging the divide between Pure and Applied Mathematics.

Participants:

Agrawal, Siddhant (University of Colorado Boulder)

Ahmad, Rami (Saarlands)

Akers, Benjamin (Air Force Institute of Technology)

Alonso-Oran, Diego (Universidad de La Laguna)

Ambrose, David (Drexel University)

Andrade, David (Universidad del Rosario)

Barros, Ricardo (Loughborough University)

Batakci, Levent (University of Washington)

Blyth, Mark (University of East Anglia)

Brull, Gabriele (Lund University)

Buffoni, Boris (Ecole Polytechnique Federale - Lausanne)

Byrnes, Ellie (University of Washington)

Carnevale, Chiara Libera (Penn State University)

Chen, Ming (University of Pittsburgh)

Choi, Wooyoung (NJIT)

Clamond, Didier (Universite Cote dAzur)

Creedon, Ryan (Brown University)

Deconinck, Bernard (University of Washington)

Durey, Matt (University of Glasgow)

Ehrnstrom, Mats (NTNU)

Geyer, Anna (TU Delft)

Granero-Belinchon, Rafael (Universidad de Cantabria)

Groves, Mark (Universitat des Saarlandes)

Grubic, Nastasia (CSIC)

Guan, Xin (University College London)

Gutheil, Nils (Saarlands)

Haragus, Mariana (Universite de Franche Comte)

Haziot, Susanna (Princeton University)

Henry, David (University College Cork)

Hilder, Bastian (TU Munich)

Hildrum, Fredrik (NTNU)

Hill, Dan (Saarland University)

Hur, Vera (University of Illinois Urbana-Champaign)

Ifrim, Mihaela (University of Wisconsin-Madison)

Ionescu, Alexandru (Princeton University)

Ionescu-Kruse, Delia (The Institute of Mathematics of the Romanian Academy)

Kairzhan, Adilbek (Nazarbayev University)

Kalisch, Henrik (University of Bergen)

Kalogirou, Anna (University of Nottingham)

Keeler, Jack (University of East Anglia)

Lannes, David (Universite de Bordeaux)

Lian, Wei (Lund University)

Martin, Calin (University of Vienna)

Milewski, Paul (Penn State)

Murashige, Sunao (Ibaraki University)

Nguyen, Huy (University of Maryland at College Park)

Nicholls, David (University of Illinois at Chicago)

Nilsson, Dag (Lund University)

Oliveras, Katie (Seattle University)

Parau, Emilian (University of East Anglia)

Pasquali, Stefano (SISSA)

Phillips, Kat (University of Warwick)

Pineau, Ben (NYU Courant)

Quirchmayr, Ronald (BBU, Cluj-Napoca)

Ribeiro, Roberto (Federal University of Paraná)

Saqib, Muhammad (Khwaja Fareed University of Engineering and Information Technology Rahim Yar Khan Pakistan)

Schneider, Guido (University of Stuttgart)

Semenova, Anastassiya (University of Washington)

Shelton, Josh (University of Bath)

Sinambela, Daniel (New York University, Abu Dhabi)

Singh, Sudhir (GITAM University, Bengaluru, India)

Stuhlmeier, Raphael (University of Plymouth)

Su, Qingtang (AMSS, Chinese Academy of Sciences)

Sulem, Catherine (University of Toronto)

Sun, Shu-Ming (Virginia Tech)

Svensson Seth, Douglas (NTNU)

Tataru, Daniel (UC Berkeley)

To, Giang (Lund University)

Trichtchenko, Olga (University of Western Ontario)

Tugulan, Claudia (The University of Western Ontario)

Vargas Magana, Rosa Maria (University of Bergen)

Varholm, Kristoffer (University of Pittsburgh)

Wahlen, Erik (Lund University)

Walsh, Samuel (University of Missouri)

Weber, Jorg (University of Vienna)

Wheeler, Miles (University of Bath)

Wilkening, Jon (University of California, Berkeley)

Wu, Sijue (University of Michigan, Ann Arbor)

Zhao, Xinyu (McMaster University)

Zheng, Zibo (NJIT)

Cartan Subalgebras in Operator Algebras, and Topological Full Groups

November 3 - 8, 2024

Organizers:

Astrid an Huef (Victoria University of Wellington)

Anna Duwenig (University of Victoria)

Aidan Sims (University of Wollongong)

Dilian Yang (University of Windsor)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5175*

This workshop was inspired by several recent breakthroughs in the mathematics of Cartan subalgebras and groupoids. These results showed that understanding Cartan subalgebras could unlock the last remaining mystery at the heart of classification of C*-algebras, could answer long-standing questions in the study of complex systems evolving through time, and have already provided new examples in group theory that have evaded researchers for many years. The workshop provided a forum for interaction between these research areas to capitalize on the unexpected new connections arising from these new results. To do so, it brought together the best minds, from early-career researchers to current world-leaders in the three areas in question. It addressed major open problems and forged new collaborations that will carry mathematical research forward over the coming years.

Participants:

an Huef, Astrid (Victoria University of Wellington)

Armstrong, Becky (Victoria University of Wellington)

Brown, Jon (University of Dayton)

Brownlowe, Nathan (The University of Sydney)

Deeley, Robin (University of Colorado, Boulder)

Duwenig, Anna (KU Leuven)

Fuller, Adam (Ohio University)

Garrido, Alejandra (Universidad Complutense de Madrid)

Gillaspy, Elizabeth (University of Montana)

Giordano, Thierry (University of Ottawa)

Goncalves de Castro, Gilles (Federal University of Santa Catarina)

Kennedy, Matthew (University of Waterloo)

Kroell, Larissa (University of Waterloo)

Laca, Marcelo (University of Victoria)

Li, Xin (University of Glasgow)

Lin, Ying-Fen (Queen's University Belfast)

Martinez, Diego (KU Leuven)

Martinez-Perez, Conchita (Universidad de Zaragoza)

Norton, Rachael (St. Olaf College)

Nucinkis, Brita (Royal Holloway, University of London)

Oyetunbi, Dolapo (University of Windsor)

Pi, Jennifer (University of Oxford)

Pitts, David (University of Nebraska-Lincoln)

Putnam, Ian (University of Victoria)

Raad, Ali (American University in Bulgaria)

Raum, Sven (University of Potsdam)

Reznikoff, Sarah (Virginia Tech)

Ruiz, Efren (University of Hawaii at Hilo)

Sehnem, Camila (University of Waterloo)

Sims, Aidan (University of Wollongong)

Siron-Barluenga, Sofia (Universidad de Zaragoza)

Strung, Karen (Institute of Mathematics - Czech Academy of Sciences)

Szakacs, Nora (University of Manchester)

Tolich, Ilija (Victoria University of Wellington)

Vdovina, Alina (The City College of New York and Graduate Center, CUNY)

Willett, Rufus (University of Hawaii at Manoa)

Williams, Dana (Dartmouth College)

Wright, Sarah (Fitchburg State University)

Yang, Dilian (University of Windsor)

Zhu, Jennifer (University of Waterloo)

Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics

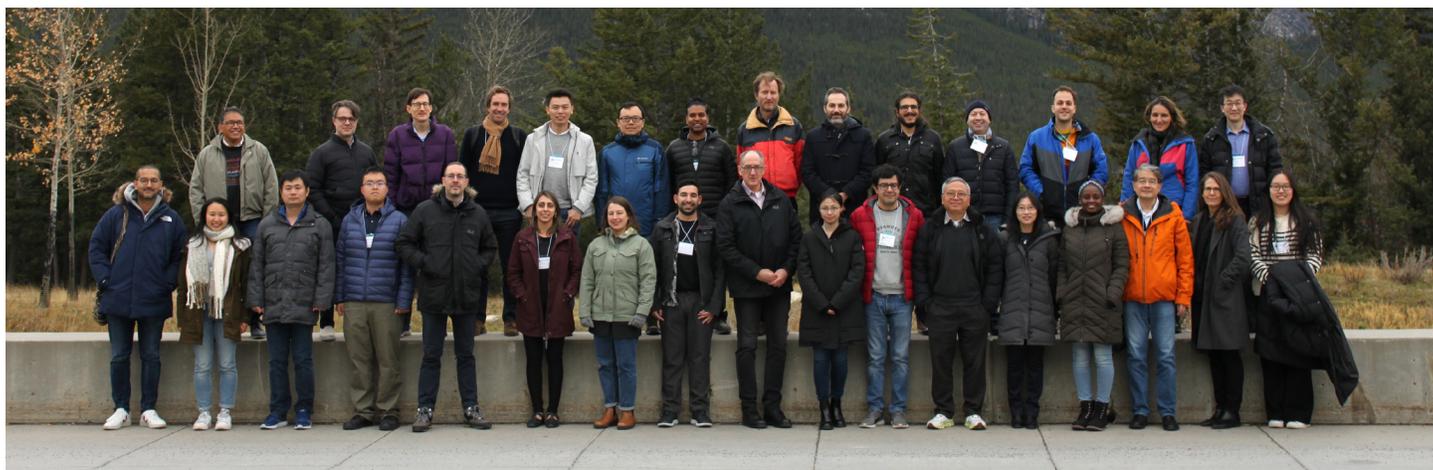## November 10 - 15, 2024

Organizers:

Antonis Papapantoleon (TU Delft | NTUA | FORTH)

Ruimeng Hu (University of California, Santa Barbara)

Christoph Frei (University of Alberta)

Emma Hubert (Princeton University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5257*

This 5-day research workshop at the Banff International Research Station was motivated by the need to better understand, quantify and regulate the risk of financial markets in the face of massive technological and economic changes. In order to discuss and assess these new developments, the workshop brought together experts from the fields of financial mathematics, financial technology (FinTech), and mathematical economics. The focus lied on the following three topics which are at different levels of modeling development and technical complexity:

(i) interbank markets, valuation adjustments and clearinghouses,

(ii) energy and commodity markets,

(iii) FinTech and high-frequency trading.

Participants:

Aïd, René (Université Paris Dauphine–PSL)

Bichuch, Maxim (University at Buffalo)

Barnett, Michael (Arizona State University)

Capponi, Agostino (Columbia University)

Bartl, Daniel (Uni Vienna)

Castaneda, Ranu (U Alberta)

Ben Hammouda, Chiheb (Utrecht University)

Chatziandreou, Konstantinos (UvA)

Bernard, Carole (Vrije Universiteit Brussel)

Cont, Rama (University of Oxford)

Crépey, Stéphane (University Paris Cité)

Dayanikli, Gokce (University of Illinois Urbana-Champaign)

dos Reis, Goncalo (University of Edinburgh)

Fadina, Tolulope (University of Illinois Urbana-champaign)

Filipovic, Damir (EFPL)

Firoozi, Dena (HEC Montréal - Université de Montréal)

Fouque, Jean-Pierre (University of California Santa Barbara)

Frei, Christoph (University of Alberta)

Gauthier, Geneviève (HEC Montreal)

Gonon, Lukas (Imperial College London)

Grasselli, Matheus (McMaster University)

Guo, Xin (UC Berkeley)

Hernandez, Daniel (Research Center for Mathematics)

Hernandez, Camilo (USC)

Horst, Ulrich (Humboldt University Berlin)

Hu, Ruimeng (University of California, Santa Barbara)

Hu, Anran (Columbia University)

Hubert, Emma (Princeton University)

Jaimungal, Sebastian (University of Toronto)

Karbach, Sven (UvA)

Kheder, Asma (University of Amsterdam)

Kou, Steven (Boston University)

Kratsios, Anastasis (McMaster and Vector Institute)

Lauriere, Mathieu (NYU Shanghai)

Liu, Chenguang (TU Delft)

Ludkovski, Mike (UC Santa Barbara)

MacKay, Anne (Université de Sherbrooke)

Mast, Gijs (TU Delft)

Mastrolia, Thibaut (UC Berkeley)

Matthys, Felix (Instituto Tecnológico Autónomo de Mexico)

Minca, Andreea (Cornell University)

Papapantoleon, Antonis (TU Delft | NTUA | FORTH)

Pesenti, Silvana (University of Toronto)

Possamaï, Dylan (ETH Zürich)

Qiu, Jinniao (University of Calgary)

Reppen, Max (BU Questrom School of Business)

Rou, Jasper (TU Delft)

Rudloff, Birgit (Vienna University of Business and Economics)

Saplaouras, Alexandros (National Technical University of Athens)

Sester, Julian (National University of Singapore)

Shi, Xiaofei (University of Toronto)

Shkolnikov, Mykhaylo (Carnegie Mellon University)

Sircar, Ronnie (Princeton University)

Sirignano, Justin (University of Oxford)

Smaragdakis, Costas (University of the Aegean)

Spiliopoulos, Konstantinos (Boston University)

Tangpi, Ludovic (Princeton University)

Wang, Ruodu (University of Waterloo)

Weber, Marko Hans (National University of Singapore)

Xu, Renyuan (New York University)

Yang, Yang (University of Calgary)

Yu, Fenghui (TU Delft)

Zariphopoulou, Thaleia (The University of Texas at Austin)

Zhang, Jiacheng (Chinese University of Hong Kong)

Zhang, Zhaoyu (UCLA)

Zhang, Yufei (Imperial College London)

Zhou, Xunyu (Columbia University)

Zhou, Haosheng (UCSB)

Detection and Analysis of Gravitational Waves in the era of Multi-Messenger Astronomy
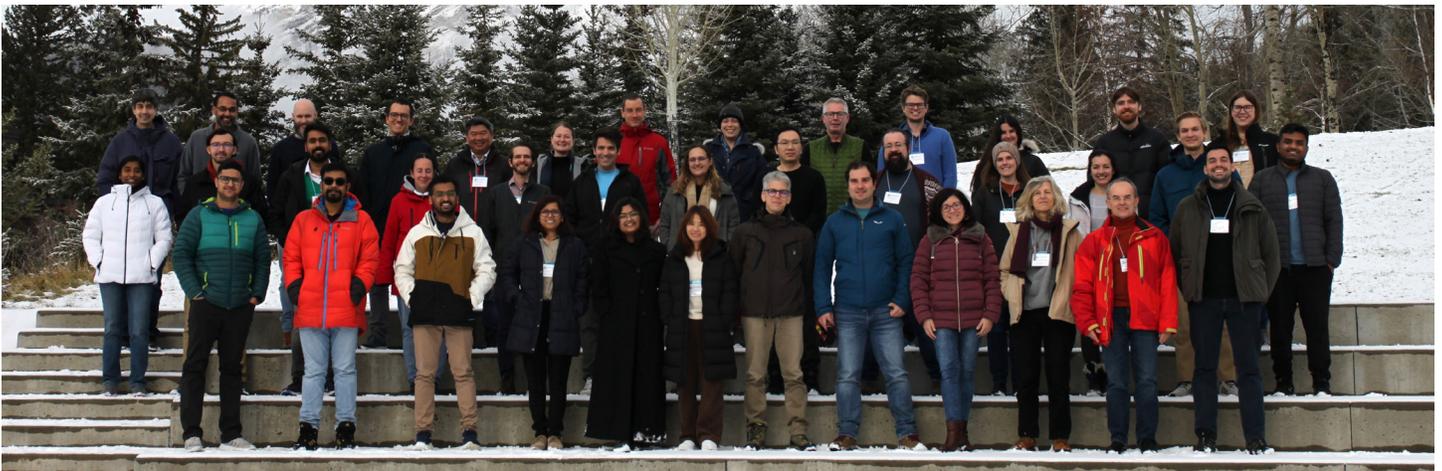
November 17 - 22, 2024

Organizers:

Marco Cavaglia (Missouri S&T)

Elena Cuoco (European Gravitational Observatory)

Jade Powell (Swinburne University of Technology)

Shaon Ghosh (Montclair State University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5177*

Gravitational waves are a new way to explore the sky and uncover the Universe's deepest mysteries. In the last few years, tens of gravitational-wave detections have allowed scientists to harness the potential of gravitational waves in testing Einstein's General Relativity theory under extreme conditions, helping to understand the origin of dense matter, measuring the Hubble constant, and estimating the population of black holes in the Universe. Researchers from all around the world gathered in Banff to discuss new, recent results from the LIGO, Virgo and KAGRA detectors and the future of gravitational-wave science. The workshop, a second in its series, provided a forum, unique in its genre, for discussing new mathematical methods in modelling, detecting, and analyzing gravitational waves, as well as their integration with machine learning and artificial intelligence.

Participants:

Ackley, Kendall (University of Warwick)

Afzal, Adeela (Quaid-i-Azam University Islamabad)

Aleman, Brianna (Cal State Northridge)

Antier, Sarah (OCA)

Bachhar, Ritesh (University of Rhode Island)

Banagiri, Sharan (Northwestern U. / Monash U.)

Baylor, Amanda (U. of Wisconsin - Milwaukee)

Bessa, Pedro (CBPF)

Borghetto, Giulia (University of Swansea)

Brady, Patrick (University of Wisconsin-Milwaukee)

Canizares, Priscilla (University of Cambridge)

Cardoso, Vitor (University of Lisbon)

Caudill, Sarah (UMass Dartmouth)

Cavaglia, Marco (Missouri Univ. of Science and Technology)

Chan, Mervyn (University of British Columbia)

Chandra, Koustav (Penn State University)

Chowdhury, Sourav Roy (Southern Federal U.)

Chowdhury, Debika (Indian Institute of Astrophysics)

Cordero-Carrión, Isabel (University of Valencia)

Coughlin, Michael (University of Minnesota)

Cuoco, Elena (European Gravitational Observatory)

Davis, Derek (California Institute of Technology)

Dejrah, Rafid H. (Ankara University)

Di Renzo, Francesco (Institut de Physique des 2 Infinis de Lyon)

Dooney, Tom (Utrecht University)

Emma, Mattia (Royal Holloway University of London)

Farr, Ben (University of Oregon)

Ghosh, Shaon (Montclair State University)

Ghosh, Shrobana (Max Planck Institute for Gravitational Physics (AEI) Hannover)

Gupta, Anuradha (University of Mississippi)

Heng, Ik Siong (University of Glasgow)

Kumar, Bhuvnesh (University of Malaysia)

Laguna, Pablo (University of Texas at Austin)

Lopez, Melissa (Nikhef)

Lyu, Zhenwei (Dalian University of Technology)

Magee, Ryan (California Institute of Technology)

Malakar, DIshari (Missouri S&T)

McIver, Jessica (The University of British Columbia)

Messenger, Christopher (University of Glasgow)

Messick, Cody (University of Wisconsin-Milwaukee)

Millhouse, Meg (Georgia Institute of Technology)

Miravet-Tenés, Miquel (University of Southampton)

Moon, Yashasvi (Missouri State University)

Morisaki, Soichiro (University of Tokyo)

Nagarajan, Narenraju (University of Glasgow)

Noureen, Tayyaba (Lahore University of Management Sciences)

Pannarale, Francesco (Sapienza U. of Rome & INFN)

Parameswaran, Ajith (International Center for Theoretical Sciences (ICTS), Bangalore)

Patricelli, Barbara (University of Pisa)

Powell, Jade (Swinburne University of Technology)

Ray, Anarya (Northwestern University)

Razzano, Massimiliano (University of Pisa)

Rivera, Marco Immanuel (ARTEMIS/OCA)

Roulet, Javier (California Institute of Technology)

Sakellariadou, Mairi (King's College London)

Sarin, Nikhil (Nordita-Stockholm)

Sathyaprakash, Bangalore (Pennsylvania State U.)

Scialpi, Matteo (University of Ferrara)

Serra, Marco (INFN Sezione di Roma)

Sharma Chaudhary, Sushant (Missouri University of Science and Technology)

Shoemaker, Deirdre (University of Texas at Austin)

Singh, Amitesh (University of Mississippi)

Soni, Kanchan (Syracuse University)

Tang, Yong (ICTP-AP)

Teofilo, F. Enrico (University of Pisa)

Toivonen, Andrew (University of Minnesota)

Ubach, Helena (University of Barcelona, ICCUB)

Vajente, Gabriele (California Institute of Technology)

Wadekar, Digvijay (Jay) (Johns Hopkins U.)

Wang, He (U. of Chinese Academy of Sciences)

Winborn, Charlie (Missouri U. of Science and Technology)

Wysocki, Daniel (UW - Milwaukee)

Zheng, Yanyan (Missouri U. of S&T)

Zimmerman, Aaron (University of Texas at Austin)

Movement and Symmetry in Graphs

November 24 - 29, 2024

Organizers:

Karen Gunderson (University of Manitoba)

Karen Meagher (University of Regina)

Joy Morris (University of Lethbridge)

Venkata Raghu Tej Pantangi (University of Regina)

Mahsa Shirazi (University of Manitoba)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5298*

Over the past three years, mathematicians from across the prairie provinces have been developing a centre of excellence in the area of "Movement and Symmetry in Graphs". In this context, a "graph" is a model for a network. Building a centre of excellence involves reaching out and mentoring students to promote and enhance their interests and skills in this field, and strengthening connections with researchers around the world with whom these students can develop careers. A very unique aspect of this particular centre of excellence is that it is led by three women: one in Winnipeg, one in Regina, and one in Lethbridge. The newly-developed centre of excellence held a workshop at the Banff International Research Station. This event served to showcase the diverse young researchers. It focused on the research they have been doing on these problems. It also introduced them to other mathematicians, including world-renowned experts, with whom they may collaborate to further develop our understanding of these problems.

Participants:

Alimirzaei, Shirin (University of Lethbridge)

Arman, Andrii (University of Manitoba)

Árnadóttir, Arnbjörg Soffía (Universidade Federal de Minas Gerais)

Bailey, Robert (Memorial University)

Balogh, Jozsef (UIUC)

behajaina, Angelot (Laboratoire Paul Painlevé (Lille))

Bonato, Anthony (Toronto Metropolitan University)

Bowtell, Candida (University of Birmingham)

Carr, MacKenzie (Simon Fraser University)

Chan, Ada (York University)

Clarke, Nancy (Acadia University)

Clavette, Francis (Universite de Montreal)

Conder, Marston (University of Auckland)

Cox, Danielle (Mount St. Vincent University)

Delcourt, Michelle (Toronto Metropolitan University)

Dobson, Edward (University of Primorska)

Dueck, Shonda (University of Winnipeg)

Duffy, Christopher (University of Melbourne)

Dukes, Peter (University of Victoria)

Fallat, Shaun (University of Regina)

Godsil, Chris (University of Waterloo)

Gunderson, Karen (University of Manitoba)

Guo, Krystal (University of Amsterdam)

Guo, He (Technion - Israel Institute of Technology)

Gupta, Himanshu (University of Regina)

Heath, Emily (Iowa State University)

Hurlbert, Glenn (Virginia Commonwealth University)

Janssen, Jeannette (Dalhousie University)

Khosravi, Behnam (Institute for Advanced Studies in Basic Sciences)

Lacaze-Masmonteil, Alice (University of Regina)

Lindzey, Nathan (University of Memphis)

MacGillivray, Gary (University of Victoria)

Maleki, Roghayeh (University of Primorska)

Meagher, Karen (University of Regina)

Meagher, Karen (University of Regina)

Miraftab, Bobby (Carleton University)

Monterde, Hermie (University of Manitoba)

Morris, Joy (University of Lethbridge)

Morris, Dave (University of Lethbridge)

Muzychuk, Mikhail (Ben Gurion U. of the Negev)

Narayanan, Bhargav (Rutgers University)

Nasserasr, Shahla (Rochester Institute of Technology)

Nir, JD (Oakland University)

Pantangi, Venkata Raghu Tej (University of Regina)

Parenteau, Johnna (University of Regina)

Plosker, Sarah (Brandon University)

Razafimahatratra, Andriaherimanana Sarobidy (Fields Institute)

Semeraro, Jason (University of Leicester)

Shirazi, Mahsa (University of Manitoba)

Solymosi, Jozsef (University of British Columbia)

Spier, Thomas (University of Waterloo)

Stevens, Brett (Carleton University)

Talebpour, Seyed Alireza (University of Regina)

Verret, Gabriel (University of Auckland)

Xia, Binzhou (The University of Melbourne)

Yip, Chi Hoi (Kyle) (University of British Columbia)

Zhan, Hanmeng (Harmony) (Simon Fraser University)

Zheng, Shasha (Comenius University in Bratislava)

Zhou, Sanming (The University of Melbourne)

Conformal and CR Geometry

December 1 - 6, 2024

Organizers:

Jeffrey Case (Penn State University)

Andrea Malchiodi (Scuola Normale Superiore)

Azahara DelaTorre Pedraza (Sapienza)

Yi Wang (Johns Hopkins University)

Pengfei Guan (McGill University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5260*

Conformal and CR geometry are the study of properties of spaces and mappings which depend on the measurement of angles but not of lengths. Recent progress in both fields is closely related to ideas and questions which arise in the AdS/CFT correspondence in string theory. In particular, Poincar\'e--Einstein metrics, which are solutions of the vacuum Einstein equations with prescribed conformal or CR data at infinity, play a key role in both fields. This workshop was organized around recent progress in understanding the existence and uniqueness of Poincar\'e--Einstein metrics, a related question for minimal submanifolds, and applications thereof to Q and Q' -curvatures, scattering theory, and related fully nonlinear PDEs. It brought together experts from a variety of mathematical backgrounds with the goals of furthering our understanding of conformal and CR geometry and of strengthening the connections and analogies between the two fields.

Participants:

Afeltra, Claudio (University of Trento)

Blitz, Samuel (Masaryk University)

Andrade, João Henrique (University of São Paolo)

Branca, Letizia (Università degli Studi di Milano)

Battaglia, Luca (Roma Tre University)

Caju, Rayssa (University of Chile)

Bernardini, Chiara (Università degli Studi di Trento)

Carron, Gilles (Universite de Nantes)

Case, Jeffrey (Penn State University)

Caselli, Michele (Scuola Normale Superiore)

Chan, Hardy (Universität Basel)

Chang, Sun-Yung Alice (Princeton University)

Chanillo, Sagun (Rutgers University)

Chen, Eric (UC Berkeley)

Cruz Blazquez, Sergio (Universidad de Granada)

Curry, Sean (Oklahoma State University)

Dameno, Davide (Universita degli Studi di Milano)

De Marchis, Francesca (Sapienza Università di Roma)

DelaTorre Pedraza, Azahara (Sapienza Università di Roma)

Di Matteo, Gianmichele (Scuola Normale Superiore di Pisa)

Duncan, Jonah (Johns Hopkins University)

Esposito, Pierpaolo (Università di Roma Tre)

Frank, Rupert (University of Munich)

Freguglia, Mattia (Scuola Normale Superiore di Pisa)

Ge, Yuxin (Université Toulouse 3)

Gover, Rod (University of Auckland)

Griffin, Erin (Northwestern University)

Han, Qing (University of Notre Dame)

Hirachi, Kengo (University of Tokyo)

Hyder, Ali (TIFR Bangalore)

Kao, Wei-Ting (National Taiwan University)

Khaitan, Ayush (Rutgers University)

Khan, Kamran (Aligarh Muslim University)

Kopinski, Jaroslaw (University of California Davis)

Kuo, Tzu-Mo (National Taiwan University)

Lee, Sanghoon (KIAS)

Lin, Yueh-Ju (Wichita State University)

Lu, Siyuan (McMaster University)

Maalaoui, Ali (Clark University)

Maeder-Baumdicker, Elena (TU Darmstadt)

Malchiodi, Andrea (Scuola Normale Superiore)

Malizia, Francesco (Scuola Normale Superiore)

Martinazzi, Luca (Sapienza Università di Roma)

Marx-Kuo, Jared (Rice University)

Mastrolia, Paolo (Universita di Milano)

Matsumoto, Yoshihiko (Osaka University)

Mayer, Martin (Scuola Superiore Meridionale)

McKeown, Stephen (University of Texas at Dallas)

Mengesha, Dawit (Penn State University)

Musso, Monica (University of Bath)

Ndiaye, Cheikh (Howard University)

Pérez-Ayala, Samuel (Haverford College)

Pistoia, Angela (Sapienza Università di Roma)

Qing, Jie (University of California, Santa Cruz)

Ratzkin, Jesse (Universität Würzburg)

Reyes Sánchez, Francisco Javier (Universidad de Granada)

Saez, Mariel (Pontificia Universidad Catolica de Chile)

Saito, Luke (Penn State University)

Takeuchi, Yuya (University of Tsukuba)

Tarantello, Gabriella (Roma Tor Vergata)

Tyrrell, Aaron (Texas Tech University)

Waldron, Andrew (University of California, Davis)

Wang, Yi (Johns Hopkins University)

Wang, Guofang (Freiburg University)

Wang, Fang (Shanghai Jiao Tong University)

Wei, Juncheng (University of British Columbia)

Weng, Liangjun (Università di Pisa)

Xia, Chao (Xiamen University)

Xiao, Ling (University of Connecticut)

Yan, Zetian (University of California Santa Barbara)

Yang, Paul (Princeton University)

Yuan, Wei (Sun Yat-Sen University)

Zhang, Xiangwen (University of California, Irvine)

Zhu, Chaona (Ningbo University)

BANFF INTERNATIONAL RESEARCH STATION

2-DAY WORKSHOPS 2024

Alberta Number Theory Days XV

March 22 - 24, 2024

Organizers:

Gulizar Sedanur Albayrak (University of Calgary)   Félix Baril Boudreau (University of Lethbridge)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/2-day-workshops/24w2020*

Number theory is a central and broad area of research with an immense amount of applications to other areas of mathematics and science. In recent years, there have been significant advances especially in the areas of algebraic and analytic number theory. The subject of number theory may be divided into several sub-disciplines that range from pure mathematics to more applied areas such as computational number theory and mathematical physics. Some of the pure mathematics sub-disciplines are algebraic number theory, arithmetic geometry, analytic number theory, automorphic forms and representation theory. The annual Alberta Number Theory Days allowed for the exchange of knowledge. New connections were made and old associations renewed. It was also an ideal forum for young talent in the Alberta number theory landscape to showcase their work and support them to continue in research.

Participants:

Akbary, Amir (University of Lethbridge)

Albayrak, Gulizar Sedanur (University of Calgary)

Alimirzaei, Shirin (University of Lethbridge)

Asgari, Amir Abbas (University of Calgary)

Aygin, Zafer Selcuk (Northwestern Polytechnic)

Balodis, Kristaps (University of Calgary)

Baril Boudreau, Félix (University of Lethbridge)

Bauer, Mark (University of Calgary)

Bell, Jason (University of Waterloo)

Benli, Kübra (University of Lethbridge)

Bhattacharjee, Sreerupa (University of Lethbridge)

Biasse, Jean-Francois (University of South Florida)

Bose, Arnab (University of Lethbridge)

Cruz, Jose (University of Calgary)

Cunningham, Clifton (University of Calgary)

David, Chantal (Concordia University)

Dijols, Sarah (University of British Columbia)

Elma, Ertan (University of Lethbridge)

Fakhari, Milad (University of Lethbridge)

Farzanfard, Golnoush (University of Lethbridge)

Fiori, Andrew (University of Lethbridge)

Ge, Zhenchao (University of Waterloo)

Gheisari, Hiva (University of Lethbridge)

Ghosh, Samprit (University of Calgary)

Gill, Brandon (University of Alberta)

Holmes, Erik (University of Toronto)

Jacobson, Michael (University of Calgary)

Jalalvand, Fatemeh (University of Calgary)

Knapp, Greg (University of Calgary)

Lozano-Robledo, Alvaro (University of Connecticut)

Maarefparvar, Abbas (University of Lethbridge)

Macri, Vincent (University of Calgary)

Mosunov, Anton (University of Waterloo)

Nguyen, Dang Khoa (University of Calgary)

Nguyen, Tri (University of Alberta)

Patnaik, Manish (University of Alberta)

Ray, Mishty (University of Calgary)

Ray, Anwesh (Chennai Mathematical Institute)

Roettger, Eric (Mount Royal University)

Saunders, J.C. (Middle Tennessee State University)

Scheidler, Renate (University of Calgary)

Smith, Jerrod (University of Calgary)

Steele, James (University of Calgary)

Tran, Ha (University of Alberta, Augustana Campus)

Yee, Randy (University of Calgary)

Combinatorial Optimization for Online Platforms
April 5 - 7, 2024

Organizers:

Rajan Udwani (UC Berkeley)

Srikanth Jagabathula (NYU Stern School of Business)

Omar El Housni (Cornell University)

Mika Sumida (USC, Marshall School of Business)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/2-day-workshops/24w2021*

Combinatorial optimization, a vital branch of mathematics that deals with finding the best solution from a large discrete space of possible solutions, is assuming an increasingly pivotal role in the digital era as online platforms grapple with complex optimization challenges. These platforms, encompassing e-commerce, social networks, ride-sharing, and streaming services, confront complex combinatorial optimization issues daily, including resource allocation, user matching, product recommendations, and item ranking. A pioneering research workshop was set to explore the latest advancements and pressing questions in combinatorial optimization for online platforms. The focus was on innovative optimization paradigms that adopt a holistic perspective, capable of handling the interconnected nature of these combinatorial and dynamic optimization challenges in a computationally tractable manner. Key topics under scrutiny included joint inventory and assortment optimization, the integration of fairness and diversity considerations into online platforms, and online and adaptive optimization.

Participants:

Aouad, Ali (London Business School)

Baek, Jackie (NYU Stern School of Business)

Caldentey, Rene (University of Chicago)

Chen, Ningyuan (University of Toronto)

Chen, Xin (Georgia Tech)

Chitla, Sandeep (NYU Stern School of Business)

Desir, Antoine (INSEAD)

El Housni, Omar (Cornell University)

Feldman, Jacob (Washington University)

Goyal, Vineet (Columbia University)

Gupta, Varun (Northwestern University)

Ibn Brahim, Marouane (Cornell University)

Jagabathula, Srikanth (NYU Stern School of Business)

Ma, Will (Columbia University)

MacRury, Calum (Columbia University)

Niazadeh, Rad (The University of Chicago Booth School of Business)

Sahin, Ozge (Johns Hopkins University)

Shmoys, David (Cornell University)

Sumida, Mika (University of Southern California, Marshall School of Business)

Sun, Shuo (UC Berkeley)

Topaloglu, Huseyin (Cornell University)

Torrico, Alfredo (Cornell University)

Udwani, Rajan (UC Berkeley)

Venkataraman, Ashwin (UT Dallas)

Ted Lewis SNAP Math Fair Workshop

April 12 - 14, 2024

Organizers:

Sean Graves (University of Alberta)   Li Solomon (University of Alberta)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/2-day-workshops/24w2022*

The purpose of a SNAP Math Fair is to provide a meaningful problem-solving experience for all students. This would be the twentieth annual Ted Lewis Math Fair Workshop at BIRS. The workshop is extremely popular with teachers in elementary and secondary schools, provides them with resources for lesson plans, and it is helping to to reshape the way mathematics is being approached in the schools. This type of 2-day workshop is considered a frontline approach in the collaborative effort between mathematicians, more experienced teachers, and all teachers interested in professional development to improve the mathematics teaching in the elementary level and beyond. To have teachers share their valuable experiences with Math Fair in their own schools is the best and most useful information to others. Teachers in Alberta and participants from outside view the Ted Lewis Workshop as one of PIMS and BIRS most valuable education initiatives.

Participants:

Arsenault, Andre (Edmonton Public Schools)

Blake, Melanie (Edmonton Public Schools)

Dalmaijer, Kim (Edmonton Public Schools)

Espinoza, Richard (Edmonton Public Schools)

Fluet, Lyssa (Edmonton Public Schools)

Fredrickson, Signy (School District 8 Kootenay Lake)

Graves, Sean (University of Alberta)

Hoffman, Janice (Edmonton Public Schools)

Hohn, Tiina (MacEwan University)

Jones, Carolyn (Edmonton Public Schools - Centre for Education)

Korfanty, Emily Rose (University of Alberta)

May, Doreen (Calgary Catholic School District)

Mayne, Sally (Edmonton Public Schools)

Moore, Rachel (Edmonton Public Schools)

Oswald-Osmanovic, Chantel (Edmonton Public Schools)

Pasanen, Trevor (University of Alberta)

Perhar, Preet (Edmonton Public Schools)

Porteous, Benjamin (WE Graham)

Rastas, Evie (Edmonton Public Schools)

Rudniski, Leann (Edmonton Public Schools)

Salisbury-Rowswell, David (SD 8 Kootenay Lake)

Shields, Tina (Foothills School Division)

Soar, Chelsea (Edmonton Public Schools)

Solomon, Li (University of Alberta)

Veinot, Meaghan (Kitaskinaw Education Authority)

Weber, Matt (Mt. Sentinel/Sequoia Program)

Model-Informed Drug Discovery and Quantitative Systems Pharmacology: Key Applications, Opportunities and Challenges

August 9 - 11, 2024

Organizers:

Morgan Craig (Sainte-Justine University Hospital Research Centre/Université de Montréal)

Anna Sher (GSK)

Rajat Desikan (GSK)

Mohit Kumar Jolly (Indian Institute of Science)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/2-day-workshops/24w2022*

Drug design and development are costly and lengthy. Mathematical and computational modelling anchored in model-informed drug development (MIDD) and quantitative systems pharmacology (QSP) methodologies are integral to accelerating the R&D pipeline. In parallel, MIDD and QSP can be used to better understand the biological basis of drug responses and fuel new biomedical research paths. This workshop brought together experts in the fields of MIDD and QSP with the goal of strengthening ties between industrial and academic researchers and advancing these exciting fields.

Participants:

Bai, Jane (US Food and Drug Administration)

Beigmohammadi, Fatemeh (Université de Montréal)

Craig, Morgan (Sainte-Justine University Hospital Research Centre/Université de Montréal)

Dalton, Mackenzie (Clarkson University)

Desikan, Rajat (GSK)

Easlick, Terry (Université de Montréal)

Farhang-Sardroodi, Suzan (University of Toronto, Temerty Faculty of Medicine)

Gazeau, Sonia (Université de Montréal)

Jolly, Mohit Kumar (Indian Institute of Science)

Sher, Anna (GSK)

Shoemaker, Jason (U Pittsburgh)

Sivaloganathan, Siv (University of Waterloo)

Skibinski, David (Curevo)

Smith, Amber (University of Tennessee Health Science Center)

Subhadarshini, Seemadri (Indian Institute of Science)

Responsible AI in Healthcare with Electronic Health Records Data

October 20 - 22, 2024

Organizers:

Jesse Gronsbell (University of Toronto)

Bhramar Mukherjee (Yale University)

Tianxi Cai (Harvard)

Paul Varghese (Verily Life Sciences)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/2-day-workshops/24w7002*

Electronic health records (EHRs) are a central data source for artificial intelligence (AI) in healthcare as they contain rich data on large populations of patients and the medical care they receive. AI with EHR data has already accelerated biomedical research to improve patient care, including studies uncovering the effectiveness of medical treatments and new tools that predict disease risk and progression. However, the analysis of EHR presents numerous challenges that have bottlenecked the widespread and responsible use of AI in medical practice. The objective of this workshop was to bring together international leaders across academia, industry, and government in a collaborative atmosphere to tackle the most pressing challenges in responsible AI with EHR data.

Participants:

Alsentzer, Emily (Stanford University)

Basit, Mujeeb (UT Southwestern Medical Center)

Bento, Mariana (University of Calgary)

Berchuck, Samuel (Duke University)

Black, Jason (University of Calgary)

Cai, Tianxi (Harvard)

Celi, Leo Anthony (Massachusetts Institute of Technology; Harvard Medical School)

Chen, Irene (UC Berkeley and UCSF)

Du, Jiacong (University of Michigan)

Gao, Jianhui (University of Toronto)

Garies, Stephanie (University of Calgary)

Gavrilova, Marina (University of Calgary)

Ghassemi, Marzyeh (MIT)

Goldenberg, Anna (The Hospital of Sick Children, University of Toronto)

Gronsbell, Jesse (University of Toronto)

Gu, Tian (Columbia University)

Holodinsky, Jessalyn (University of Calgary)

Hong, Chuan (Duke University)

Joshi, Shalmali (Columbia University)

Kundu, Ritoban (University of Michigan)

Li, Xihao (University of North Carolina at Chapel Hill)

Li, Michelle (Harvard Medical School)

Li, Wanxin (University of British Columbia)

Liao, Katherine (Brigham and Women's Hospital)

Liu, Molei (Columbia University)

Matadi, Maba Boniface (University of Zululand)

McGrail, Kimberlyn (University of British Columbia)

Mohammed, Mohammed Farman Rahamath (CIHI)

Mukherjee, Bhramar (Yale University)

Naumann, Tristan (Microsoft Research)

Nyberg Lippert, Karoline (University of Montreal)

Okolo, Chinasa T. (The Brookings Institution)

Pierson, Emma (Cornell Tech)

Pinto, Andrew (University of Toronto)

Shah, Nigam (Stanford University)

Shi, Xu (University of Michigan)

Shi, Yaqi (University of Toronto)

Stephenson, Ellen (Statistics Canada)

Thurston, Hilary (York University)

Tian, Yuan (University of Toronto)

Ustun, Berk (University of California San Diego)

Varghese, Paul (Verily Life Sciences)

Verma, Amol (University of Toronto)

Wang, Linbo (University of Toronto)

Williamson, Tyler (University of Calgary)

Zhang, Linjun (Rutgers University)

BANFF INTERNATIONAL RESEARCH STATION

FOCUSED RESEARCH GROUPS 2024

PIMS-BIRS TeamUp: Quantum State Transfer

June 30 - July 13, 2024

Organizers:

Sarah Plosker (Brandon University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/focussed-research-groups/24frg202*

Quantum state transfer concerns the ability to reliably transfer a quantum state from one part of a quantum computer to another; such transfers can be modelled by way of a graph, which can be analysed using graph theory techniques, or by considering the associated adjacency matrix or Laplacian matrix, or other Hamiltonian, and analysed using linear algebra and related techniques. Besides the physical importance of this concept, it is also of mathematical interest, combining techniques from spectral graph theory, combinatorial matrix theory, and matrix analysis, among other areas. The group explored the concept of strong cospectrality, a necessary condition for perfect quantum state transfer, as well as the notion of quantum state transfer between edges of a graph, a more recent and less developed version of quantum state transfer, which normally involves the vertices of a graph.

Participants:

Chan, Ada (York University)

Kim, Sooyeong (University of Guelph)

Kirkland, Steve (University of Manitoba)

Monterde, Hermie (University of Manitoba)

Plosker, Sarah (Brandon University)

Zhang, Xiaohong (University of Montreal)

Advancing Stability through Rigorous Computation

July 14 - 21, 2024

Organizers:

Vera Hur (University of Illinois Urbana-Champaign)   Olivier Hénot (École Polytechnique)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/focussed-research-groups/24frg202*

Hamiltonian partial differential equations (PDEs) are commonly used to describe various natural phenomena like wave motion. However, figuring out if these solutions are stable can be tricky and involves a lot of nuances. One important condition for stability is that when we study the equation's behavior around a solution, the spectrum of the resulting operator should only consist of points along the imaginary axis. Excitingly, a growing area called validated numerics or rigorous computation is on the brink of offering new tools to help us understand the behavior of these types of equations. These tools can help us analyze operators that pop up when studying the stability of traveling wave solutions. We're currently close to proving that for a particular equation called the cubic Korteweg-de Vries (KdV) equation, even though it's not easy to solve directly, the spectrum of its linearized version around a traveling wave solution is entirely imaginary. If successful, this would be a groundbreaking result, as it would be the first time we've proven this kind of stability without needing the equation to be easily solvable.

Participants:

Barker, Blake (Brigham Young University)   **Hur, Vera** (University of Illinois Urbana-Champaign)
Bronski, Jared (University of Illinois)   **Lafortune, Stephane** (College of Charleston)
Hénot, Olivier (École Polytechnique)

BANFF INTERNATIONAL RESEARCH STATION

RESEARCH IN TEAMS
2024

Stable and Hyperbolic Polynomials and their Determinantal Representations

February 4 - 11, 2024

Organizers:

Victor Vinnikov (Ben Gurion University of the Negev)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit023*

An outstanding open problem, the generalized Lax conjecture asks whether any hyperbolic polynomial admits, up to a factor, a positive definite linear determinantal representation certifying its hyperbolicity and representing the hyperbolicity cone as a spectrahedral cone which is a feasibility set for semidefinite programming. We intended to progress towards the solution of this problem by relating hyperbolic polynomials to complex polynomials that are stable with respect to a tube domain over the hyperbolicity cone in the complex Euclidean space, and tackling certifying linear determinantal representations of complex stable polynomials using tools of multivariable operator theory.

Participants:

Vinnikov, Victor (Ben Gurion University of the Negev)

Woerderman, Hugo (Drexel University)

Homological Invariants of Fourier Algebras

March 3 - 10, 2024

Organizers:

Yemon Choi (Lancaster University)   Mahya Ghandehari (University of Delaware)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit022*

Harmonic analysis and functional analysis are two closely related areas of mathematics, which evolved from tools developed to analyze differential equations arising in physics and chemistry, and have since found further applications in number theory, signal processing and quantum mechanics. Fourier algebras of locally compact groups sit at the interface between these two areas; they are normed algebras of functions that encode both the topological and the algebraic structure of the original groups.

Participants:

Choi, Yemon (Lancaster University)   **Ghandehari, Mahya** (University of Delaware)

PIMS-BIRS TeamUp: Twisted Tensors of Hopf Algebras

March 17 - 30, 2024

Organizers:

Pablo Ocal (UCLA)   Amrei Oswald (University of Washington)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit600

Our collaboration concerned the study of the representation theory of Hopf algebras via twisted tensor products. Our goal was to establish a Hopf algebra structure on twisted tensor products, and use this to obtain information about a given algebra by decomposing it into simpler components. A motivating endpoint was to decompose the Balmer spectrum of the stable module category of a quantum group in terms of its components as a twisted tensor product.

Participants:

Ocal, Pablo (UCLA)   **Oswald, Amrei** (University of Washington)

Deciphering the Topology/Geometry of three-stranded RNA-DNA Hybrids

March 22 - 24, 2024

Organizers:

Christine Soteros (University of Saskatchewan)   Koya Shimokawa (Ochanomizu University)
Natasha Jonoska (University of South Florida)   Mariel Vazquez (University of California Davis)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit022

This Research in Teams aimed to answer the question of what structural information can be obtained by applying topology and discrete mathematics to models that integrate biological properties and are informed by experimental data. To this end, mathematicians having expertise in low-dimensional topology met with those having expertise in combinatorics and polymer modelling with the overarching goal of deciphering the entanglement of three-stranded RNA-DNA hybrids.

Participants:

Arsuaga, Javier (University of California, Davis)   **Shimokawa, Koya** (Ochanomizu University)
Jonoska, Natasha (University of South Florida)   **Soteros, Christine** (University of Saskatchewan)

Problems in Lefschetz and Liaison Theory

March 24 - 31, 2024

Organizers:

Juan Migliore (University of Notre Dame)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit014*

Two areas of great interest in Algebraic Geometry and Commutative Algebra are Lefschetz Theory and Liaison Theory. The goal was to get a better understanding of some basic structure.

Participants:

Boij, Mats (KTH Royal Institute of Technology)   **Miro Roig, Rosa Maria** (Universitat de Barcelona)

Migliore, Juan (University of Notre Dame)   **Nagel, Uwe** (University of Kentucky)

Homomorphisms between Braid Groups and Holomorphic Maps between Configuration Spaces

March 31 - April 14, 2024

Organizers:

Jeroen Schillewaert (University of Auckland)   Peter Huxford (University of Chicago)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit018*

We investigated homomorphisms from braid groups of low rank to arbitrary braid groups, both proving non-existence results and providing constructions, for example using elliptic curves. We also studied the repercussions on holomorphic maps between the associated configuration spaces and the potential extension of our techniques to closely related groups and geometries.

Participants:

Huxford, Peter (University of Chicago)   **Schillewaert, Jeroen** (University of Auckland)

Real Cubings and Large Scale Geometry of Hierarchically Hyperbolic Groups

May 19 - 26, 2024

Organizers:

Ilya Kazachkov (Ikerbasque - Basque Foundation for
Science)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit021

The philosophy of studying groups from far away can be dated back to Gromov. Finitely generated groups are discrete objects and so the traditional local geometric machinery cannot be used to study them. The aim of our project was to study asymptotic cones of hierarchically hyperbolic groups.

Participants:

Casals-Ruiz, Montserrat (Ikerbasque and University of the Basque Country)

Kazachkov, Ilya (Ikerbasque - Basque Foundation for Science)

Hagen, Mark (University of Bristol)

Applications of Multivariate Hawkes Processes in Finance, Insurance and Epidemiology

July 14 - 21, 2024

Organizers:

Anatoliy Swishchuk (University of Calgary)

Tomasz Bielecki (Illinois Tech)

Jacek Jakubowski (University of Warsaw)

Mariusz Nieweglowski (Warsaw University of
Technology)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit015

This workshop was devoted to the research activities associated with applications of multivariate Hawkes processes in finance (multidimensional models for stock prices), insurance (modelling of claims arrival and risk processes) and epidemiology (modelling of spread of epidemic diseases accounting for various types of cases and SIR-Hawkes modelling).

Participants:

Bielecki, Tomasz (Illinois Tech)

Jakubowski, Jacek (University of Warsaw))

Swishchuk, Anatoliy (University of Calgary)

Nieweglowski, Mariusz (Warsaw University of Technology

Algebraic K-theory of Lawvere Theories
July 14 - 28, 2024

Organizers:

Maru Sarazola (University of Minnesota)　　　　Paula Verdugo (Johns Hopkins University)

Lyne Moser (Universität Regensburg)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit024

Algebraic K-theory is a major subject field within algebraic topology, and has captured the attention of an increasing number of experts since its inception in the 70's. In spite of this, we are still pleasantly surprised when new interactions come to light between algebraic K-theory and other seemingly disconnected disciplines. This workshop aimed to delve further into this relation, and leverage our categorical and algebraic understanding of Lawvere theories to study the implications of this relation on foundational aspects of algebraic K-theory, such as the study of multiplicative structures.

Participants:

Moser, Lyne (Universität Regensburg)　　　　**Verdugo, Paula** (Johns Hopkins University)

Sarazola, Maru (University of Minnesota)

Novel Effective Theories of Phase Separation in Quasi-Crystals
July 28 - August 11, 2024

Organizers:

Lorenza D'Elia (TU Wien)　　　　Riccardo Cristoferi (Radboud University)

For more details, please refer to the workshop page: https://www.birs.ca/events/2024/research-in-teams/24rit019

We investigated some homogenization models for materials with fine quasi-crystalline structures. Such materials at the microscopic level present an ordered structure which exhibits neither periodicity nor randomness. Motivated by the increasing interest of industrial applications, such as coating composites, of materials forming a quasi-crystalline phase under suitable conditions, we paved the way towards rigorous mathematical investigations of the interaction between quasi-crystalline microstructures and phase transition.

Participants:

Cristoferi, Riccardo (Radboud University)　　　　**D'Elia, Lorenza** (TU Wien)

PIMS-BIRS TeamUp: Generalizations of the Prime Number Theorem

July 28 - August 10, 2024

Organizers:

Habiba Kadiri (University of Lethbridge)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit201*

Our goal was to gain a comprehensive understanding of these functions by exploring cases with varying sizes of x in relation to parameters such as moduli or the degree and discriminant of the field. This investigation involved translating our case study to provide both numerically and asymptotically sharp estimates for the sums over the zeros.

Participants:

Das, Sourabhashis (University of Waterloo)   **Lumley, Allysa** (York University)

Kadiri, Habiba (University of Lethbridge)

The Steklov Eigenproblem under Polygonal and Polyhedral Approximation

August 4 - 11, 2024

Organizers:

Alexandre Girouard (Universite Laval)   Nilima Nigam (Simon Fraser University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit029*

Vibrations and quantum mechanical effects are ubiquitous in science, in technology and in everyday life, from the design of musical instruments to nanotechnology and stability of planes. Mathematics provide the adequate language to describe these phenomena: the natural frequencies of a vibrating structure and the energy levels of quantum systems are both modeled by eigenvalues of operators that act on various spaces, such as surfaces, manifolds, graphs and even fractals. Spectral geometry is the study of the interplay between the eigenvalues of an operator and the geometry of the space on which it is defined. This team activity brought together specialists of both approaches and to study these problems in the context of the eigenvalues of the Dirichlet-to-Neumann map on smooth domains and their polyhedral approximations.

Participants:

Dominguez-Rivera, Sebastian (Siemens DI SW)   **Lagacé, Jean** (King's College London)

Girouard, Alexandre (Université Laval)   **Nigam, Nilima** (Simon Fraser University)

Centers of mass of Convex Bodies

August 18 - 25, 2024

Organizers:

Kateryna Tatarko (University of Waterloo)

Serhii Myroshnychenko (University of the Fraser Valley)

Vladyslav Yaskin (University of Alberta)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit025*

This Research in Teams aimed to investigate the properties of the centroids relative to different measurements of convex bodies (such as width, diameter, etc.) and their connection with other special points of convex bodies (such as centroids of the body surface, Santalo point, centers of inscribed and circumscribed spheres, etc.).

Participants:

Myroshnychenko, Serhii (University of the Fraser Valley)

Tatarko, Kateryna (University of Waterloo)

Yaskin, Vladyslav (University of Alberta)

Computability of Markov Partitions

August 8 - September 15, 2024

Organizers:

Tamara Kucherenko (The City College of New York)

Christian Wolf (CUNY Graduate Center)

Michael Burr (Clemson)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit027*

In this project, we studied the computability of Markov partitions for smooth dynamical systems. Markov partitions, whose existence has been established for many classes of hyperbolic systems, allow for the reduction of dynamical properties of smooth systems to the corresponding properties of the associated symbolic systems. This allows for the application of known computability results from symbolic systems to deduce computability properties for smooth systems.

Participants:

Burr, Michael (Clemson)

Wolf, Christian (CUNY Graduate Center)

Kucherenko, Tamara (The City College of New York)

Determining a Collection of Boundary Points on the p-adic Mandelbrot Set of degree d Polynomials

October 13 - 20, 2024

Organizers:

Jacqueline Anderson (Bridgewater State U.)   Bella Tobin (Agnes Scott College)

Emerald Stacy (Washington College)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit028*

We aimed to explore generalizations of the Mandelbrot set for polynomials defined in a different setting, specifically over a p-adic field. While p-adic numbers are structured very differently from complex numbers, we have evidence of some similarities between the classical complex Mandelbrot set and our newly-defined p-adic counterparts. In this project, we investigated these structures further and build a better understanding of what p-adic Mandelbrot sets look like and what they can tell us about dynamical systems.

Participants:

Anderson, Jacqueline (Bridgewater State University)   **Tobin, Bella** (Agnes Scott College)

Stacy, Emerald (Washington College)

PIMS-BIRS TeamUp: Small Solutions to Thue Equations Over Quadratic Imaginary Fields

November 24 - December 7, 2024

Organizers:

Greg Knapp (University of Calgary)   Sumin Leem (University of Calgary)

Eva Goedhart (Bryn Mawr College)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit503*

One of the oldest problems in mathematics is that of finding integer solutions to polynomial equations with integer coefficients; these equations are known as Diophantine equations. These problems date back at least as far as 1800 BCE, when Babylonians compiled integer solutions to the equation $a^2 + b^2 = c^2$ on the Plimpton 322 tablet. However, not every Diophantine equation has infinitely many solutions, and subtle changes in the equations can lead to drastic changes in the behavior of solutions. For example, the equation $a^2 - 2b^2 = 1$ has infinitely many solutions, but the equation $a^3 - 2b^3 = 1$ has only two: $(a, b) = (1, 0)$, and $(a, b) = (-1, -1)$. We aimed to show that certain classes of these equations have a very limited set of solutions.

Participants:

Goedhart, Eva (Bryn Mawr College)   **Leem, Sumin** (University of Calgary)

Knapp, Greg (University of Calgary)

Explicit Local Solubility and Applications

December 8 - 15, 2024

Organizers:

Christopher Keyes (King's College London)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/research-in-teams/24rit020*

The question of whether or not a collection of equations has a solution in the integers is notoriously challenging, with the answer depending heavily on the geometry of the constituent equations. An important reduction is localization - looking at the equations modulo a prime or over the real numbers. Having solutions locally is a key necessary condition for the equations to have an integral solution and much more tractable to determine explicitly. The proposed research involves determining explicit and exact expressions for how often certain families of equations have local solutions, which can sometimes yield explicit results for how often an equation has an integral solution.

Participants:

Beneish, Lea (University of North Texas)　　　　　**Keyes, Christopher** (King's College London)

BANFF INTERNATIONAL RESEARCH STATION

SUMMER SCHOOLS 2024

12th ICAPS Summer School on Automated Planning and Scheduling

May 26 - June 1, 2024

Organizers:

Sarah Keren (Technion - Israel Institute of Technology)

Pascal Bercher (The Australian National University)

Jane Kiam (University of the Bundeswehr München)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/summer-schools/24ss003*

The 12th ICAPS Summer School on Planning and Scheduling happened in Banff, just before the main ICAPS conference, the premier conference for researchers working in Planning and Scheduling, a subfield of Artificial Intelligence (AI) that allows the realization of intelligent behavior. The summer school provided learning, practical experience, and personal interactions for young researchers in this subfield of AI and automated planning and scheduling. The focus of the summer school was on different ways to use automated planning tools for task and motion planning with a strong focus in exploring this for robotics, as well as an outlook in its transferability to complex real-world applications.

IMO Team Summer Training Camp

June 30 - July 13, 2024

Organizers:

James Rickards (Canadian Math Society / Saint Mary's University)

Victor Rong (University of Toronto)

Eric Shen (Harvard)

Howard Halim (Modal Labs)

Alex Song (Phillips Exeter Academy Waterloo)

Anna Kelley (Princeton)

Kateryna Tretiakova (McMaster University)

Dorette Pronk (Dalhousie University)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/summer-schools/24ss002*

The top 6 Canadian high school mathletes trained at BIRS in preparation for the International Mathematical Olympiad (IMO). Selected by their results on several competitions throughout the school year, the team prepared to travel to the United Kingdom to compete against students from over 100 other countries. The two week training camp featured lectures, problem sessions, and mock olympiads, designed to emulate the conditions of the IMO.
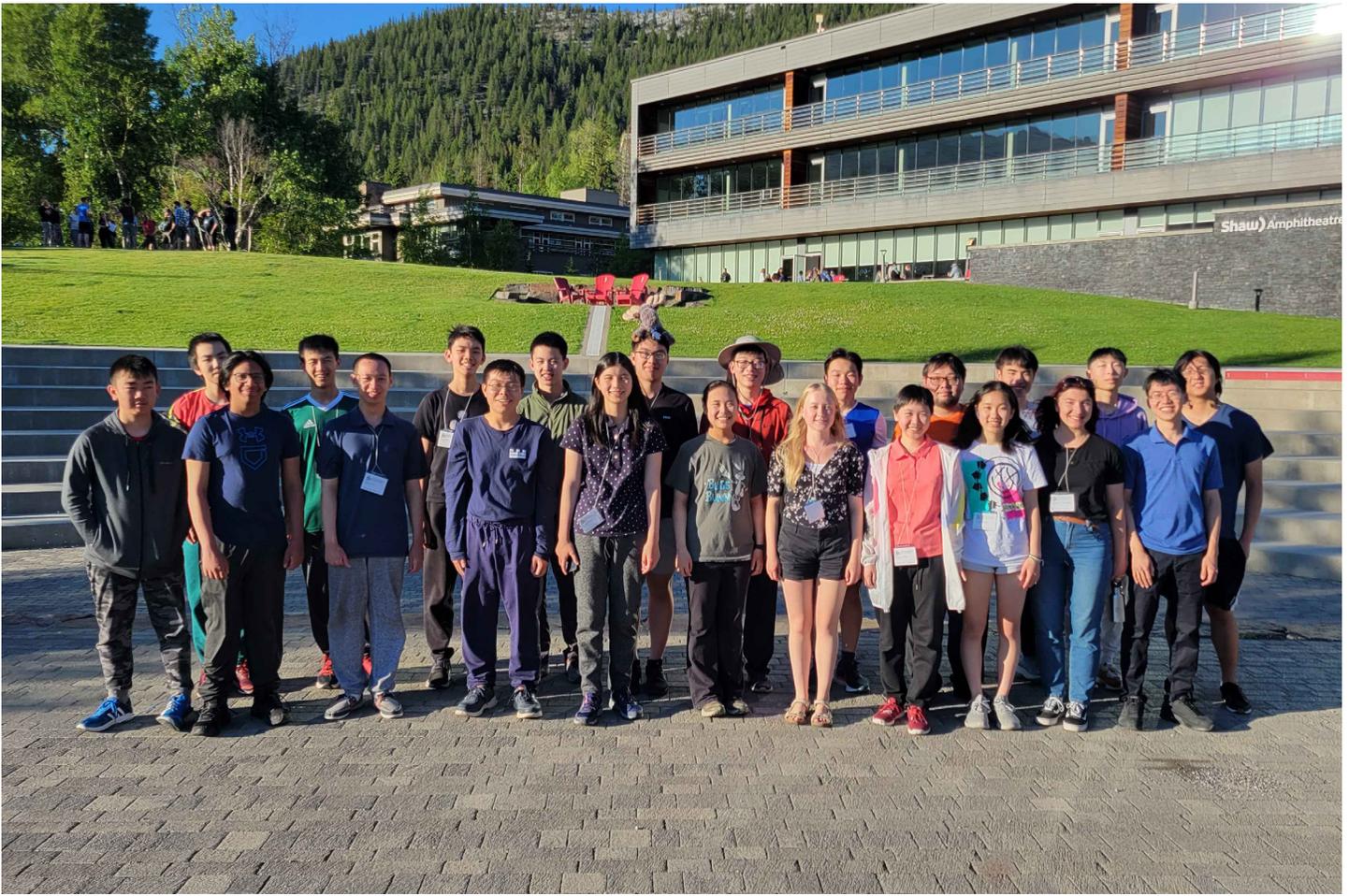
Participants:

Agarwal, Ansh (IMO Student)

Bai, Ryan (IMO Student)

Bei, Warren (IMO Student)

Chen, Rachel (IMO Student)

Dai, Perry (IMO Student)

Deng, Calvin (Jane Street)

Fu, Yuxin (IMO Student)

Halim, Howard (Modal Labs)

Kelley, Anna (Princeton)

Li, Tiger (IMO Student)

Ma, Emily (IMO Student)

Ma, Andrew (IMO Student)

Mao, Marvin (IMO Student)

Rong, Victor (University of Toronto)

Shen, Eric (Harvard)

Song, Alex (Phillips Exeter Academy Waterloo)

Tretiakova, Kateryna (McMaster University)

Wang, Xuezhi (Jerry) (IMO Student)

Wu, Leo (IMO Student)

Xing, Honjar (IMO Student)

Yang, Ming (IMO Student)

Yuan, Jimmy (IMO Student)

Zhang, Sophie (IMO Student)

UNIVERSITY OF BRITISH COLUMBIA OKANAGAN

2024 PROGRAMS

5-DAY WORKSHOPS 2024

May 19 - May 24	Homological Perspective on Splines and Finite Elements
May 26 - May 31	Propagation and Stability in Evolution Equations
Jun 02 - Jun 07	Quantum Circuit Design Automation
Jun 23 - Jun 28	New Trends and Challenges in Stochastic Differential Games
Jul 07 - Jul 12	Branching Problems for Representations of Real, p-adic and Adelic Groups

SUMMER SCHOOLS

Jul 14 - Jul 26	PIMS-BIRS-UBCO Summer School on Forecasting and Mathematical Modeling for Renewable Energy

Homological Perspective on Splines and Finite Elements
May 19 - 24, 2024

Organizers:

Tanya Sorokina (Towson University)

Ulrich Reif (Technische Universtität Darmstadt)

Deepesh Toshniwal (Delft University of Technology)

Martina Lanini (University of Rome Tor Vergata)

Jenna Rajchgot (McMaster Univeristy)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5313*

Modeling of complicated geometric objects is important in many areas of industry. For example, in the design of airplane wings, optimizing efficiency means understanding airflow, which in turn means solving a system of partial differential equations. At the opposite end of the spectrum, animation in movies such as Toy Story must address this same problem. This workshop brought together researchers from different mathematical communities: on the applied side, those working in numerical analysis and approximation theory, and on the theoretical side, those working in GKM theory, equivariant cohomology and homological algebra. The aim was to bring theory and practice together, and to build collaborations between researchers from different areas. The advancement of knowledge often arises from integration of seemingly different fields.

Participants:

Alonso Rodriguez, Ana Maria (Università degli Studi di Trento)

Anderson, David (The Ohio State University)

Arf, Jeremias (RPTU Kaiserslautern-Landau)

Berdinsky, Dmitry (Mahidol University)

Bracco, Cesare (University of Florence)

Bressan, Andrea (CNR)

Bruni Bruno, Ludovico (Università di Padova)

Chaumont-Frelet, Théophile (INRIA)

Chu, Ba-Duong (Technische Universität Darmstadt)

Da Silva, Sergio (VSU)

Davydov, Oleg (University of Giessen)

De Burgos, Amaury (UBC Okanagan)

DiPasquale, Michael (University of South Alabama)

Escobar, Laura (Washington University in St. Louis)

Floater, Michael (University of Oslo)

García Puente, Luis David (Colorado College)

Goldin, Rebecca (George Mason University)

Grandine, Thomas (UW)

Grošelj, Jan (University of Ljubljana)

Guzman, Johnny (Brown University)

Hirani, Anil (University of Illinois at Urbana-Champaign)

Hu, Kaibo (University of Oxford)

Iezzi, Giulia (RWTH Aachen)

Juettler, Bert (Johannes Kepler University, Linz/Austria)

Kaveh, Kiumars (University of Pittsburgh)

Lai, Ming-Jun (University of Georgia)

Lanini, Martina (University of Rome Tor Vergata)

Lesnevich, Nathan (Washington University in St Louis)

Lyche, Tom (University of Oslo)

Manni, Carla (University of Rome Tor Vergata)

Manon, Christopher (University of Kentucky)

Mantzaflaris, Angelos (Inria at Université Côte d'Azur)

Milicevic, Elizabeth (Haverford College)

Mourrain, Bernard (Inria)

Neilan, Michael (University of Pittsburgh)

Peters, Jorg (University of Florida)

Piel, Robert (University of Surrey)

Precup, Martha (Washington University in St. Louis)

Rajchgot, Jenna (McMaster University)

Rapetti, Francesca (Universite Cote Azur)

Reif, Ulrich (Technische Universität Darmstadt)

Sande, Espen (EPFL)

Schenck, Hal (Auburn University)

Schumaker, Larry (Vanderbilt University)

Shekhtman, Boris (USF)

Sorokina, Tanya (Towson University)

Speleers, Hendrik (University of Rome Tor Vergata)

Stillman, Mike (Cornell University)

Toshniwal, Deepesh (Delft University of Technology)

Tymoczko, Julianna (Smith College)

Vazquez, Rafael (Universidade de Santiago de Compostela)

Villamizar, Nelly (Swansea University)

Vohralik, Martin (Inria Paris)

Williams, David (Pennsylvania State University)

Woo, Alexander (University of Idaho)

Yang, Jay (Washington University in St. Louis)

Yuan, Beihui (Swansea University)

Zaynullin, Kirill (University of Ottawa)

Propagation and Stability in Evolution Equations
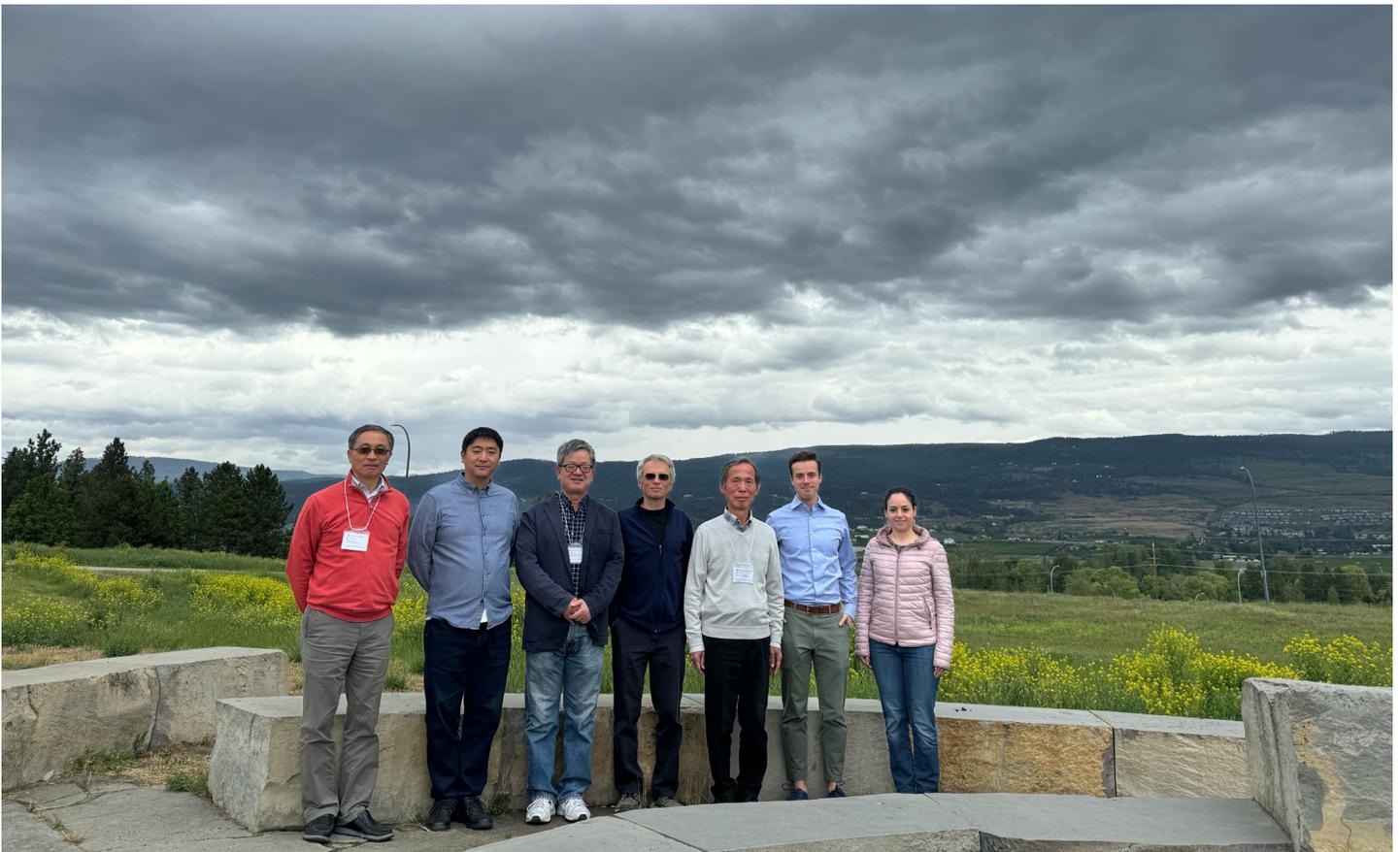## May 26 - 31, 2024

Organizers:

Hiroshi Matano (Meiji University)

Hirokazu Ninomiya (Meiji University)

Peter Polacik (University of Minnesota)

Luca Rossi (Sapienza)

Léo Girardin (CNRS)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5273*

Propagation and interfacial phenomena are observed in many fields of sciences, such as chemistry, physics, biology, medicine, epidemiology and social sciences. They also arise in more abstract mathematical contexts, such as the study of geometric flows. The research on these themes is receiving a strong impulse in recent years, using various approaches. The number of results is rapidly growing, but several important and challenging questions remain open. In this workshop we aimed at gathering the leading experts in the fields of reaction-diffusion equations and geometric flows, as well as promising young researchers, in order to increase the interactions between the different communities.

Participants:

Affili, Elisa (Université de Rouen Normandie)

An, Jing (Duke University)

Angenent, Sigurd (UW Madison)

Bertsch, Michiel (University of Rome Tor Vergata)

Birindelli, Isabeau (Sapienza Università di Roma)

Boutillon, Nathanaël (INRAE)

Davila, Juan (University of Bath)

Du, Yihong (University of New England)

Ducasse, Romain (LJLL, Université Paris Cité)

Fang, Jian (Harbin Institute of Technology)

Giletti, Thomas (University of Clermont-Auvergne)

Girardin, Léo (CNRS)

Graham, Cole (University of Wisconsin–Madison)

Gui, Changfeng (University of Macau)

Guo, Jong-Shenq (Tamkang University)

Hamamuki, Nao (Hokkaido University)

Hamel, Francois (Aix-Marseille Université)

Karali, Georgia (University of Crete)

Liang, Xing (University of Science and Technology of China)

Matano, Hiroshi (Meiji University)

Ninomiya, Hirokazu (Meiji University)

Park, Hyunjoon (Meiji University / MIMS)

Polacik, Peter (University of Minnesota)

Roquejoffre, Jean-Michel (Université Toulouse III-Paul Sabatier)

Rossi, Luca (Sapienza)

Ryzhik, Lenya (Stanford University)

Sesum, Natasa (Rutgers University)

Shen, Wenxian (Auburn University)

Shimojo, Masahiko (Tokyo Metropolitan University)

Taniguchi, Masaharu (Okayama University)

Wang, Rong (Lanzhou University)

Wu, Yaping (Capital Normal University)

Wu, Chang-Hong (National Yang Ming Chiao Tung University)

Xiao, Dongyuan (The University of Tokyo)

Zhang, Mingmin (Université Toulouse III - Paul Sabatier)

Zhao, Xiaoqiang (Memorial University of Newfoundland)

Zhou, Maolin (Nankai University)

Zlatos, Andrej (UC San Diego)

Quantum Circuit Design Automation

June 2 - 7, 2024

Organizers:

Neil Julien Ross (Dalhousie University)

Matthew Amy (Simon Fraser University)

Olivia Di Matteo (The University of British Columbia)

Vadym Kliuchnikov (Microsoft)

Romy Minko (University of Bristol)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5307*

This workshop united several communities of researchers focused on varying parts of the quantum software stack: the translation of quantum algorithms into instructions a quantum computer can understand (i.e., the process of quantum circuit compilation); the design, optimization, and verification of those circuits; circuit simulation; and the extension and scaling of methods to work with the fault-tolerant (error-corrected) devices of the future. The interaction of researchers at multiple layers of this stack led to cross-pollination of ideas that enables co-design of all these elements. Furthermore, the novel methods developed, and improvements in their scaling, will further drive quantum computing research and applications, bringing us closer to the solution of today's most important problems.

Participants:

Abhishek, Abhishek (University of British Columbia)

Amy, Matthew (Simon Fraser University)

Arrazola, Juan Miguel (Algorithms at Xanadu)

Babaee Khanehsar, Sara (Simon Fraser University)

de Silva, Nadish (Simon Fraser University)

Dean, Christopher (Dalhousie University)

Di Matteo, Olivia (The University of British Columbia)

Dinh, Linh (Dalhousie University)

Fu, Frank (University of South Carolina)

Gheorghiu, Vlad (Institute for Quantum Computing/ softwareQ Inc.)

Glaudell, Andrew (Photonic Inc.)

Haner, Thomas (AWS)

Howard, Mark (University of Galway)

Javadi-Abhari, Ali (IBM)

Jiang, Jacky (UBC)

Kalra, Amolak Ratan (University of Waterloo)

Kissinger, Aleks (University of Oxford)

Kliuchnikov, Vadym (Microsoft)

Kornell, Andre (Dalhousie University)

Kuperberg, Greg (UC Davis)

Lautsch, Oscar (Simon Fraser University)

Li, Sarah Meng (University of Amsterdam)

Masoudi, Kasra (Simon Fraser University)

Meijer, Arianne (University of Helsinki/IQM)

Mendelson, Sam (US Navy)

Minko, Romy (University of Bristol)

Mukhopadhyay, Priyanka (University of Toronto)

Murphy, Ewan (University of Waterloo / Institute for Quantum Computing / Perimeter Institute)

Paetznick, Adam (Microsoft)

Paykin, Jennifer (Unaffiliated)

Perdrix, Simon (Inria)

Petit, Christophe (Université libre de Bruxelles and University of Birmingham)

Pring, Benjamin (University of Bristol)

Quetschlich, Nils (Technical University of Munich)

Rand, Robert (University of Chicago)

Ross, Neil Julien (Dalhousie University)

Sawicki, Adam (Polish Academy of Sciences)

Schoute, Eddie (Los Alamos National Laboratory)

Selinger, Peter (Dalhousie University)

Stinchcombe, Lucas (Simon Fraser University)

Sundaram, Aarthi (Microsoft)

Thombre, Ritu (UBC)

Valiron, Benoit (Université Paris Saclay)

Wesley, Scott (Dalhousie University)

Wiebe, Nathan (University of Toronto)

Yard, Jon (Waterloo, IQC and Perimeter Institute)

New Trends and Challenges in Stochastic Differential Games

June 23 - 28, 2024

Organizers:

Jinniao Qiu (University of Calgary)

Pierre Cardaliaguet (Paris Dauphine-PSL University)

Miryana Grigorova (University of Warwick)

Thibaut Mastrolia (UC Berkeley)

Jianfeng Zhang (University of Southern California)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5277*

In today's dynamic and complex world, competitions, conflicts, and interactions exist everywhere, ranging from economic competition among countries to stock market decisions. The modern game theory introduced by Von Neumann and Morgenstern in the 1940s paves a way for us to analyze such situations rigorously with the help of beautiful mathematics; the importance of this subject finds its way into popular culture, for instance through the American drama film "A Beautiful Mind" about the life and work of mathematician and 1994 Nobel prize winner John Nash, whose contributions on games led to a notion of game equilibrium, bearing his name. When the states in the game are governed by differential equations subject to noises, we refer to it as a stochastic differential game. Recently, some interesting classes of stochastic differential games have arisen from applications, which, in turn, have initiated new trends and posed new challenges. This workshop brought together applied mathematicians who work on different aspects of stochastic differential games to discuss the recent achievements and challenges in light of new trends.

Participants:

Bayraktar, Erhan (University of Michigan)

Bertucci, Charles (Ecole Polytechnique)

Bouchard, Bruno (Université Paris Dauphine - PSL)

Cao, Haoyang (Johns Hopkins University)

Cardaliaguet, Pierre (Paris Dauphine-PSL University)

Cheng, Ziteng (The Hong Kong University of Science and Technology (Guangzhou))

Cheung, Hang (University of Calgary)

Dumitrescu, Roxana (King's College London)

Grigorova, Miryana (University of Warwick)

Guo, Xin (UC Berkeley)

Han, Jiequn (Flatiron Institute, Simons Foundation)

He, Xihao (University of Michigan)

Horst, Ulrich (Humboldt University Berlin)

Hu, Yaozhong (University of Alberta)

Hu, Anran (Columbia University)

Huang, Minyi (Carleton Univ.)

Huang, Hui (Karl-Franzens-Universität Graz)

Hubert, Emma (Princeton University)

Iseri, Melih (University of Michigan)

Kolokoltsov, Vassili (Moscow State University)

Lam, Ka Lok (University of California Santa Barbara)

Lauriere, Mathieu (NYU Shanghai)

Lazrak, Ali (University of British Columbia)

Li, Xinyu (UC Berkeley)

Liu, Yating (Paris-Dauphine University)

Ludkovski, Mike (UC Santa Barbara)

Mastrolia, Thibaut (UC Berkeley)

Mészáros, Alpár (Durham University)

Mirzaei, Keivan (University of Calgary)

Mou, Chenchen (City University of Hong Kong)

Nadtochiy, Sergey (Illinois Institute of Technology)

Nutz, Marcel (Columbia)

Possamaï, Dylan (ETH Zürich)

Qiu, Jinniao (University of Calgary)

Ren, Zhenjie (Université Paris-Dauphine - PSL)

Shkolnikov, Mykhaylo (Carnegie Mellon University)

Sirbu, Mihai (UT Austin)

Sircar, Ronnie (Princeton University)

Souganidis, Panagiotis (University of Chicago)

Tai, Ho Man (Dublin City University)

Talbi, Mehdi (Paris Cité University)

Tan, Xiaolu (The Chinese University of Hong Kong)

Tangpi, Ludovic (Princeton University)

Wang, Gaozhan (University of Southern California)

Wang, Xiong (Johns Hopkins University)

Wong, Ting Kam Leonard (University of Toronto)

Xing, Hao (Boston University)

Xu, Renyuan (New York University)

Yang, Yang (University of Calgary)

Zhang, Jing (Fudan University)

Zhang, Jianfeng (University of Southern California)

Zhang, Kelvin Shuangjian (Fudan University)

Zhang, Yufei (Imperial College London)

Zhang, Junxi (University of Alberta)

Zhou, Zhou (University of Sydney)

Zhou, Jianjun (Northwest A&F University)

Zou, Bin (University of Connecticut)

Branching Problems for Representations of Real, p-adic and Adelic Groups

July 7 - 12, 2024

Organizers:

Michael Pevzner (University of Reims) Birgit Speh (Cornell University)

Toshiyuki Kobayashi (The University of Tokyo)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/5-day-workshops/24w5220*

In recent years there was an outburst of research activities focusing on the restriction of continuous symmetries in the infinite-dimensional cases, for which new geometric and analytic methods have been developed. We highlight branching problems of infinite-dimensional representations of real, p-adic and adelic reductive groups, the former carrying analytic features and the latter carrying number-theoretic features, which might lead us to a (conjectural) unification of phenomena. A major goal of the workshop was to capitalize on this momentum and to gather researchers from diverse mathematical disciplines to encourage new collaborations, and achieve progress in solving open questions in number theory, geometry and physics.

Participants:

Barchini, Leticia (Oklahoma State University)

Beuzart-Plessis, Raphael (CNRS Aix-Marseille Université)

Clare, Pierre (William and Mary)

Gourevitch, Dmitry (Weizmann Institute of Science)

Harris, Michael (Columbia University)

Hazeltine, Alexander (University of Michigan)

HE, Haian (Shanghai University)

He, Hongyu (Louisiana State University)

Hikawa, Tatsuro (The University of Tokyo)

Jiang, Dihua (University of Minnesota)

Kannaka, Kazuki (RIKEN)

Kitagawa, Masatoshi (The University of Tokyo)

Kobayashi, Toshiyuki (The University of Tokyo)

Kubo, Toshihisa (Ryukoku University)

Labriet, Quentin (UQAM)

Lau, Jing Feng (SUSS - Singapore)

Li, Huajie (Johns Hopkins University)

Liu, Baiying (Purdue University)

Lo, Chi-Heng (Purdue)

Loke, Hung Yean (National University of Singapore)

Luo, Caihua (CUHK-Shenzhen)

Mansouri, Mitra (University of Ottawa)

Miyauchi, Shunsuke (University of Tokyo)

Murnaghan, Fiona (University of Toronto)

Nakahama, Ryosuke (Nippon Telegraph and Telephone Corporation)

Nasrin, Salma (University of Dhaka)

Nevins, Monica (University of Ottawa)

Nowshad, Mehedi (University of Dhaka)

Ochiai, Hiroyuki (Kyushu University)

Oshima, Yoshiki (The University of Tokyo)

Paradan, Paul-Emile (University of Montpellier)

Pérez-Valdés, Víctor (Ryukoku University)

Pevzner, Michael (University of Reims)

Prasad, Dipendra (Indian Institute of Technology Bombay)

Reznikov, Andre (Bar-Ilan University)

Sayag, Eitan (Ben-Gurion University of the Negev, Israel)

Sekiguchi, Hideko (The University of Tokyo)

Speh, Birgit (Cornell)

Spiloti, Polyxeni (University of Göttingen)

Tanaka, Yuichiro (University of Tokyo)

Tauchi, Taito (Aoyama Gakuin University)

Temma, Aoyama (The University of Tokyo)

Teng, Wentao (University of Tokyo)

Tiwari, Ekta (University of Ottawa)

Vargas, Jorge (Universidad Nacional de Cordoba)

Wang, Danielle (MIT)

Xu, Bin (Tsinghua University)

Zhang, Lei (National University of Singapore)

Zhang, Genkai (Chalmers University of Technology and University of Gothenburg)

Zhang, Zhiyu (Stanford University)

Zhu, Chengbo (National University of Singapore)

Zou, Xin (Johns Hopkins University)

UNIVERSITY OF BRITISH COLUMBIA OKANAGAN

SUMMER SCHOOLS 2024

PIMS-BIRS-UBCO Summer School on Forecasting and Mathematical Modeling for Renewable Energy

July 14 - 26, 2024

Organizers:

Deniz Sezer (University of Calgary)

Richard Karsten (Acadia University)

Whitney Huang (Clemson University)

Adam Monahan (University of Victoria)

For more details, please refer to the workshop page: *https://www.birs.ca/events/2024/summer-schools/24ss004*

Wind and solar power are the primary sources of renewable energy, and both driven by the weather, hence stochastic and variable. To solve the grand challenges related to their optimal deployment requires an interdisciplinary approach combining expertise in mathematics, statistics, atmospheric sciences, fluid dynamics, power system engineering, economics and finance. In this summer school, the students will receive training in key methodologies for forecasting and mathematical modeling of renewables. Topics covered include atmospheric boundary layer for complex terrains and near the sea surface, stochastic modeling of wind and solar energy, microgrids, their optimization and applications for remote communities, and mathematical modeling of electricity markets.

Participants:

Alsharif, Mohammed (University of Victoria)

Aung, Thiha (University of California at Santa Barbara)

Benjamin, Benteke (University of Guelph)

Bhandari, Dila Ram (Tribhuvan University)

Borotkanics, Robert (Independent Consultant/ Researcher)

Boutelet, Romain (Michigan State University)

Brinkerhoff, Joshua (University of British Columbia)

Dash, Aditya Raj (Odisha University of Technology and Research)

Duran, Serasu (University of Calgary)

Duran, Danielle (Verity Tracking, Data Science Team Lead)

Endo, Kota (University of Victoria)

Fathi Hafshejani, Sajad (University of Lethbridge)

Gheisari, Hiva (University of Lethbridge)

Ghertner, Benjamin (Simon Fraser University)

Gilda, Sankalp (University of Florida - Gainesville, FL)

Golmirzaee, Narges (University of Calgary)

Huang, Whitney (Clemson University)

Hung, Noah (Georgia State University)

Ibrahim, Slim (University of Victoria)

Iwazian, Souren (University of Calgary)

Jbara, Layal (University of British Columbia)

Jia, Tianxia (University of Calgary)

Karsten, Richard (Acadia University)

Lawrence, Trisha (The University of West Indies)

Ludkovski, Mike (UC Santa Barbara)

Ma, Yuting (University of California at Santa Barbara)

Mahmoudi Gharaie, Maryam (University of Calgary)

Mao, Qiangqiang (University of British Columbia)

McCurdy, James (University of Calgary)

Mohamad, Mustafa (University of Calgary)

Monahan, Adam (University of Victoria)

Mouti, Saad (Worcester Polytechnic Institute)

Oguz, Halis (Bogazici University)

Sadeghi, Bita (University of Calgary)

Sambrook, James (University of Calgary)

Schwarz, Florian (University of Calgary)

Sezer, Deniz (University of Calgary)

Shore, Nadiya (University of Victoria)

Tsang, Connie (University of Calgary)

Ukogu, Obinna (University of Washington)

Vedensky, Daniel (University of Missouri)

Vithana, Shanukie (University of Calgary)

Wang, Tianxu (University of Alberta)

Yang, Yang (University of Calgary)

Yang, Ying (University of British Columbia)

Zinchenko, Yuriy (University of Calgary)

Zou, Chenxuanyin (University of British Columbia)

The **Banff International Research Station** for Mathematical Innovation and Discovery (BIRS) is a collaborative Canada-US-Mexico venture that provides an environment for creative interaction as well as the exchange of ideas, knowledge, and methods within the Mathematical Sciences, with related disciplines and with industry. The research station is located at The Banff Centre in Alberta and is supported by Canada's Natural Science and Engineering Research Council (NSERC), the US National Science Foundation (NSF), Alberta Economic Development and Trade, and Mexico's Consejo Nacional de Ciencia y Tecnología (CONACYT).

Contact Us:

Scientific Director: Dr. Malabika Pramanik
Phone: 604-822-1649 Fax: 604-822-0883
Email: birs-director@birs.ca

Administrator: Danny Fan
Phone: 604-822-1844   Fax: 604-822-0883
Email: birs-administrator@birs.ca

Finance Officer: Vaibbhav Jadhav
Phone: 604-827-4454 Fax: 604-822-0883
Email: finance@birs.ca

Program Coordinator: Chee Chow
Phone: 604-822-5213 Fax: 604-822-0883
Email: birs@birs.ca

Program Assistant: Kimmie Xiong
Phone: 604-822-1694 Fax: 604-822-0883
Email: birs-secretary@birs.ca

Station Manager: Linda Jarigina-Sahoo
Phone: 403-763-6999   Fax: 403-763-6990
Email: birsmgr@birs.ca

Station Facilitator and Coordinator: Jacob Posacki
Phone: 403-763-6996   Fax: 403-763-6990
Email: birs-facilitator@birs.ca

Technology Manager: Vincent Ohprecio
Phone: 403-763-6997 Fax: 403-763-6990
Email: vincent@birs.ca

BIRS Mailing Address in Vancouver:
Banff International Research Station
University of British Columbia
4176-2207 Main Mall
Vancouver, BC V6T 1Z4 CANADA

BIRS Mailing Address in Banff:
Banff International Research Station
c/o The Banff Centre
Room 103, TransCanada Pipelines Pavilion
107 Tunnel Mountain Drive
Box 1020, Stn 48
Banff, AB T1L 1H5   CANADA

Web: http://www.birs.ca
Twitter: @BIRS_Math

University of British Columbia Campus Okanagan (UBCO) UBC's Okanagan campus is an innovative hub for research and learning. The campus was founded in 2005 in partnership with local Indigenous peoples, the Syilx Okanagan Nation, in whose territory the campus resides. Since its inception, UBCO has experienced tremendous growth, including an increase in research funding of 366 percent.

Contact Us:

BIRS-UBCO Director:
W. John Braun
Email: john.braun@ubc.ca

BIRS-UBCO Events Coordinator:
Jasmine Yang
Email: birs-ubco@birs.ca

BIRS-UBCO Events Coordinator:
Liam Davidson
Email: ldbdavidson@gmail.com

UBCO Mailing Address:
UBCO OFFICE
1147 Research Rd, Kelowna, BC V1V 1V7
Arts Building
Room 386

Web: https://birs.ok.ubc.ca/