BIRS-CMO 2018 Annual Report

Banff International Research Station
for Mathematical Innovation and Discovery

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BIRS 2018 Program

5-Day Workshops 2018

Jan 14	Jan 19	Workshop on the Interface of Machine Learning and Statistical Inference
Jan 21	Jan 26	Geometry and Physics of F-theory
Jan 28	Feb 2	Shape-Constrained Methods: Inference, Applications, and Practice
Feb 4	Feb 9	Extremal Problems in Combinatorial Geometry
Feb 11	Feb 16	Relativistic Fermions and Nodal Semimetals from Topology
Feb 18	Feb 23	Modelling Imbalance in the Atmosphere and Ocean
Feb 25	Mar 2	DM-Stat: Statistical Challenges in the Search for Dark Matter
Mar 4	Mar 9	Distributionally Robust Optimization
Mar 11	Mar 16	Modular Forms and Quantum Knot Invariants
Mar 18	Mar 23	New Developments in Open Dynamical Systems and Their Applications
Mar 25	Mar 30	Emerging Trends in Geometric Functional Analysis
Apr 1	Apr 6	Physical, Geometrical and Analytical Aspects of Mean Field Systems of Liouville Type
Apr 8	Apr 13	Entropies, the Geometry of Nonlinear Flows, and their Applications
Apr 15	Apr 20	Workshop on Geometric Quantization
Apr 22	Apr 27	Numerical Analysis and Approximation Theory meets Data Science
Apr 29	May 4	Mathematical Foundations of Data Privacy
May 6	May 11	An Algebraic Approach to Multilinear Maps for Cryptography
May 13	May 18	Asymptotically Hyperbolic Manifolds
May 20	May 25	Topics in the Calculus of Variations: Recent Advances and New Trends
May 27	Jun 1	Adaptive Numerical Methods for Partial Differential Equations with Applications
Jun 3	Jun 8	Hydraulic Fracturing: Modeling, Simulation, and Experiment
Jun 10	Jun 15	Integrative Cell Models for Disease Intervention
Jun 17	Jun 22	Advanced Developments for Surface and Interface Dynamics - Analysis and Computation
Jun 24	Jun 29	New Trends in Syzygies
Jul 1	Jul 6	Spectral Geometry: Theory, Numerical Analysis and Applications
Jul 8	Jul 13	Mathematical Approaches to Cell-Cell Communication and Collective Behaviours
Jul 15	Jul 20	Around Quantum Chaos
Jul 22	Jul 27	Complex Fluids in Biological Systems
Jul 29	Aug 3	Physics and Mathematics of Quantum Field Theory
Aug 5	Aug 10	New Statistical Methods for Family-Based Sequencing Studies
Aug 12	Aug 17	Mathematics of the Cell: Mechanical and Chemical Signaling across Scales
Aug 19	Aug 24	Regularity and Blow-up of Navier-Stokes Type PDEs using Harmonic and Stochastic Analysis
Aug 26	Aug 31	Interacting Particle Systems and Parabolic PDEs
Sep 2	Sep 7	Tau Functions of Integrable Systems and Their Applications
Sep 9	Sep 14	Geometry and Physics of Quantum Curves
Sep 16	Sep 21	Affine Algebraic Groups, Motives and Cohomological Invariants
Sep 23	Sep 28	The Traveling Salesman Problem: Algorithms & Optimization
Sep 30	Oct 5	Spin Glasses and Related Topics
Oct 7	Oct 12	Moduli Spaces: Birational Geometry and Wall Crossings
Oct 14	Oct 19	Fusion Categories and Subfactors
Oct 21	Oct 26	Crossing Numbers: Theory and Applications
Oct 21	Oct 26	Hessenberg Varieties in Combinatorics, Geometry and Representation Theory
Oct 28	Nov 2	Intersection of Information Theory and Signal Processing: New Signal Models, their Information Content and Acquisition Complexity
Nov 4	Nov 9	WOA: Women in Operator Algebras
Nov 11	Nov 16	Mathematical and Statistical Challenges in Bridging Model Development, Parameter Identification and Model Selection in the Biological Sciences
Nov 18	Nov 23	Unifying Themes in Ramsey Theory
Nov 25	Nov 30	Model Theory and Operator Algebras
Dec 2	Dec 7	Integrating the Integrators for Nonlinear Evolution Equations: from Analysis to Numerical Methods, High-Performance-Computing and Applications
Dec 9	Dec 14	Shape Analysis, Stochastic Geometric Mechanics and Applied Optimal Transport

2-Day Workshops 2017

Mar 16	Mar 18	Impact of Women Mathematicians on Research and Education in Mathematics
Apr 27	Apr 29	Ted Lewis SNAP Math Fair Workshop 2018
May 11	May 13	Alberta Number Theory Days X
May 25	May 27	10th Seminar for Next Generation of Researchers in Power Systems
Jun 15	Jun 17	Restructuring IEEE VIS for the Future
Aug 17	Aug 19	Advancement of Stochastic and Statistical Techniques for Natural and Environmental Simulation
Aug 24	Aug 26	Privacy Compliance Tools Workshop
Oct 12	Oct 14	Retreat for Young Researchers in Stochastics
Nov 16	Nov 18	CS-Can / Info-Can State-of-the-Discipline and Planning Retreat

Focused Research Groups

Apr 1	Apr 8	The Crystal Structure of the Plethysm of Schur Functions
Apr 29	May 6	Algebraic Structure of Cyclic Combinatorial Objects
Jun 17	Jun 24	Stability Indices for Nonlinear Waves and Patterns in Many Space Dimensions
Jul 22	Jul 29	Investigating Linear Codes via Commutative Algebra
Aug 5	Aug 12	Measuring the Connectedness of Graphs and Digraphs
Aug 12	Aug 19	Microlocal Geometry of Langlands Parameter Spaces for p-adic Groups

Summer School

Jun 24	Jul 7	2018 Summer IMO Training Camp

Banff International Research Station

2018

5-Day Workshops

Workshop on the Interface of Machine Learning and Statistical Inference
January 14 - 19, 2018

Organizers:

Giles Hooker (Cornell University)
Gerard Biau (University Pierre and Marie Curie)
Lucas Mentch (University of Pittsburgh)
Stefan Wager (Stanford University)

Over the past thirty years, Machine Learning has proved enormously successful in using large databases to produce automatic prediction methods; they have been used in fields from handwriting recognition to automatic share market investments. However, these techniques produce little insight into the underlying mechanisms the result in the outcomes, nor do they provide statistical quantification of uncertainty. This workshop brought together statisticians, mathematicians, and computer scientists to build on recent advances that seek to integrate machine learning with more traditional statistical models to obtain both highly accurate and understandable models while quantifying uncertainty about their predictions and conclusions.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5054

Participants:

Athey, Susan (Stanford)
Bhat, Harish (University of California, Merced)
Biau, Gerard (University Pierre and Marie Curie)
Bradic, Jelena (University of California - San Diego)
Caruana, Rich (Microsoft Research)
Chouldechova, Alexandra (CMU)
Cutler, Adele (Utah State University)
Ertefaie, Ashkan (University of Rochester)
Fink, Daniel (Cornell University)
G'Sell, Max (Carnegie Mellon University)
George, Edward (University of Pennsylvania)
Hill, Jennifer (New York University)
Hirshberg, David (Columbia University)
Hofman, Jake (Microsoft Research)
Hooker, Giles (Cornell University)
Hothorn, Torsten (University of Zurich)
Janson, Lucas (Harvard University)
Jensen, Shane (University of Pennsylvania)
Kallus, Nathan (Cornell University)
Kang, Hyunseung (University of Wisconsin - Madison)
Kolesar, Michal (Princeton)
Kosorok, Michael (University of North Carolina at Chapel Hill)
Kuenzel, Soeren (University of California at Berkeley)
Lei, Lihua (University of California Berkeley)
Lopes, Miles (University of California at Davis)
Mentch, Lucas (University of Pittsburgh)
Newey, Whitney (Massachusetts Institute of Technology)
Peng, Wei (University of Pittsburgh)
Sangnier, Maxime (Universite Pierre et Marie Curie)
Scornet, Erwan (Ecole Polytechnique)
Strobl, Carolin (Unversity of Zurich)
Tan, Sarah (Cornell University)
van der Laan, Mark (University of California - Berkeley)
Vassilvitskii, Sergei (Google)
Wager, Stefan (Stanford University)
Wilson, Andrew (Cornell University)
Wong, Weng-Keen (Oregon State University)
Yu, Bin (University of Berkeley)
Zhao, Qingyuan (University of Pennsylvania)

Geometry and Physics of F-theory
January 21 - 26, 2018

Organizers:

Washington Taylor (MIT)
Antonella Grassi (University of Pennsylvania)
Jonathan Heckman (University of Pennsylvania)
David Morrison (UCSB)

The Banff International Research Station hosted a workshop in 2018 on The Geometry and Physics of F-theory. This workshop brought together leading physicists and mathematicians who were studying a rich set of connections between recent developments in geometry and the physics of string theory. These new connections shed light on some long-standing problems in physics and in mathematics. In particular, through the geometric framework of "F-theory", insight from physics gives new perspectives and tools on geometry problems in mathematics, and recent progress in mathematics leads to new understanding of how geometric structure may encode physical theories of gravity and other forces like electromagnetism, and matter.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5190

Participants:

Anderson, Lara (Virginia Tech)
Apruzzi, Fabio (University of North Carolina Chapel Hill)
Braun, Andreas (University of Oxford)
Candelas, Philip (University of Oxford)
Clemens, Herb (OSU)
Collinucci, Giulio (Université Libre de Bruxelles)
Del Zotto, Michele (Simons Center for Geometry and Physics)
Di Cerbo, Gabriele (Princeton University)
Diemer, Colin (IHES)
Elkies, Noam D. (Harvard University)
Fazzi, Marco (Technion)
Grassi, Antonella (University of Pennsylvania)
Gray, James (Virginia Tech)
Hajouji, Nadir (University of California, Santa Barbara)
Halverson, Jim (Northeastern U)
Heckman, Jonathan (University of Pennsylvania)
Huang, Yu-Chien (MIT)
Kloosterman, Remke (Università degli studi di Padova)
Kuwata, Masato (Chuo University)
Lawrie, Craig (University of Heidelberg)
Lin, Ling (University of Pennsylvania)
Long, Cody (Northeastern University)
Malmendier, Andreas (Utah State University)
Maxim, Laurentiu (University of Wisconsin-Madison)
McAllister, Liam (Cornell University)
Morrison, David (UCSB)
Oehlmann, Paul-Konstantin (Virginia Tech)
Raghuram, Nikhil (MIT)
Rudelius, Thomas (IAS)
Savelli, Raffaele (Instituto de Fisica Teorica UAM - CSIC Cantoblanco Madrid)
Schafer-Nameki, Sakura (Oxford University)
Sethi, Savdeep (University of Chicago)
Shaneson, Julius (University of Pennsylvania)
Svaldi, Roberto (Cambridge)
Taylor, Washington (MIT)
Tomasiello, Alessandro (Universita di Milano-Bicocca)
Turner, Andrew (MIT)
Wang, Yinan (MIT)
Watari, Taizan (IPMU Tokyo)
Weigand, Timo (CERN)
Wen, David (UCSB)

Shape-Constrained Methods: Inference, Applications, and Practice
January 28 - February 2, 2018

Organizers:

Hanna Jankowski (York University)
Mary Meyer (Colorado State University)
Richard Samworth (University of Cambridge)
Bodhisattva Sen (Columbia University)

In reliability engineering, the so-called bathtub curve is a popular way of describing hazard rates because consumer product life cycles often behave that way. The curve goes by the name “bathtub” because it looks like the cross-section of a bathtub: first decreasing, then constant, then increasing again. In statistical models, such an assumption (e.g. increasing, decreasing) is called a shape constraint. Shape-constrained statistical methods have a long history of use in statistics and other fields as practical models of real-world data because they outperform other methods in several key ways. With researchers realizing the advantages of using shape-constrained methods in their work, the field has seen considerable growth in recent years, with both computational and theoretical advances. However, many important theoretical, methodological and computational challenges still remain. The goals of this workshop were to advance the state of knowledge and practice in statistical shape-constrained estimation and to focus future research on the most pressing problems in the field through interaction with researchers in other areas, particularly econometrics, operations research, and machine learning (big data).

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5112

Participants:

Aravkin, Aleksandr (University of Washington)
Beare, Brendan (University of California - San Diego)
Bellec, Pierre C (Rutgers)
Brunel, Victor-Emmanuel (Massachusetts Institute of Technology)
Chatterjee, Sabyasachi (University of Illinois at Urbana-Champaign)
Chen, Yining (London School of Economics)
Dasgupta, Sutanoy (Florida State University)
Deb, Nabarun (Columbia University)
Doss, Charles (University of Minnesota)
Duembgen, Lutz (University of Bern)
Durot, Cecile (Université Paris Nanterre)
Fang, Billy (UC Berkeley)
Feng, Oliver (University of Cambridge)
Friedlander, Michael (University of British Columbia)
Gijbels, Irene (KU Leuven)
Groeneboom, Piet (TUDelft)
Guntuboyina, Aditya (University of California - Berkeley)
Hendrickx, Kim (Hasselt University)
Johnson, Andrew (Texas A&M University)
Jongbloed, Geurt (Delft University of Technology)
Kim, Arlene Kyoung Hee (University of Cambridge)
Koenker, Roger (University College London)
Lockhart, Richard (Simon Fraser University)
Lopuhaa, Rik (Delft University of Technology)
Meyer, Mary (Colorado State University)
Mizera, Ivan (University of Alberta)
Musta, Eni (Delft University of Technology)
Oliva, Cristian (Colorado State University)
Parker, Tom (University of Waterloo)
Patra, Rohit Kumar (University of Florida)
Racine, Jeff (McMaster University)
Royset, Johannes (Naval Postgraduate School)
Sadeghi, Samira (University of Alberta)
Samworth, Richard (University of Cambridge)
Sen, Bodhisattva (Columbia University)
Wei, Yuting (University of California at Berkeley)
Wellner, Jon (University of Washington)
Xu, Min (University of Pennsylvania)

Extremal Problems in Combinatorial Geometry
February 4 - 9, 2018

Organizers:

Andrew Suk (University of California - San Diego)
Janos Pach (École Polytechnique Fédérale de Lausanne)
Jozsef Solymosi (University of British Columbia)

The workshop on Extremal problems in combinatorial geometry focussed on the algebraic and combinatorial properties of points, lines, and other simple geometric objects in Euclidean space. The goal was to gather experts and promising young researchers in combinatorial geometry and related areas, to discuss the recent developments of algebraic and combinatorial methods used in the field. Over the past 6 years in particular, several ground-breaking results have been discovered, answering some of the oldest problems in the field. This workshop was a timely event to capitalize on this momentum.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5058

Participants:

Aronov, Boris (New York University)
Balko, Martin (Charles University)
Bárány, Imre (Alfred Renyi Institute of Mathematics)
Bukh, Boris (Carnegie Mellon University)
De Zeeuw, Frank (EPFL)
Do, Thao (Massachusetts Institute of Technology)
Dumitrescu, Adrian (University of Wisconsin--Milwaukee)
Ezra, Esther (Georgia Tech)
Fulek, Radoslav (IST Austria)
Furedi, Zoltan (Renyi Institute of Mathematics)
Holmsen, Andreas (KAIST)
Hubard, Alfredo (UPEM)
Kawamura, Akitoshi (Kyushu University)
Keszegh, Balázs (Alfréd Rényi Institute of Mathematics)
Kupavskii, Andrey (University of Birmingham)
Linial, Nathan (Hebrew University of Jerusalem)
Moshchevitin, Nikolay (Moscow Lomonosov State University)
Mubayi, Dhruv (University of Illinois at Chicago)
Pach, Janos (École Polytechnique Fédérale de Lausanne)
Palvolgyi, Domotor (Eötvös Loránd University)
Patáková, Zuzana (Institute Of Science and Technology Austria)
Raz, Orit (IAS)
Roche-Newton, Oliver (Johannes Kepler Universität)
Rote, Günter (Freie Universität Berlin)
Rubin, Natan (Ben-Gurion University)
Rudnev, Misha (University of Bristol)
Sheffer, Adam (CUNY - Baruch College)
Solymosi, Jozsef (University of British Columbia)
Stevens, Sophie (University of Bristol)
Suk, Andrew (University of California - San Diego)
Swanepoel, Konrad (London School of Economics and Political Science)
Tardos, Gabor (Renyi Institute, Budapest)
Toth, Geza (Renyi Institute of Mathematics)
Toth, Csaba (California State University Northridge)
Walczak, Bartosz (Jagiellonian University)
White, Ethan (UBC)
Yuditsky, Lena (Karlsruhe institute of technology)
Zahl, Joshua (University of British Columbia)
Zerbib, Shira (University of Michigan)

Relativistic Fermions and Nodal Semimetals from Topology
February 11 - 16, 2018

Organizers:

Marcel Franz (University of British Columbia)
Andrei Bernevig (Princeton University)
Claudia Felser (Max Planck Insitute Dresden)
Nai Phuan Ong (Princeton University)
Siddharth Parameswaran (University of Oxford)

Metals and insulators represent two key types of solids distinguished by their fundamental response to the applied electric field: metals conduct electricity while insulators do not. This workshop is concerned with properties of “semimetals”, materials that straddle the divide between metals and insulators. Significant new insights into our understanding of semimetals have been achieved in the recent years by combining ideas borrowed from the branch of mathematics known as topology, particle physics, and traditional condensed matter physics and material science. In fact new materials in his class discovered recently by material scientists realize unusual phenomena predicted long time ago by particle physicist, some of them never before observed. This workshop brought together leading experts representing these disparate groups with the goal to exchange ideas and develop new ways to understand, classify and characterize these remarkable new materials, as well as find ways to discover new ones and exploit their properties in future technological applications.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5047

Participants:

Ali, Mazhar (Max Plank Institute for Microstructure Physics)
Armitage, Peter (John Hopkins University)
Beenakker, Carlo (Leiden University)
Beidenkopf, Haim (Weizmann Institute of Science)
Bradlyn, Barry (Princeton University)
Burkov, Anton (University of Waterloo)
Cano, Jennifer (Princeton)
Chen, Yong (Purdue Univ)
Cook, Ashley (University of Zurich)
Dai, Xi (Hong Kong University of Science and Technology)
Franz, Marcel (University of British Columbia)
Grushin, Adolfo (Berkeley / Néel)
Herbut, Igor (Simon Fraser University)
Hughes, Taylor (University of Illinois)
Ilan, Roni (Tel Aviv University)
Kharzeev, Dmitri (Stony Brook)
Maciejko, Joseph (University of Alberta)
Nandkishore, Rahul (University of Colorado - Boulder)
Neupert, Titus (University of Zurich)
Ni, Ni (UCLA)
Ong, Nai Phuan (Princeton University)
Parameswaran, Siddharth (University of Oxford)
Pereg-Barnea, Tami (McGill University)
Pesin, Dmytro (Utah)
Pikulin, Dmitry (Microsoft Corporation)
Potter, Andrew (UT Austin)
Queiroz, Raquel (Weizmann Institute of Science)
Schoop, Leslie (Princeton University)
Skinner, Brian (MIT)
Song, Justin (Nanyang Technological University)
Vafek, Oskar (Florida State University)
Vozmediano, Maria (Instituto de Ciencia de Materiales de Madrid)

Modelling Imbalance in the Atmosphere and Ocean
February 18 - 23, 2018

Organizers:

Bruce Sutherland (University of Alberta)
Ulrich Achatz (Goethe Universitaet Frankfurt)
Colm-cille Caulfield (University of Cambridge)
Jody Klymak (University of Victoria)

The workshop on "Modelling Imbalance in the Atmosphere and Ocean" brought together mathematicians, atmosphere and ocean scientists, numerical modellers and laboratory experimentalists to determine the effect of small-scale mixing, stirring by eddies, convection in storms, and breaking of waves upon the large scale circulation of the atmosphere and ocean with their consequent influence upon weather and climate. The goal of the workshop was to encourage the cross-fertilization of ideas between mathematicians, observationalists and modellers so as to improve the general circulation models of the atmosphere and ocean that are the primary means of forming weather and climate predictions. The workshop further aimed to provide young researchers with a broad world-view, providing them the tools with which to connect mathematics to complex real-world problems whose understanding is now being increasingly constrained by sophisticated highresolution satellite and in situ observations.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5119

Participants:

Achatz, Ulrich (Goethe Universitaet Frankfurt)
Arbic, Brian (University of Michigan)
Bölöni, Gergely (University of Frankfurt)
Buhler, Oliver (Courant Institute of Mathematical Sciences)
Caulfield, Colm-cille (University of Cambridge)
Chini, Greg (University of New Hampshire)
Durran, Dale (University of Washington)
Ferrari, Raffele (MIT)
Fringer, Oliver (Stanford University)
Fritts, David (GATS)
Gagarina, Elena (University of Frankfurt)
Gervais, Alain (University of Alberta)
Halawa, Basem (University of Calgary)
Hien, Steffen (University of Frankfurt)
Holt, Laura (Northwest Research Associates)
Johnston, Shaun (Scripps Institution of Oceanography)
Kafiabad, Hossein (University of Edinburgh)
Klymak, Jody (University of Victoria)
Kunze, Eric (Northwest Research Associates)
Legg, Sonya (Princeton University)
Lelong, Pascale (NorthWest Research Associates)
Ma, Yongxing (University of Alberta)
Peltier, Richard (University of Toronto)
Pinkel, Rob (Scripps Institution of Oceanography)
Plougonven, Riwal (Ecole Polytechnique)
Randall, David (Colorado State University)
Rotunno, Richard (National Center for Atmospheric Research)
Salehipour, Hesam (University of Toronto)
Schlutow, Mark (Freie University of Berlin)
Smith, Kat (University of Cambridge)
Straub, David (McGill University)
Sutherland, Bruce (University of Alberta)
Tiwari, Ujjwal (University of Alberta)
Vanneste, Jacques (University of Edinburgh)
Vreugdenhil, Cat (University of Cambridge)
Wagner, Gregory (MIT)
Whalen, Caitlin (University of Washington)
Wilms, Henrike (German Aerospace Center (DLR))
Zhou, Qi (University of Calgary)

DM-Stat: Statistical Challenges in the Search for Dark Matter
February 25 - March 2, 2018

Organizers:

Aaron Vincent (Queen's University)
Gianfranco Bertone (University of Amsterdam)
Jessi Cisewski (Yale University)
Roberto Ruiz de Austri (University of Valencia)

One of the biggest puzzles in modern physics is the nature of Dark Matter. This mysterious particle makes up 85% of the matter in the Universe, but is invisible except for its gravitational effect on stars, galaxies, and galactic clusters. Signals of invisible dark matter in the visible world can come from many directions: gamma rays from far-off galaxies, small signals in specially-designed experiments buried deep in underground laboratories, or through the collision of high-energy particles at the Large Hadron Collider. The goal of this workshop was to bring together the dark matter hunters with statisticians and experts on modern machine learning tools in order to illuminate a consistent characterization of dark matter from theories and data. With interdisciplinary experts and state-of-the-art machine learning tools, we can get one step closer to cracking the enigma of dark matter.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5095

Participants:

Algeri, Sara (Imperial College London)
Anelli, Christopher (University of Victoria)
Bozorgnia, Nassim (Durham University)
Bramante, Joe (Queen's University and CPARC an Perimeter Institute)
Brooks, Alyson (Rutgers University)
Casas, Alberto (Instituto de Física Teórica)
Cisewski, Jessi (Yale University)
Cyr-Racine, Francis-Yan (Harvard University)
Danninger, Matthias (University of British Columbia)
Edwards, Thomas (University of Amsterdam)
Geringer-Sameth, Alex (Imperial College London)
Hendriks, Luc (Radboud University)
Iocco, Fabio (ICTP-SAIFR)
Kavanagh, Bradley (University of Amsterdam)
Mamuzic, Judita (IFIC / CSIC - UV)
Mishra-Sharma, Siddharth (Princeton University)
Nieto, Daniel (Universidad Complutense de Madrid)
Page, William (University of British Columbia)
Rau, Wolfgang (Queen's University)
Reindl, Florian (HEPHY / TU Vienna)
Ruiz de Austri, Roberto (University of Valencia)
Rummel, Markus (McMaster University)
Safdi, Ben (University of Michigan)
Schafer, Chad (Carnegie Mellon University)
Scott, Pat (Imperial College)
Slatyer, Tracy (Massachusetts Institute of Technology)
Tsai, Yue-Lin Sming (Academia Sinica)
van Beekveld, Melissa (Radboud University)
van Dyk, David (Imperial College London)
Vincent, Aaron (Queen's University)
Weniger, Christoph (University of Amsterdam)
West, Jennifer Rittenhouse (UC Irvine)
Wolpert, Robert (Duke University)

Distributionally Robust Optimization
March 4 - 9, 2018

Organizers:

Erick Delage (HEC Montréal)
Daniel Kuhn (Ecole Polytechnique Federale de Laussane)
Karthik Natarajan (Singapore University of Technology and Design)
Wolfram Wiesemann (Imperial College London)

Mathematical optimization problems traditionally model uncertainty via probability distributions. However, observable statistical data can often be explained by many strikingly different distributions. This "uncertainty about the uncertainty" poses a major challenge for optimization problems with uncertain parameters: estimation errors in the parameters' distribution are amplified through the optimization process and lead to biased (overly optimistic) optimization results as well as post-decision disappointment in out-of-sample tests. The emerging field of distributionally robust optimization (DRO) seeks to propose new optimization models whose solutions are optimized against all distributions consistent with the given prior information. Recent findings have shown that many DRO models can be solved in polynomial time even when the corresponding stochastic models are intractable. DRO models also offer a more realistic account of uncertainty and mitigate the post-decision disappointment characteristic of stochastic models.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5102

Participants:

A. Murthy, Karthyek R. (Singapore University of Technology and Design)
Ahipasaoglu, Selin Damla (Singapore University of Technology and Design)
Bayraksan, Guzin (Ohio State University)
Bertsimas, Dimitris (MIT)
Campi, Marco (University of Brescia)
Carlsson, John Gunnar (University of Southern California)
Cheng, JianQiang (University of Arizona)
Delage, Erick (HEC Montréal)
den Hertog, Dick (Tilburg University)
Garatti, Simone (Politecnico di Milano)
Georghiou, Angelos (McGill University)
Goyal, Vineet (Columbia University)
Gupta, Vishal (University of Southern California)
Hanasusanto, Grani A. (University of Texas - Austin)
Homem-de-Mello, Tito (Universidad Adolfo Ibanez)
Iancu, Dan (Stanford University)
Jaillet, Patrick (MIT)
Jiang, Ruiwei (University of Michigan)
Kallus, Nathan (Cornell University)
Kleywegt, Anton (Georgia Institute of Technology)
Kuhn, Daniel (Ecole Polytechnique Federale de Laussane)
Lam, Henry (University of Michigan)
Li, Jonathan Yu-Meng (University of Ottawa)
Lim, Andrew (National University of Singapore)
Lisser, Abdel (University Paris Sud)
Mehrotra, Sanjay (Northwestern University)
Natarajan, Karthik (Singapore University of Technology and Design)
Özmen, Ayşe (University of Calgary)
Pflug, Georg (University of Vienna)
Postek, Krzysztof (Erasmus University Rotterdam)
Qi, Jin (Hong Kong University of Science and Technology)
Shen, Siqian (University of Michigan)
Sim, Melvyn (NUS Business School)
So, Anthony Man-Cho (The Chinese University of Hong Kong)
Teo, Chung Piaw (National University of Singapore)
Van Parys, Bart Paul Gerard (MIT)
Vayanos, Phebe (University of Southern California)
Wiesemann, Wolfram (Imperial College London)
Xu, Huan (Georgia Institute of Technology)
Xu, Huifu (University of Southampton)
Ye, Yinyu (Stanford University)

Modular Forms and Quantum Knot Invariants
March 11 - 16, 2018

Organizers:

Robert Osburn (University College Dublin)
Kazuhiro Hikami (Kyushu University)
Jeremy Lovejoy (CNRS, Université Paris 7)

This workshop will explore newly emerging connections between modular forms and quantum knot invariants. Modular forms have enjoyed long and fruitful interactions with many areas in mathematics such as number theory, algebraic geometry, combinatorics and physics. Quantum knot invariants have their origin in the seminal work of Jones in 1984 on von Neumann algebras and Witten in 1988 on topological quantum field theory.

The goal of this intense five-day workshop was to bring together international experts and young researchers in low-dimensional topology, number theory, string theory, quantum physics, algebraic geometry, conformal field theory, special functions and automorphic forms to discuss new developments and investigate potential directions for future research at the crossroads of these diverse areas.

For details, please refer to the workshop webpage
https://www.birs.ca/events/2018/5-day-workshops/18w5007

Participants:

Beirne, Paul (University College Dublin)
Bouchard, Vincent (University of Alberta)
Champanerkar, Abhijit (College of Staten Island & The Graduate Center, CUNY)
Creutzig, Thomas (University of Alberta)
Dasbach, Oliver (Louisiana State University)
Detcherry, Renaud (Michigan State University)
Dousse, Jehanne (Universität Zürich)
Folsom, Amanda (Amherst College)
Fuji, Hiroyuki (Kagawa University)
Gannon, Terry (University of Alberta)
Garvan, Frank (University of Florida)
Gukov, Sergei (California Institute of Technology)
Hikami, Kazuhiro (Kyushu University)
Irmer, Ingrid (Technion)
Jennings-Shaffer, Christopher (Oregon State University)
Kalfagianni, Effie (Michigan State University)
Kanade, Shashank (University of Denver)
Kashaev, Rinat (Universite de Geneve)
Lawrence, Ruth (Hebrew University - Jerusalem)
Lee, Christine (University of Texas at Austin)
Loebrich, Steffen (University of Amsterdam)
Lovejoy, Jeremy (CNRS, Université Paris 7)
Milas, Antun (State University of New York - Albany)
Murakami, Jun (Waseda University)
Nawata, Satoshi (Fudan University)
Osburn, Robert (University College Dublin)
Takata, Toshie (Kyushu University)
van der Veen, Roland (Universiteit Leiden)
Walsh, Katherine (University of Connecticut)
Warnaar, Ole (The University of Queensland)
Wedrich, Paul (Australian National University)
Yang, Tian (Texas A&M)
Yuasa, Wataru (Tokyo Institute of Technology)
Zwegers, Sander (University of Cologne)

New Developments in Open Dynamical Systems and Their Applications March 18 - 23, 2018

Organizers:

Konstantin Khanin (University of Toronto)
Mark Demers (Fairfield University)
Dmitry Dolgopyat (University of Maryland)
Hongkun Zhang (University of Massachusetts - Amherst)

Dynamical systems is a branch of mathematics that seeks to understand the evolution of systems that change over time. The proposed workshop will bring together leading researchers from diverse branches of dynamics related to open systems. These areas of research have many important applications, ranging from our understanding of thermodynamics to our ability to quantify the occurrence of rare events such as large storms or financial crises. By fostering connections between the study these various types of open systems, the workshop will create new directions of research and promote significant progress in this new, but rapidly developing area of dynamics.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5061

Participants:

Bakhtin, Yuri (New York University)
Baladi, Viviane (CNRS and UPMC)
Balint, Peter (Technical University of Budapest)
Blumenthal, Alex (University of Maryland)
Bonetto, Federico (Georgia Institute of Technology)
Bruin, Henk (University of Vienna)
Bunimovich, Leonid A. (Georgia Institute of Technology)
Cellarosi, Francesco (Queen's University)
Chen, Jianyu (University of Massachusetts Amherst)
de Simoi, Jacopo (University of Toronto)
Demers, Mark (Fairfield University)
Dettmann, Carl (The University of Bristol)
Dolgopyat, Dmitry (University of Maryland)
Dyatlov, Semyon (UC Berkeley)
Eslami, Peyman (University of Warwick)
Feres, Renato (Washington University)
Fernandez, Bastien (CNRS)
Fisher, Todd (Brigham Young University)
González Tokman, Cecilia (University of Queensland)
Grigo, Alex (University of Oklahoma)
Hu, Huyi (Michigan State University)
Jézéquel, Malo (École Normale Supérieure de Paris)
Kaloshin, Vadim (University of Maryland)
Khanin, Konstantin (University of Toronto)
Kim, Ki Yeun (Eunice) (Tufts University)
Leguil, Martin (University of Toronto)
Lenci, Marco (University of Bologna)
Liverani, Carlangelo (University of Rome Tor Vergata)
Marklof, Jens (University of Bristol)
Melbourne, Ian (University of Warwick)
Nandori, Peter (University of Maryland)
Nicol, Matthew (University of Houston)
Pene, Francoise (Université de Bretagne Occidentale)
Pesin, Yakov (Penn State)
Pollicott, Mark (Warwick University)
Rom-Kedar, Vered (Weizmann Institute)
Simanyi, Nandor (University of Alabama - Birmingham)
Szasz, Domokos (Budapest Technical University)
Todd, Mike (University of St Andrews)
Vytnova, Polina (University of Warwick)
Webb, Benjamin (Brigham Young University)
Zhang, Hongkun (University of Massachusetts - Amherst)
Zhang, Ke (University of Toronto)

Emerging Trends in Geometric Functional Analysis
March 25 - 30, 2018

Organizers:

Alexander Litvak (University of Alberta)
Grigoris Paouris (Texas A&M University)
Peter Pivovarov (University of Missouri)
Elisabeth Werner (Case Western Reserve University)

Asymptotic Geometric Analysis (AGA) is concerned with geometric and linear properties of finite dimensional objects, studying their characteristic behavior when the dimension, or a number of other relevant free parameters, grows to infinity. High dimensional systems appear naturally and play an essential role in mathematics and applied sciences. It is from the shared need to better understand similar phenomena that many breakthrough results have occurred in the last decade. The roots of AGA are in Functional Analysis but the area is now closely tied to Convex and Discrete Geometry, several areas of Probability including Random Matrix Theory, among others. By virtue of the general framework of AGA and its methods, it is situated at the “crossroads” of these fields. The focus of the conference is to cover connections between these fields, including the geometry of high-dimensional measures, affine isoperimetric inequalities and asymptotic non-limit theory of random matrices. The goal was to communicate new techniques that merge tools from the latter fields.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5081

Participants:

Alonso, David (University of Zaragoza)
Besau, Florian (Goethe University Frankfurt)
Cordero-Erausquin, Dario (Sorbonne Université)
Dann, Susanna (University of Bogota)
Ergur, Alperen (Technische Universitat Berlin)
Florentin, Dan (Kent State University)
Karoly, Bezdek (University of Calgary)
Koldobsky, Alexander (University of Missouri)
Li, Ben (Case Western Reserve University)
Litvak, Alexander (University of Alberta)
Livshyts, Galyna (Georgia Institute of Technology)
Lombardi, Nico (University of Florence)
Ludwig, Monika (Technische Universität Wien)
Meckes, Mark (Case Western Reserve University)
Meyer, Mathieu (Université Paris-Est Marne-la-Vallée)
Milman, Vitali (Tel Aviv University)
Moreno, Oscar Adrian (University of Warwick)
Myroshnychenko, Sergii (University of Alberta)
Paouris, Grigoris (Texas A&M University)
Pivovarov, Peter (University of Missouri)
Rebollo Bueno, Jesus (University of Missouri)
Rebrova, Elizaveta (University of Michigan)
Reitzner, Matthias (Universitat Osnabruck)
Rotem, Liran (University of Minnesota)
Schneider, Rolf (University of Freiburg)
Schütt, Carsten (Christian-Albrechts-Universitaet)
Segal, Alex (Afeka college of engineering, Tel Aviv)
Slomka, Boaz (University of Michigan)
Stancu, Alina (Concordia University)
Stephen, Matthew (University of Alberta)
Tatarko, Kateryna (University of Alberta)
Tomczak-Jaegermann, Nicole (University of Alberta)
Valettas, Petros (Universtiy of Missouri)
van Handel, Ramon (Princeton University)
Vershynin, Roman (University of Michigan)
Vritisou, Beatrice (University of Alberta)
Werner, Elisabeth (Case Western Reserve University)
Yaskin, Vladyslav (University of Alberta)
Zvavitch, Artem (Kent State Univeristy)

Physical, Geometrical and Analytical Aspects of Mean Field Systems of Liouville Type
April 1 - 6, 2018

Organizers:

Daniele Castorina (Padova)
Changfeng Gui (University of Texas at San Antonio)
Gabriella Tarantello (Roma Tor Vergata)

This five-day workshop provided a forum for the dissemination of current advances in the study of Mean Field Systems of Liouville type (MFS in short), such as the Toda. The focus was in the interplay between their physical, geometrical, topological and analytical aspects.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5209

Participants:

Bartolucci, Daniele (Roma Tor Vergata)
Battaglia, Luca (Roma La Sapienza)
Castorina, Daniele (Padova)
D'Aprile, Teresa (Roma Tor Vergata)
Da Lio, Francesca (ETH,Zurich)
De Marchis, Francesca (Sapienza Università di Roma)
Dolbeault, Jean (Université Paris-Dauphine)
Eremenko, Alexandre (Purdue University)
Esposito, Pierpaolo (Università di Roma Tre)
Ghoussoub, Nassif (University of British Columbia)
Gui, Changfeng (University of Texas at San Antonio)
Hauer, Daniel (The University of Sydney)
Hu, Yeyao (University of Texas at San Antonio)
Jevnikar, Aleks (Roma Tor Vergata)
Lee, Youngae (Kyungpook National University)
Li, Yanyan (Rutgers University)
Lin, Chang-Shou (National Taiwan University)
López Soriano, Rafael (Univ. Granada)
Lucia, Marcello (CUNY)
Malchiodi, Andrea (Scuola Normale Superiore di Pisa)
Mancini, Gabriele (Sapienza Università di Roma)
Martinazzi, Luca (University of Padova)
Moradifam, Amir (University of California, Riverside)
Nie, Zhaohu (Utah State Univ)
Nolasco, Margherita (Universita di L'Aquila)
Poliakovsky, Arkady (Ben-Gurion)
Ruf, Bernhard (Università degli Studi di Milano)
Ruiz, David (Universidad de Granada)
Sani, Federica (Università degli Studi di Milano)
Struwe, Michael (ETH Zentrum)
Tarantello, Gabriella (Roma Tor Vergata)
Wei, Juncheng (University of British Columbia)
Yan, Xukai (Georgia Tech)
Zhu, Meijun (University of Oklahoma)

Entropies, the Geometry of Nonlinear Flows, and their Applications
April 8 - 13, 2018

Organizers:

Jose Carrillo (Imperial College London)
Eric Carlen (Rutgers University)
Jean Dolbeault (Université Paris-Dauphine)
Daniel Matthes (TU-Munich)
Dejan Slepčev (Carnegie Mellon University)

Many natural processes involving the interaction of a very large number of particles, such as conduction of heat, fluid flows and chemical reactions, possess an entropy, a quantity that increases during the evolution. A powerful strategy for quantitatively understanding the properties of such systems is to establish mathematical relations between entropies and other quantities characterizing the state of the system. The investigation of these relations has been extremely successful explaining and predicting the properties of the dynamics of such large and complicated systems, and to draw the sharpest conclusions it is important to establish the optimal relations between relevant quantities. There is also an important geometric aspect to the evolutions of such systems.

A large scientific community has been involved in this area since the first meeting held in Banff in 2006, which played an important role in the development of the topic, and entropy methods have now reached a certain maturity through the geometric interpretation of nonlinear flows. The area is now more vibrant than ever involving a growing network of interaction between branches of mathematics, physics, biology and the social sciences. This meeting is intended to consolidate this progress and set the stage for new advances.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5069

Participants:

Arnold, Anton (Technische Universitaet Wien)
Blanchet, Adrien (Université de Toulouse)
Bowles, Malcolm (University of British Columbia)
Cañizo, José Alfredo (Universidad de Granada)
Carlen, Eric (Rutgers University)
Carlier, Guillaume (Université Paris Dauphine)
Carrillo, Jose (Imperial College London)
Carvalho, Maria C (Rutgers University)
Craig, Katy (University of California Santa Barbara)
Degond, Pierre (Imperial College London)
Denzler, Jochen (University of Tennessee - Knoxville)
Di Francesco, Marco (University of L'Aquila)
Dolbeault, Jean (Université Paris-Dauphine)
Erbar, Matthias (University of Bonn)
Esteban, Maria J. (Universite de Paris-Dauphine)
Evans, Josephine (University of Cambridge)
Fathi, Max (CNRS and IMT)
Fellner, Klemens (University of Graz)
Figalli, Alessio (ETH Zurich)
Filbet, Francis (Université de Toulouse)
Gangbo, Wilfrid (UCLA)
Gentil, Ivan (Universite Lyon 1)
Ghoussoub, Nassif (University of British Columbia)
Guillin, Arnaud (University Clermont Auvergne)
Iacobelli, Mikaela (Durham University)
Kim, Inwon (University of California, Los Angeles)
Kinderlehrer, David (Carnegie Mellon University)
Loss, Michael (Georgia Institute of Technology)
Maas, Jan (IST Austria)
Matthes, Daniel (TU-Munich)
McCann, Robert (University of Toronto)
Muratori, Matteo (Politecnico di Milano)
Palmer, Aaron (University of British Columbia)
Patacchini, Francesco (Carnegie Mellon University)
Plazotta, Simon (Technical University of Munich)
Raoul, Gaël (Ecole polytechnique)
Savaré, Giuseppe (University of Pavia)
Schlichting, André (RWTH Aachen University)
Slepčev, Dejan (Carnegie Mellon University)
Stevens, Angela (Universität Münster)
Volzone, Bruno (Università di Napoli "Parthenope")
Yao, Yao (Georgia Tech)

Workshop on Geometric Quantization
April 15 - 20, 2018

Organizers:

Paul-Emile Paradan (Université de Montpellier)
Xiaonan Ma (Université Paris Diderot - Paris 7)
Eckhard Meinrenken (University of Toronto)

Following the principle of quantum mechanics, the aim of geometric quantization is to associate to a classical phase space, described by a symplectic manifold M, a quantized version Q(M), given by a Hilbert space. In this procedure, the Poisson bracket of functions on M, regarded as classical observables, should correspond to the commutator of self-adjoint operators, regarded as quantum observables. Furthermore, an action of a group G by symmetries of M should be implemented as a unitary representation on the quantum Hilbert space Q(M). The philosophy of geometric quantization has been used in a variety of contexts, with remarkable and often surprising consequences. This workshop at BIRS brought together mathematicians working on these topics and with different techniques such as topological K-theory, analytic estimates, C* -algebras, representation theory. The philosophy of geometric quantization will act as a focal point for the interaction between all of these areas. The workshop provided an excellent opportunity for experts working on different aspects of the theory to exchange ideas, leading to fresh insights and new developments.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5182

Participants:

Barron, Tatyana (University of Western Ontario)
Blacker, Casey (University of California Santa Barbara)
Charles, Laurent (University Pierre et Marie Curie)
Dai, Xianzhe (University of California Santa Barbara)
Freed, Daniel (University of Texas at Austin)
Gukov, Sergei (California Institute of Technology)
Hamilton, Mark (Mount Allison University)
Hawkins, Eli (University of York)
Hekmati, Pedram (The University of Auckland)
Higson, Nigel (Pennsylvania State University)
Hochs, Peter (University of Adelaide)
Ioos, Louis (Pierre and Marie Curie University-Paris 6)
Karshon, Yael (University of Toronto)
Kottke, Chris (New College of Florida)
Krepski, Derek (University of Manitoba)
Lackman, Joshua (University of Toronto)
Lerman, Eugene (Uniiversity of Illinois)
Loizides, Yiannis (Pennsylvania State University)
Ma, Xiaonan (Université Paris Diderot - Paris 7)
Marinescu, George (Köln University)
Meinrenken, Eckhard (University of Toronto)
Melrose, Richard (MIT)
Paradan, Paul-Emile (Université de Montpellier)
Puchol, Martin (University of Lyon)
Rochon, Frédéric (Université du Québec à Montréal)
Rodsphon, Rudy (Vanderbilt University)
Savale, Nikhil (Universität zu Köln)
Schick, Thomas (Universität Göttingen)
Sniatycki, Jedrzej (University of Calgary)
Song, Yanli (Washington University at St.Louis)
Stolz, Stephan (University of Notre Dame)
Tang, Xiang (Washington University)
Uribe, Alejandro (University of Michigan)
Valiveti, Kaavya (MIT)
Varghese, Mathai (University of Adelaide)
Vergne, Michèle (University Paris Diderot)
Waldorf, Konrad (Universität Greifswald)
Wang, Hang (East China Normal University)
Zerouali, Ahmed (University of Toronto)

Numerical Analysis and Approximation Theory meets Data Science
April 22 - 27, 2018

Organizers:

Ben Adcock (Simon Fraser University)
Andrea Bertozzi (University of California Los Angeles)
Ronald DeVore (Texas A & M University)
Clayton Webster (University of Tennessee)

The central theme of the workshop was to improve the scientific discovery process by fostering the interaction between numerical analysis, approximation theory, and continuous problems arising in data science. Realizing the future potential of international scientific facilities, including neutron and light sources, high-energy reactors, and extreme-scale computing requires scientists to address a fundamental question, namely "how many realizations of a nonlinear manifold are required to recover a complex phenomena, with optimal approximation guarantees and minimal computational cost?" This grand challenge naturally arises in a large number of fields including neutron, tomographic and magnetic resonance image reconstruction, uncertainty quantification, optimal control and parameter identification for engineering and science applications, as well as many important energy, defense, and material science applications. Here constructing the solution map to these complex problems requires repeated measurements that are often expensive, high-dimensional, and stochastic, i.e., an ensemble of complex numerical simulations or time-consuming physical experiments. As such, this workshop aimed to present the mathematical foundations for enabling next-generation computational methods for approximating and analyzing systems having a certain set of constraints, from a limited amount of sparse and noisy scientific data.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5172

Participants:

Adcock, Ben (Simon Fraser University)
Archibald, Rick (Oak Ridge National Laboratory)
Brugiapaglia, Simone (Simon Fraser University)
Dahmen, Wolfgang (University of South Carolina)
Dexter, Nick (University of Tennessee)
Foi, Alessandro (Tampere University of Technology)
Foucart, Simon (Texas A&M University)
Griebel, Michael (Universitaet Bonn)
Haber, Eldad (The University of British Columbia)
Haddock, Jamie (University of California - Davis)
Hansen, Anders (University of Cambridge)
Lou, Yifei (University of Texas at Dallas)
Lunz, Sebastian (University of Cambridge)
Lynch, Richard (Texas A&M University)
Nichols, James (Sorbonne Universités)
Nuyens, Dirk (KU Leuven)
Owen, Justin (Texas A&M University)
Owhadi, Houman (California Institute of Technology)
Perea, José (Michigan State University)
Petrosyan, Armenak (Oak Ridge National Laboratory)
Platte, Rodrigo (Arizona State University)
Poon, CP (University of Cambridge)
Rapinchuk, Ekaterina (Michigan State University)
Ritter, Klaus (Technische Universität Kaiserslautern)
Schönlieb, Carola-Bibiane (University of Cambridge)
Slepčev, Dejan (Carnegie Mellon University)
Slevinsky, Richard Mikael (University of Manitoba)
Tran, Giang (University of Waterloo)
Webster, Clayton (University of Tennessee)
Yoo, Gene Ryan (CalTech)
Yuan, Baichuan (UCLA)
Zhang, Guannan (Oak Ridge National Laboratory)

Mathematical Foundations of Data Privacy
April 29 - May 4, 2018

Organizers:

Thomas Steinke (IBM Research Almaden)
Mark Bun (Princeton University)
Cynthia Dwork (Harvard University)
Toniann Pitassi (University of Toronto)

Widespread collection, analysis, and sharing of sensitive data has led to several high-profile privacy breaches. Often, these attacks involve linking an "anonymized" dataset, having sensitive information, with a public dataset holding only neutral information. The failure of traditional methods for anonymizing data has demonstrated the need for a rigorous theory of private data analysis --- one which is robust against the use of both existing and unforseen outside sources of information. Over the past decade, differential privacy has emerged as the standard for privacy-preserving data analysis within the mathematical sciences. This workshop brought together researchers from different disciplines with a common interest in the mathematical foundations of data privacy. It helped the community understand the diverse challenges being tackled by current privacy research, share new algorithmic techniques for privacy-preserving data analysis, and discuss the most pressing directions for further research.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5189

Participants:

Awan, Jordan (Pennsylvania State University)
Bassily, Raef (Ohio State University)
Blasiok, Jaroslaw (Harvard University)
Bun, Mark (Princeton University)
Cummings, Rachel (Georgia Tech)
Dong, Jinshuo (University of Pennsylvania)
Dwork, Cynthia (Harvard University)
Feldman, Vitaly (Google)
Gaboardi, Marco (University at Buffalo)
He, Xi (Duke University)
Hrvacic, Isak (Cohere Communications)
Joseph, Matthew (University of Pennsylvania)
Kairouz, Peter (Stanford University)
Kamath, Gautam (MIT)
Kasiviswanathan, Shiva (Amazon)
Kattis, Assimakis (University of Toronto)
Kifer, Daniel (Pennsylvania State University)
Korolova, Aleksandra (University of Southern California)
Mironov, Ilya (Google)
Neel, Seth (University of Pennsylvania)
Nikolov, Aleksandar (University of Toronto)
Nissim, Kobbi (Georgetown University)
Pitassi, Toniann (University of Toronto)
Raskhodnikova, Sofya (Boston University)
Reimherr, Matthew (Pennsylvania State University)
Reingold, Omer (Stanford University)
Rogers, Ryan (Apple)
Rothblum, Guy (Weizmann Institute of Science)
Sarwate, Anand (Rutgers University)
Sheffet, Or (University of Alberta)
Smith, Adam (Boston University)
Steinke, Thomas (IBM Research Almaden)
Stemmer, Uri (Harvard University)
Talwar, Kunal (Google)
Thakkar, Om (Boston University)
Thakurta, Abhradeep (University of California Santa Cruz)
Ullman, Jonathan (Northeastern University)
Vadhan, Salil (Harvard University)
Waggoner, Bo (University of Pennsylvania)
Wu, Steven (Microsoft Research-NYC)

An Algebraic Approach to Multilinear Maps for Cryptography
May 6 - 11, 2018

Organizers:

Alice Silverberg (University of California, Irvine)
Dan Boneh (Stanford University)
Ted Chinburg (University of Pennsylvania)

The infrastructure of modern society depends on secure and efficient cryptography. Cryptographic methods in turn depend on increasingly sophisticated techniques in number theory and arithmetic geometry. This workshop brought cryptographers, number theorists and arithmetic geometers together to discuss problems of central importance to the future of electronic communication. Advances over the past 15 years have opened up the possibility of a revolution in the parts of cryptography pertaining to multilinear maps. This workshop laid the foundations for such a revolution by focusing on potential constructions of cryptographically useful multilinear maps using cup product maps in the \'etale cohomology and K-theory of arithmetic schemes. By bringing together researchers from arithmetic geometry with cryptographers who are directly familiar with what is needed for a major advance, we prepared the ground for important new developments in both subjects.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5118

Participants:

Bleher, Frauke (University of Iowa)
Boneh, Dan (Stanford University)
Bright, Martin (Universiteit Leiden)
Chinburg, Ted (University of Pennsylvania)
Elkies, Noam D. (Harvard University)
Galbraith, Steven (University of Auckland)
Gangl, Herbert (Durham University)
Glass, Darren (Gettysburg College)
Guy, Richard (The University of Calgary)
Heninger, Nadia (University of Pennsylvania)
Huang, Ming-Deh (USC)
Jao, David (University of Waterloo)
Kedlaya, Kiran (University of California, San Diego)
Lee, Changmin (Seoul National University)
Lenstra, Hendrik (Universiteit Leiden)
Pellet--Mary, Alice (LIP, ENS de Lyon)
Rubin, Karl (University of California, Irvine)
Sahai, Amit (UCLA)
Scheidler, Renate (University of Calgary)
Scherr, Zach (Bucknell University)
Shani, Barak (University of Pennsylvania)
Sharif, Shahed (CSU San Marcos)
Silverberg, Alice (University of California, Irvine)
Stange, Katherine (University of Colorado Boulder)
Stevenhagen, Peter (Universiteit Leiden)
Takashima, Katsuyuki (Kyushu University)
Tibouchi, Mehdi (NTT Corporation)
Tran, Ha (University of Calgary)
Zobernig, Lukas (The University of Auckland)

Asymptotically Hyperbolic Manifolds
May 13 - 18, 2018

Organizers:

Eric Woolgar (University of Alberta)
Rafe Mazzeo (Stanford University)
Anna Sakovich (Uppsala Universitet)

Most of us are familiar with the geometry of Euclid, which is based on the properties of the flat plane. But there are two other similarly fundamental simple geometries and, as Riemann showed, infinitely more if you allow for more complicated, less symmetrical geometric structures. Of the two other most simple geometries, one is the geometry of the sphere, but the other is perhaps less familiar: it's the geometry of the hyperbolic plane, popularized in the work of the artist MC Escher. The subject of this workshop is Riemannian geometries that resemble hyperbolic geometry at large distances. These geometries are called asymptotically hyperbolic (AH) manifolds. Remarkably, these geometries play a fundamental role in modern physics. They appear (with a slight twist) in general relativity, where that are called asymptotically anti-de Sitter spacetimes (AdS). They are fundamental in string theory and particle physics, through what is known as the AdS/CFT correspondence, a paradigm for relating two otherwise very distinct objects, quantum conformal field theory and gravitation. In pure mathematics, AH manifolds have revolutionized our understanding of conformal geometry. This workshop brought together experts in the many diverse areas touched by asymptotically hyperbolic manifolds and asymptotically anti-de Sitter spacetimes, to consolidate the advances of the recent past and to focus attention on the most pressing new questions in the field.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5108

Participants:

Alaee, Aghil (University of Toronto)
Albin, Pierre (University of Illinois, Urbana-Champaign)
Alexakis, Spyros (University of Toronto)
Allen, Paul T (Lewis & Clark College)
Bahuaud, Eric (Seattle University)
Bizon, Piotr (Jagiellonian University)
Bland, John (University of Toronto)
Burkhart, Madeleine (University of Washington)
Cabrera Pacheco, Armando (Universitaet Tuebingen)
Capogna, Luca (Worcester Polytechnic Institute)
Cederbaum, Carla (Universitat Tubingen)
Chang, Alice (Princeton University)
Chen, Eric (Princeton University)
Chien, Chun-Kai Kevin (University of Washington)
Engelhardt, Netta (Princeton University)
Eptaminitakis, Nikolaos (University of Washington)
Galloway, Greg (University of Miami)
Gicquaud, Romain (Universite Francois)
Gover, Rod (University of Auckland)
Graham, Robin (University of Washington)
Han, Qing (University of Notre Dame)
Harvie, Brian (University of California Davis)
Hershkovits, Or (Stanford University)
Jang, Hyun Chul (University of Connecticut)
Khuri, Marcus (Stony Brook University)
Lee, John M (University of Washington)
Lundberg, David (Uppsala University)
Matsumoto, Yoshihiko (Osaka University)
Maxwell, David (University of Alaska Fairbanks)
Mazzeo, Rafe (Stanford University)
McCormick, Stephen (Uppsala Universitet)
Qing, Jie (University of California, Santa Cruz)
Quan, Hadrian (University of Illinois Urbana-Champaign)
Saez, Mariel (Pontificia Universidad Católica de Chile)
Sakovich, Anna (Uppsala Universitet)
Singer, Michael (University College London)
Stavrov, Iva (Lewis & Clark College)
Taylor, Marika (University of Southampton)
Vasy, András (Stanford University)
Wang, Guofang (Freiburg University)
Woolgar, Eric (University of Alberta)

Topics in the Calculus of Variations: Recent Advances and New Trends
May 20 - 25, 2018

Organizers:

Maria Giovanna Mora (Università di Pavia) **Giovanni Leoni** (Carnegie Mellon University)

The Calculus of Variations is at the same time a classical area of mathematical analysis with long-standing open problems and a very active subject of modern mathematics, that has important applications in a variety of different fields, such as materials science, mathematical physics, and treatment of digitalized images, just to name a few examples. In the last decades this subject has enjoyed a flourishing development worldwide, driven both by mathematical developments and emergent applications.

This international workshop brought together a group of worldwide experts in a variety of emerging areas in the Calculus of Variations to share recent results and discuss future research directions. Topics included: inelastic behavior in solids (crack growth, plasticity, damage, cavitation, dislocation theory), surface diffusion and other geometric problems (problems of isoperimetric type, non-local energies of the Ohta-Kawasaki type), many-particle interaction, image processing, transport problems, multiscale problems, thin structures, dissipative and rate-independent flows.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5094

Participants:

Aguirre Salazar, Lorena (McMaster University)
Babadjian, Jean-François (Université Paris-Sud)
Barchiesi, Marco (Università di Napoli Federico II)
Cagnetti, Filippo (University of Sussex)
Caroccia, Marco (Carnegie Mellon University)
Cristoferi, Riccardo (Carnegie Mellon University)
Dal Maso, Gianni (SISSA)
Davoli, Elisa (Universität Wien)
Dolzmann, Georg (University of Regensburg)
Dondl, Patrick (Albert-Ludwigs-Universität Freiburg)
Francfort, Gilles (Université Paris Nord)
Friedrich, Manuel (Universität Wien)
Fusco, Nicola (Universita di Napoli)
Ginster, Janus (Carnegie Mellon University)
Gladbach, Peter (Carnegie Mellon University)
Gravina, Giovanni (Carnegie Mellon University)
Hagerty, Adrian (Carnegie Mellon University)
Iurlano, Flaviana (Université Paris 6)
Knüpfer, Hans (Universität Heidelberg)
Leoni, Giovanni (Carnegie Mellon University)
Lu, Xin Yang (Lakehead University)
Maor, Cy (University of Toronto)
Mora, Maria Giovanna (University of Pavia)
Morandotti, Marco (Technische Universität München)
Morini, Massimiliano (Università di Parma)
Muratov, Cyrill (New Jersey Institute of Technology)
Murray, Ryan (PennState University)
O'Brien, Ethan (Carnegie Mellon University)
Piovano, Paolo (University of Vienna)
Rindler, Filip (University of Warwick)
Ruland, Angkana (Oxford)
Savaré, Giuseppe (University of Pavia)
Schmidt, Bernd (University of Augsburg)
Slastikov, Valeriy (University of Bristol)
Stinson, Kerrek (Carnegie Mellon University)
Tobasco, Ian (University of Michigan)
Wojtowytsch, Stephan (Carnegie-Mellon University)

Adaptive Numerical Methods for Partial Differential Equations with Applications
May 27 - June 1, 2018

Organizers:

Ronald Haynes (Memorial University)
Chris Budd (University of Bath)
Weizhang Huang (University of Kansas)
Tricia Brown (Armstrong State University)

Scientific computing is an increasingly important tool in many areas of science and engineering, allowing scientists to computational explore systems that are not amenable to theoretical or experimental investigation. It is widely used in engineering in the design of cars, aircraft, wind turbines, oil extraction etc, in medicine in the simulation of tissues and medical imaging, and it plays a central role in the forecasting of weather and climate. However a major bottle neck in current scientific computing practice is the difficulty of resolving small scale effects without excessive computational cost. For example predicting a thunderstorm, which is very small on the scale of the earth. Adaptive methods afford the possibility of achieving much better resolution, and thus much more accurate predictions, at little or no extra cost. This workshop brought together scientists from the fields of mathematics, computing, physics, engineering and meteorology to discuss the latex advances in adaptive methods and their applications to many real life problems. Participants included both senior and young researchers to allow vigorous discussion and collaboration which will advance the state-of-the-art in this exciting and emerging field.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5148

Participants:

Budd, Chris (University of Bath)
Chen, Shaohua (Cape Breton University)
Christara, Christina C. (University of Toronto)
DiPietro, Kelsey (University of Notre Dame)
Haynes, Ronald (Memorial University)
Hill, Róisín (National University of Ireland Galway)
Huang, Weizhang (University of Kansas)
Hubbard, Matthew (University of Nottingham)
Jahandari, Hormoz (Memorial University)
Kamenski, Lennard (Weierstrass Institute for Applied Analysis and Stochastics)
Kolasinski, Avary (University of Kansas)
Kopteva, Natalia (University of Limerick)
Lang, Jens (Darmstadt University of Technology)
Lindsay, Alan (University of Notre Dame)
Mackenzie, John (University of Strathclyde)
Madden, Niall (National University of Ireland Galway)
McRae, Andrew (University of Oxford)
Miedlar, Agnieszka (University of Kansas)
Muir, Paul (Saint Mary's University)
Qiu, Jianxian (Xiamen University)
Russell, Robert (Simon Fraser University)
Sarker, Abu Naser (Memorial University)
Shashkov, Mikhail (Los Alamos National Laboratory)
Sheng, Qin (Baylor University)
Shontz, Suzanne (University of Kansas)
Spiteri, Ray (University of Saskatchewan)
Stockie, John (Simon Fraser University)
Sun, Weiwei (City University of Hong Kong)
Tang, Huazhong (Peking University)
Van Vleck, Erik (University of Kansas)
Walsh, Emily (University of West England)
Wang, Yanqiu (Nanjing Normal University)
Wang, Dawei (Memorial University)
Williams, JF (Simon Fraser University)
Yang, Xiaobo (China University of Mining and Technology)
Zegeling, Paul (Utrecht University)
Zhang, Hong (Utrecht University)

Hydraulic Fracturing: Modeling, Simulation, and Experiment June 3 - 8, 2018

Organizers:

Anthony Peirce (University of British Columbia)
Andrew Bunger (University of Pittsburgh)
Emmanuel Detournay (University of Minnesota)
Egor Dontsov (University of Houston)
Dmitry Garagash (Dalhousie University)

The widespread use of hydraulic fracturing to enable the extraction of hydrocarbons from gas-rich shale formations has lead to significant public concern. These concerns stem from the fear that hydraulic fractures may breach aquifers or induce significant seismic events. The use of hydraulic fracturing in such mechanically complex solid media has put engineering field practice beyond the current computer simulation tools. To address these concerns, the objective of this meeting was to convene a BIRS Workshop of Applied Mathematicians, Geo-Scientists, and Engineers from Academia and Industry to accelerate the development of the state-of-the-art tools to analyze the evolution of hydraulic fractures that propagation in these complex solid media.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5085

Participants:

Adachi, Jose (Chevron)
Ball, Thomasina (Cambridge University)
Bessmertnykh, Alena (University of Houston)
Bunger, Andrew (University of Pittsburgh)
Chen, Nancy Shengnan (University of Calgary)
Detournay, Emmanuel (University of Minnesota)
Detournay, Christine (Itasca Minnesota)
Dontsov, Egor (University of Houston)
Esipov, Denis (Institute of Computational Technologies)
Fries, Thomas-Peter (Graz University of Technology)
Fu, Wei (University of Pittsburgh)
Garagash, Dmitry (Dalhousie University)
Golovin, Sergey (Lavrentyev Institute of Hydrodynamics)
Gracie, Robert (University of Waterloo)
Grassl, Peter (University of Glasgow)
Gunaydin, Delal (University Of Pittsburgh)
Kresse, Olga (Schlumberger)
Lecampion, Brice (EPFL)
Lee, Sanghyun (Florida State University)
Lew, Adrian (Stanford University)
Lu, Guanyi (University of Pittsburgh)
Mishuris, Gennady (Aberystwyth University)
Moukhtari, Fatima-Ezzahra (EPFL)
Napier, John (University of Pretoria)
Peirce, Anthony (University of British Columbia)
Protasov, Innokentiy (University of Houston)
Rezaei, Ali (U of Houston)
Rubinstein, Shmuel (Harvard University)
Sarvaramini, Erfan (U of Waterloo)
Savitski, Alexei (Shell International Exploration and Production)
Sinkey, Matthew (Calfrac Well Services)
Steinhardt, Will (Harvard University)
Tanne, Erwan (University of British Columbia)
Tulu, Ihsan Berk (West Virginia University)
Viesca, Robert (Tufts University)
Wang, Zhiqiao (China University of Geosciences -Beijing)
Wang, Ting (Dalhousie University)
Wong, Sau-Wai (National University of Singapore)
Yoshioka, Keita (Helmholtz Centre for Environmental Research)

Integrative Cell Models for Disease Intervention
June 10 - 15, 2018

Organizers:

Matthew Scott (University of Waterloo)
Hans Othmer (University of Minnesota)
Peter Swain (University of Edinburgh)

Biological processes do not occur in isolation and their appropriate execution requires communication and coordination across the cell. We know that signals are conveyed via interactions between proteins and between proteins and DNA, but such regulatory interactions are not the sole drivers of cellular responses. Changes in the physiological composition of the cell and particularly in the levels of common resources, such as energy and raw materials, also, just as in the human economy, provides a higher level of regulation. The extent of the control provided by this potentially primordial regulation has only recently been appreciated. Yet its effects are felt widely, ranging from the development of antibiotic resistance to the production of chemicals in the biotechnology industry. The broad ambition of this workshop was to foster the development of a new mathematical framework for modeling cellular processes that includes global regulation, either implicitly or explicitly, and so enables quantitative prediction particularly focused on disease intervention.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5073

Participants:

Allen, Rosalind (University of Edinburgh)
Amir, Ariel (Harvard University)
Bosia, Carla (Politecnico di Torino and Italian Institute for Genomic Medicine)
Bruggeman, Frank (VU University)
Ciandrini, Luca (University of Montpellier)
Dunlop, Mary (Boston University)
el Karoui, Meriem (University of Edinburgh)
Emberly, Eldon (Simon Fraser University)
Gedeon, Tomas (Montana State University)
Gou, Jia (University of Minnesota)
Greene, James (Rutgers University)
Iber, Dagamar (ETH Zurich)
Klipp, Edda (Humbold-Universitaet zu Berlin)
Klumpp, Stefan (University of Goettingen)
Larripa, Kamila (Humboldt State University)
Lu, Ting (University of Illinois at Urbana-Champaign)
Martins, Bruno (University of Cambridge)
Othmer, Hans (University of Minnesota)
Pilizota, Teuta (University of Edinburgh)
Scott, Matthew (University of Waterloo)
Shahrezaei, Vahid (Imperial College London)
Swain, Peter (University of Edinburgh (UK))
Teusink, Bas (Vrije Universiteit Amsterdam)
Umulis, David (Purdue University)
van Nimwegen, Erik (University of Basel)

Advanced Developments for Surface and Interface Dynamics - Analysis and Computation
June 17 - 22, 2018

Organizers:

Piotr Rybka (University of Warsaw)
Yoshikazu Giga (University of Tokyo)
Richard Tsai (University of Texas Austin and Royal Institute of Technology in Stockholm)

The workshop was devoted to analysis and numerical treatment of an array of processes involving interfaces or moving surfaces. Such processes are found to be crucial parts of many important applications, ranging from biological sciences, materials sciences, information sciences to social sciences. A simple example of a moving surface is the surface of a growing crystal. Controlling this process is of utmost importance for manufacturing of semiconductor devices. This workshop fostered interaction and brainstorming sessions among experts in mathematical analysis and numerical computation for the advancement of related areas.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5033

Participants:

Bonforte, Matteo (Universidad Autónoma de Madrid)
Chambolle, Antonin (Ecole Polytechnique and CNRS)
Choksi, Rustum (McGill University)
Chu, Chia-Chieh (National Tsinghua University)
Deckelnick, Klaus (University of Magdeburg)
Esedoglu, Selim (University of Michigan)
Gao, Yuan (The Hong Kong University of Science and Technology)
Giga, Yoshikazu (University of Tokyo)
Giga, Mi-Ho (University of Tokyo)
Guillen, Nestor (University of Massachusetts Amherst)
Hamamuki, Nao (Hokkaido University)
Kim, Inwon (University of California - Los Angeles)
King, John R. (University of Nottingham)
Kublik, Catherine (University of Dayton)
Liu, Jian-Guo (Duke University)
Łasica, Michał (Sapienza University of Rome)
Manfredi, Juan J. (University of Pittsburgh)
Margetis, Dionisios (University of Maryland - College Park)
Mazon, Jose (Universitat de Valencia)
Moll, Salvador (Universitat de Valencia)
Mucha, Piotr (University of Warsaw)
Muszkieta, Monika (Wrocław University of Science and Technology)
Namba, Tokinaga (Nippon Steel & Sumitomo Metal Corporation)
Nürnberg, Robert (Imperial College London)
Ohtsuka, Takeshi (Gunma University Japan)
Okamoto, Jun (University of Tokyo)
Pozar, Norbert (Kanazawa University)
Ruuth, Steve (Simon Fraser University)
Rybka, Piotr (University of Warsaw)
Shirakawa, Ken (Chiba University)
Stinner, Bjoern (University of Warwick)
Taguchi, Kazutoshi (University of Tokyo)
Tsai, Richard (University of Texas Austin and Royal Institute of Technology in Stockholm)
Voller, Vaughan (University of Minnesota)
Xin, Jack (University of California at Irvine)
Zahedi, Sara (KTH Sweden)

New Trends in Syzygies
June 24 - 29, 2018

Organizers:

Jason McCullough (Iowa State University)

Giulio Caviglia (Purdue University)

Free resolutions and syzygies are algebraic objects used throughout algebraic geometry, combinatorics, mathematical physics, topology and algebra. Recently several long-standing open problems on free resolutions have been settled, such as the Eisenbud-Goto Conjecture, Stillman's Problem, and the Boij-S\"oderberg Conjectures, but other important questions remain. This workshop brought together world experts in the various problems on syzygies to identify and attack some of the outstanding problems of this field.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5133

Participants:

Berkesch, Christine (University of Minnesota)
Boij, Mats (KTH Royal Institute of Technology)
Boocher, Adam (University of Utah)
Caviglia, Giulio (Purdue University)
Chardin, Marc (Université Pierre et Marie Curie)
Conca, Aldo (University of Genova)
Dao, Hailong (University of Kansas)
De Stefani, Alessandro (University of Nebraska)
Eisenbud, David (Mathematical Sciences Research Institute)
Elias, Juan (University of Barcelona Spain)
Francisco, Chris (Oklahoma State University)
Gibbons, Courtney (Hamilton College)
Hibi, Takayuki (Osaka University)
Iyengar, Srikanth (University of Utah)
Juhnke-Kubitzke, Martina (University of Osnabrück)
Kahle, Thomas (Otto-von-Guericke-Universität Magdeburg)
Katthän, Lukas (Goethe-Universität Frankfurt)
Kwak, Sijong (KAIST)
Mantero, Paolo (University of Arkansas)
McCullough, Jason (Iowa State University)
Miller, Claudia (Syracuse University)
Murai, Satoshi (Osaka University)
Nagel, Uwe (University of Kentucky)
Polini, Claudia (University of Notre Dame)
Raicu, Claudiu (University of Notre Dame)
Rossi, Maria-Evelina (University of Genova)
Sam, Steven (University of California, San Diego)
Sammartano, Alessio (MSRI)
Schenck, Hal (Iowa State University)
Seceleanu, Alexandra (University of Nebraska-Lincoln)
Sega, Liana (University of Missouri)
Sidman, Jessica (Mount Holyoke)
Smith, Gregory G. (Queen's University)
Striuli, Janet (Fairfield University)
Swanson, Irena (Reed College)
Thompson, Peder (Texas Tech University)
Ulrich, Bernd (Purdue University)
Van Tuyl, Adam (McMaster Univeristy)
Varbaro, Matteo (University of Genova)
Walker, Mark (University of Nebraska)
Welker, Volkmar (Philipps-Universitaet Marburg)

Spectral Geometry: Theory, Numerical Analysis and Applications
July 1 - 6, 2018

Organizers:

Iosif Polterovich (Université de Montréal)
Nilima Nigam (Simon Fraser University)
Justin Solomon (Massachusetts Institute of Technology)

The discipline of spectral geometry holds its roots in classical mathematics but continues to be a vibrant area of research among mathematicians and engineers. The basic approach in spectral geometry is to study shapes through the lens of differential operators, e.g. those governing the propagation of heat or waves across a volume or surface. From a theoretical standpoint, these operators encode a remarkable variety of both fine-grained and global information about shape, such as its curvature and topology. Computational systems developed in the last few years apply this unique, multiscale perspective on shape to applications in computer graphics, modeling, machine learning, medical imaging, and other disciplines. Needed to bridge the gap between theory and practice is the design of numerical analysis techniques that faithfully approximate operators from smooth spectral geometry on computational grids, meshes, boundary representations, and other computational structures for representing a shape. The first of its kind, this workshop brought together researchers in theoretical spectral geometry, numerical analysis, and application areas with the goal of multidisciplinary progress on the remaining challenges of this discipline.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5090

Participants:

Ben-Chen, Mirela (Technion - Israel Institute of Technology)
Bonnaillie-Noël, Virginie (École normale supérieure)
Bruno, Oscar (California Institute of Technology)
Bucur, Dorin (Université de Savoie, France)
Cakoni, Fioralba (Rutgers University)
Canzani , Yaiza (University of North Carolina - Chapel Hill)
Charron, Philippe (Université de Montréal)
Colton, David (University of Delaware)
Dominguez, Sebastian (Simon Fraser University)
Dryden, Emily (Bucknell University)
Gardini, Francesca (University of Pavia)
Gedicke, Joscha (University of Vienna)
Han, Rachel (University of British Columbia)
Hassannezhad, Asma (University of Bristol)
Ilmavirta, Joonas (University of Jyväskylä)
Jakobson, Dmitry (McGill University)
Karpukhin, Mikhail (McGill)
Kimmel, Ron (Technion-Israel Institute of Technology)
Lagacé, Jean (Université de Montréal)
Lena, Corentin (Universidade de Lisboa)
Levitin, Michael (University of Reading)
Liu, Xuefeng (Niigata University)
Lombaert, Hervé (Inria Sophia Antipolis)
May, Ian (Simon Fraser University)
Nigam, Nilima (Simon Fraser University)
Osting, Braxton (University of Utah)
Ovall, Jeff (Portland State University)
Parnovski, Leonid (University College London)
Polterovich, Iosif (Université de Montréal)
Sher, David (DePaul University)
Solomon, Justin (MIT)
St-Amant, Simon (Université de Montréal)
Stojisavljevic, Vukasin (Tel Aviv University)
Sun, Jiguang (Michigan State University)
Vaxman, Amir (Utrecht University)
Vouga, Etienne (University of Texas at Austin)
Wang, Yu (MIT)

Mathematical Approaches to Cell-Cell Communication and Collective Behaviours
July 8 - 13, 2018

Organizers:

Hyun Youk (Delft University of Technology)
Kresimir Josic (University of Houston)
Andrew Mugler (Purdue University)

Single cells perform extraordinary tasks, from the processing of environmental information to the extraordinary feat of replication. Yet, cells rarely act alone. Most microbes are part of complex communities where constituent cells interchange signals and even genetic material. This has an evolutionary reason: Interacting cells can coordinate their behaviour by communicating, and cells in the collective can specialize by assuming different responsibilities. As a result, the collective can perform computations and exhibit behaviours that are far more sophisticated than those of a single cell. Cellular collectives are thus more efficient, and have a wider range of functions than communities of non-interacting cells. But how do these behaviours emerge, and how are they coordinated across cellular populations? How are cells able to act as a well-trained choir, even in the absence of a conductor? Recent experimental and theoretical results have started to provide answers. Yet, the underlying processes are complex and far from understood. Experimental biologists will need the help of theorists to interpret their results. Theorists, on the other hand, will need the guidance of their experimental colleagues to capture the mechanisms that drive the observed emergent behaviours.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5042

Participants:

Bennett, Matthew (Rice University)
Byrd, Tommy (Purdue University)
Coppey, Mathieu (Curie Institute Paris)
Daneshpour, Hirad (Delft University of Technology)
De Monte, Silvia (CNRS, IBENS Paris)
Eckford, Andrew (York University)
Ganzinger, Kristina (Max Planck Institute for Biochemistry)
Ghilardi, Samuel (Boston University)
Gomez, Marcella (University of California at Santa Cruz)
Gomez-Alvarez, Diego Ricardo (Delft University of Technology)
Goyal, Sid (University of Toronto)
Igoshin, Oleg (Rice University)
Josic, Kresimir (University of Houston)
Julien, Jean-Daniel (Max Planck Institute for Dynamics and Self-Organization)
Karamched, Bhargav (University of Houston)
Kim, Jae Kyoung (KAIST)
Li, Zhengda (University of Michigan)
Liu, Shixuan (University of Toronto)
Maire, Theo (Delft University of Technology)
McGuigan, Alison (University of Toronto)
Mitchell, Amir (University of Massachusetts)
Mugler, Andrew (Purdue University)
O'Reilly, Breanna (Boston University)
Pedraza, Juan (Universidad de los Andes)
Puls, Owen (University of Michigan)
Rappel, Wouter-Jan (University of California - San Diego)
Sadeghpour, Mehdi (University of Houston)
Schwarz, Jennifer (Syracuse University)
Setayeshgar, Sima (Indiana University Bloomington)
Sgro, Allyson (Boston University)
Sinha, Somdatta (University of British Columbia)
Suel, Gurol (UCSD)
Sun, Bo (Department of Physics)
Sung, Chun-Yen (University of Michigan)
Thomas, Peter (Case Western Reserve University)
Tkacik, Gasper (Institute for Science and Technology - Austria)
Tsimring, Lev (University of California - San Diego)
Wang, Shiyuan (University of Michigan)
Yang, Qiong (University of Michigan)
Youk, Hyun (Delft University of Technology)

Around Quantum Chaos
July 15 - 20, 2018

Organizers:

Dmitry Jakobson (McGill University)
Stephane Nonnenmacher (Universite Paris-Sud)
Steve Zelditch (Northwestern university)

The workshop gathered specialists studying such problems for various systems, including Riemannian manifolds (with ergodic, completely integrable or mixed geodesic flows), arithmetic manifolds, quantum graphs, as well as random systems. The spectral theory of such systems is studied using a variety of different methods, including microlocal analysis, number theory, the theory of elliptic PDE, probabilistic methods and graph theory. The goal of the workshop was to review the latest progress in the field, and to facilitate interactions between specialists of different subdomains.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5002

Participants:

Band, Ram (Technion)
Berkolaiko, Gregory (Texas A&M University)
Burq, Nicolas (Université Paris-Sud)
Canzani , Yaiza (University of North Carolina at Chapel Hill)
Chang, Robert (Northwestern university)
Cox, Graham (Memorial University of Newfoundland)
Deleporte, Alix (University of Strasbourg)
Dyatlov, Semyon (University of Berkeley)
Faure, Frederic (Univ. Grenoble)
Galkowski, Jeff (Stanford University)
Gayet, Damien (Univ. Grenoble)
Geis, Michael (Northwestern university)
Gomes, Sean (Northwestern University)
Hanin, Boris (Texas A&M)
Hillairet, Luc (Université Orléans)
Jakobson, Dmitry (McGill University)
Jung, Junehyuk (Texas A&M University)
Karpukhin, Mikhail (McGill)
Kleinhenz, Perry (Northwestern university)
Klevtsov, Semyon (Univ. Koln)
Lagacé, Jean (Université de Montréal)
Le Masson, Etienne (Bristol University)
Mangoubi, Dan (The Hebrew University)
Nonnenmacher, Stephane (Universite Paris-Sud)
Riviere, Gabriel (Universite Lille)
Silberman, Lior (University of British Columbia)
Strohmaier, Alex (Univ. of Leeds)
Tacy, Melissa (University of Otago)
Toth, John (McGill University)
Vogel, Martin (University of California, Berkeley)
Wigman, Igor (King's College London)
Wunsch, Jared (Northwestern University)

Complex Fluids in Biological Systems
July 22 - 27, 2018

Organizers:

Saverio Spagnolie (University of Wisconsin - Madison) **Gwynn Elfring** (University of British Columbia)

The workshop was focused at the intersection of three areas: rheology (the study of the deformation and flow of matter), biolocomotion (swimming and crawling through biological fluids and tissues), and active matter (large systems of active particles and their collective dynamics). This is a particularly vibrant area of multi-disciplinary science, requiring sophisticated mathematical understanding and novel computational techniques to push the field further towards problems of immediate interest for applications in biology, engineering, and human health services. Some of the long term goals of the field are to improve human understanding of fertility and the spread of bacterial infections and diseases. Medical challenges also include detecting and quantifying disruptions in normal material functionality (e.g. dehydrated lung mucus) and to develop new therapies. Fundamental insight gained at the intersection of complex fluids in biological contexts is certain to make a direct impact on these and other important pursuits. But the study of emergent dynamics in large, interacting systems is a fundamental issue in the physical sciences, and lessons learned may impact numerous other scientific fields.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5123

Participants:

Alexeev, Alexander (Georgia Institute of Technology)
Ardekani, Arezoo (Purdue University)
Arratia, Paulo (University of Pennsylvania)
Datta, Sujit (Princeton University)
Dunkel, Joern (Massachusetts Institute of Technology)
Einarsson, Jonas (Stanford University)
Elfring, Gwynn (University of British Columbia)
Fauci, Lisa (Tulane University)
Feng, James J (University of British Columbia)
Fu, Henry (University of Utah)
Furst, Eric (University of Delaware)
Graham, Michael (University of Wisconsin-Madison)
Guy, Robert (University of California at Davis)
Hohenegger, Christel (University of Utah)
Juarez, Gabriel (University of Illinois)
Kanso, Eva (University of Southern California)
Khair, Aditya (Carnegie Mellon University)
Lushi, Enkeleida (New York University)
Montenegro-Johnson, Tom (University of Birmingham)
Narsimhan, Vivek (Purdue University)
Pak, On Shun (Santa Clara University)
Powers, Thomas (Brown University)
Ramchandran, Arun (University of Toronto)
Saintillan, David (UC San Diego)
Spagnolie, Saverio (University of Wisconsin - Madison)
Stein, David (Flatiron Institute)
Thiffeault, Jean-Luc (University of Wisconsin)
Thomases, Becca (University of California, Davis)
Underhill, Patrick (Rensselaer polytechnic institute)
Yan, Wen (Flatiron Institute, Simons Foundation)
Yariv, Ehud (Technion - Israel Institute of Technology)
Young, Yuan-Nan (NJIT)
Zia, Roseanna (Stanford University)

Physics and Mathematics of Quantum Field Theory
July 29 - August 3, 2018

Organizers:

Jan Derezinski (University of Warsaw)
Stefan Hollands (University of Leipzig)
Karl-Henning Rehren (University of Göttingen)

Quantum Field Theory (QFT) is the established theoretical framework to understand the fundamental constituents of matter and forces, with the exception of the gravitational force. It combines the principles of Quantum Mechanics with relativistic covariance and Einstein causality and leads to quantities describing fields (such as the electric field), which are, at the same time, to be viewed as fluctuating quantities subject to a fundamental uncertainty. This workshop was a great opportunity to exchange ideas between various research communities. Beside mathematical physicists, we also included practitioners of QFT -- theoretical physicists studying high energy physics, especially, extensions of the Standard Model.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5015

Participants:

Abdesselam, Abdelmalek (University of Virginia)
Bahns, Dorothea (Goettingen University)
Bischoff, Marcel (Ohio University)
Brown, Matthew (UC Santa Barbara)
Buchholz, Detlev (Goettingen University)
Cadamuro, Daniela (Technical University Munich)
Carpi, Sebastiano (University of Chieti-Pescara)
Chandra, Ajay (University of Warwick)
Derezinski, Jan (University of Warsaw)
Disertori, Margherita (Bonn University)
Duch, Paweł (Jagiellonian University)
Dybalski, Wojciech (Technical University Munich)
Feldman, Joel (University of British Columbia)
Fewster, Christopher (University of York)
Fröb, Markus B. (University of York)
Gannon, Terry (University of Alberta)
Gawedzki, Krzysztof (Ecole Normale Superieure de Lyon)
Gerard, Christian (Université Paris-Saclay)
Hack, Thomas-Paul (Leipzig University)
Hollands, Stefan (University of Leipzig)
Jaekel, Christian (University of São Paulo)
Khavkine, Igor (Czech Academy of Sciences)
Lechner, Gandalf (Cardiff University)
Lewin, Mathieu (Université Paris Dauphine)
Meissner, Krzysztof (University of Warsaw)
Misiak, Mikolaj (University of Warsaw)
Mueger, Michael (Radboud Universiteit Nijmegen)
Pinamonti, Nicola (University of Genova)
Pizzo, Alessandro (University of Rome Tor Vergata)
Rehren, Karl-Henning (University of Göttingen)
Rejzner, Kasia (York University)
Rivasseau, Vincent (University Paris-Sud XI)
Sanders, Ko (Dublin City University)
Siemssen, Daniel (University of Wuppertal)
Simmons-Duffin, David (California Institute of Technology)
Smith, Scott (Max-Planck Institute Leipzig)
Stottmeister, Alexander (Rome University Tor Vergata)
Tanimoto, Yoh (University of Rome Tor Vergata)
Várilly, Joseph C. (University of Costa Rica)
Verch, Rainer (Leipzig University)
Wald, Robert (University of Chicago)
Wrochna, Michał (Université Grenoble Alpes)

New Statistical Methods for Family-Based Sequencing Studies August 5 - 10, 2018

Organizers:

Alexandre Bureau (Université Laval)
Kelly Burkett (University of Ottawa)
Jinko Graham (Simon Fraser University)
Ingo Ruczinski (Johns Hopkins Bloomberg School of Public Health)

The advent of high-throughput DNA sequencing has opened the possibility of detecting rare genetic mutations that may be involved in complex human diseases. Family samples are better suited to establish involvement of rare mutations in complex traits than samples of unrelated subjects because in a family, multiple affected members may carry the same rare mutation, from the basic principles of inheritance from parents to children. A common theme to the various areas covered in the workshop is the need to account for various forms of dependence structures in familial DNA sequence data. One source of dependence is the relationships among family members, either known or unknown to the investigators. Another is the association among mutations located at nearby genomic regions, which is detectable through familial and population patterns in the DNA-sequence. Yet another is the dependence among multiple traits. This workshop brought together statisticians and genetic epidemiologists to better integrate and model the various forms of dependence in statistical inference approaches more powerful and valid than the few statistical methods currently applicable to these data.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5154

Participants:

Alie, Renaud (Université du Québec à Montréal)
Almasy, Laura (University of Pennsylvania)
Briollais, Laurent (Lunenfeld Tanenbaum Research Inst.)
Bull, Shelley (University of Toronto)
Bureau, Alexandre (Université Laval)
Burkett, Kelly (University of Ottawa)
Choi, Yun-Hee (University of Western Ontario)
Cordell, Heather (Newcastle University)
de Andrade, Mariza (Mayo Clinic)
Dossa, Houssou Roland Giustti (UQAM)
Fournier, Patrick (UQAM)
Fu, Jack (Johns Hopkins Bloomberg School of Public Health)
Gilly, Arthur (Wellcome Sanger Institute)
Girard, Simon (Université du Québec à Chicoutimi)
Graham, Jinko (Simon Fraser University)
Gravel, Simon (McGill University)
Hecker, Julian (Harvard T.H. Chan School of Public Health)
Ionita-Laza, Iuliana (Columbia University)
Jiang, Lai (Mc Gill University)
Karunarathna, Charith Bhagya (Simon Fraser University)
Krukov, Ivan (University of Calgary)
Lakhal Chaieb, Lajmi (Université Laval)
Lange, Ken (University of California, Los Angeles)
Larribe, Fabrice (UQAM)
Lee, Jooyoung (University of waterloo)
Lin, Xihong (Harvard University)
Liu, Dongmeng (Simon Fraser University)
Loredo-Osti, J-C (Memorial University)
Nickchi, Payman (Simon Fraser University)
Onifade, Maryam (University of Ottawa)
Oualkacha, Karim (Université du Québec à Montréal)
Qiao, Dandi (Brigham and Women's Hospital)
Ruczinski, Ingo (Johns Hopkins Bloomberg School of Public Health)
Scharpf, Rob (Johns Hopkins University)
Sinsheimer, Janet (University of California, Los Angeles)
Taub, Margaret (Johns Hopkins University)
Thompson, Elizabeth (University of Washington)
Thornton, Timothy (University of Washington)
Wijsman, Ellen (University of Washington)
Yilmaz, Yildiz (Memorial University)
Zhao, Kaiqiong (McGill University)

Mathematics of the Cell: Mechanical and Chemical Signaling across Scales
August 12 - 17, 2018

Organizers:

Alexandra Jilkine (University of Notre Dame)
Jun Allard (University of California, Irvine)
Arpita Upadhyaya (University of Maryland)

As biology enters the quantitative era, mathematics is playing an increasingly important role in revealing underlying principles of life. This is especially true for the cell, the fundamental unit of living systems. BIRS has played a foundational role in the development of what has become known as Mathematical Biology of the Cell, by hosting regular workshops that have helped reveal principles behind how cells move (including how immune cells patrol our bodies and how cancer cells spread), how cells polarize (forming a distinct front and rear) and how genes, biochemistry and forces come together in these living machines. A new layer of questions concerns how cells receive and process information from other cells and from their surroundings. This phenomenon, called cell signaling, is important for fundamental science but also for medicine, since new methods, including cancer immunotherapy, attempt to tune cell signaling to combat disease. A mathematical understanding of cell signaling also presents the opportunity to discover new deep mathematical concepts, particularly because it involves chemistry and physics acting across length-scales, from molecules to tissues and organs. We gathered researchers who study cell signaling in immune cells, cancer cells and stem cells during healthy development, among other, using cutting-edge experimental techniques and mathematical methods.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5126

Participants:

Allard, Jun (University of California, Irvine)
Bement, William (U Wisconsin Madison)
Betterton, Meredith (University of Colorado - Boulder)
Bland, Tom (The Francis Crick Institute)
Bovyn, Matt (UC Irvine)
Buttenschoen, Andreas (University of British Columbia)
Campas, Otger (University of California - Santa Barbara)
Ciocanel, Veronica (The Ohio State University)
Clemens, Lara (UC Irvine)
Copos, Calina (NYU Courant Institute)
Das, Moumita (Rochester Institute of Technology)
Dawes, Adriana (Ohio State University)
Edelstein-Keshet, Leah (University of British Columbia)
Feng, James J (University of British Columbia)
Fletcher, Dan (University of California Berkeley)
Gatlin, Jesse (University of Wyoming)
Goehring, Nathan (The Francis Crick Institute)
Goodson, Holly (University of Notre Dame)
Holmes, Bill (Vanderbilt)
Howard, Jonathon (Yale University)
Howard, Martin (John Innes Centre)
Jacobson, Ken (University of North Carolina Chapel Hill)
Lamson, Adam (University of Colorado Boulder)
Lee, Rachel (University of Maryland)
Lindsay, Alan (University of Notre Dame)
Mackay, Laurent (McGill University)
Maddox, Amy (UNC Chapel Hill)
Manhart, Angelika (New York University)
Mogilner, Alex (New York University)
Needleman, Daniel (Harvard University)
Neufeld, Zoltan (University of Queensland)
Papoian, Garegin (University of Maryland)
Prasad, Ashok (Colorado State University)
Rens, Elisabeth (University of British Columbia)
Toettcher, Jared (Princeton)
Upadhyaya, Arpita (University of Maryland)
Volkening, Alexandria (Ohio State University)
Weiner, Orion (University of California San Francisco)
Williams, David (Allen Institute for Cell Science)
Xu, Bin (University of Notre Dame)
Zmurchok, Cole (Vanderbilt University)

Regularity and Blow-up of Navier-Stokes Type PDEs using Harmonic and Stochastic Analysis
August 19 - 24, 2018

Organizers:

Kazuo Yamazaki (University of Rochester)
Hakima Bessaih (University of Wyoming)
Peter Constantin (Princeton University)
Jiahong Wu (Oklahoma State University)

Over the past few years, there have been extensive activities and substantial developments in the mathematical study of the Navier-Stokes-type equations such as the Euler Equations, the surface quasi-geostrophic equations, the Boussinesq and magnetohydrodynamics systems. These partial differential equations are some of the most frequently used models for describing motion of fluid, and for many scientific and practical applications, it is crucial to understand the behavior of their solutions, in particular whether all the solutions initiated from sufficiently smooth data remain smooth for all time or if there exists an initial data such that a solution may evolve from it to display a finite-time blow-up. This five-day workshop was to provide an intellectual environment for interaction among the community of researchers in fluid dynamics with diverse background in training, in particular harmonic and stochastic analysis. Besides stimulating lectures through which participants could share their work and junior mathematicians could mature through valuable training, organizers planned to provide sufficient amount of breaks between each talk, which became opportunities for participants to engage in discussions and collaborate, as well as establish contacts with those whom otherwise would not have had such an opportunity to come together and interact.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5057

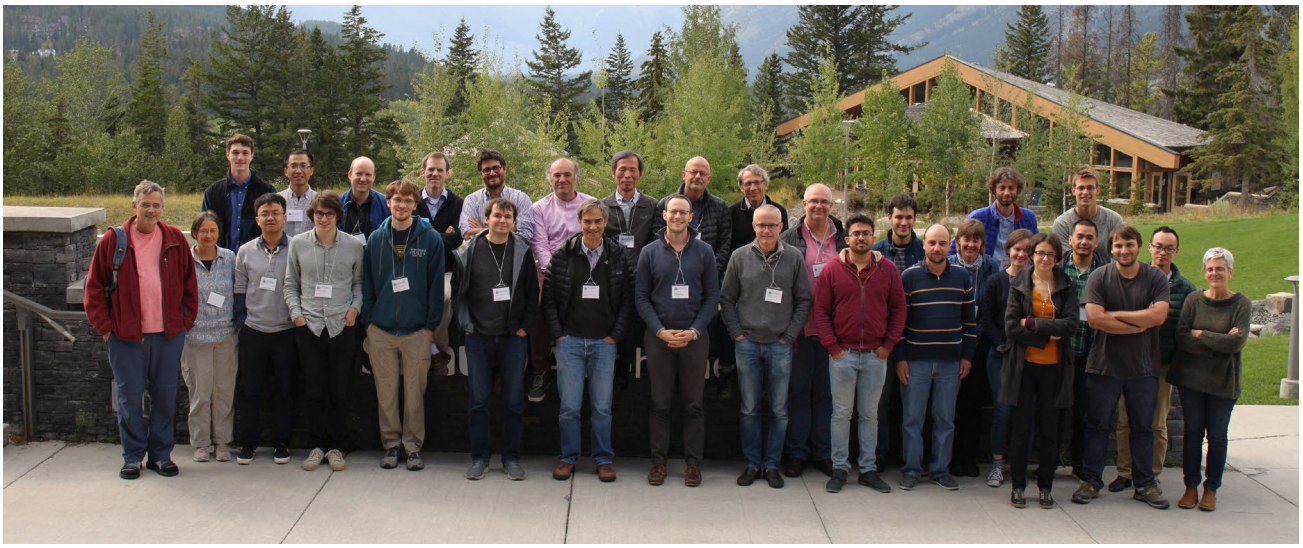
Participants:

Bessaih, Hakima (University of Wyoming)
Buckmaster, Tristan (Princeton University)
Chae, Dongho (Chung-Ang University)
Cheskidov, Alexey (University of Chicago Illinois)
Constantin, Peter (Princeton University)
Cordoba, Diego (ICMAT Madrid)
Dai, Mimi (University of Illinois at Chicago)
Doering, Charles R. (University of Michigan)
Dong, Hongjie (Brown University)
Drivas, Theodore (Princeton University)
Ferrario, Benedetta (University of Pavia)
Friedlander, Susan (USC)
Glatt-Holtz, Nathan (Tulane University)
Hmidi, Taoufik (Universite de Rennes1)
Ignatova, Mihaela (Princeton University)
Iyer, Gautam (Carnegie Mellon University)
Larios, Adam (University of Nebraska-Lincoln)
Mario, Maurelli (Technische Universitaet Berlin)
Martinez, Vincent (CUNY-Hunter College)
Miller, Evan (University of Toronto)
Ohkitani, Koji (The University of Sheffield)
Romito, Marco (Università di Pisa)
Schmalfuss, Bjorn (Friedrich-Schiller-University Jena)
Shvydkoy, Roman (University of Illinois at Chicago)
Tarfulea, Andrei (University of Chicago)
Titi, Edriss (Texas A&M University)
Vasseur, Alexis (University of Texas at Austin)
Wu, Jiahong (Oklahoma State University)
Xu, Xiaoqian (Carnegie Mellon University)
Yamazaki, Kazuo (University of Rochester)
Yao, Yao (Georgia Tech)
Yu, Xinwei (University of Alberta)

Interacting Particle Systems and Parabolic PDEs
August 26 - 31, 2018

Organizers:

Lenya Ryzhik (Stanford University)
Julien Berestycki (Oxford University)
Leonid Mytnik (Technion)
Jean-Michel Roquejoffre (Universite Paul Sabatier, Toulouse)



The main goal of this workshop was to bring together specialists in probability theory and stochastic processes, and partial differential equations to share emerging ideas in the these areas. Stochastic particle systems are an extremely active area of research with applications ranging from biology to social dynamics. Problems involving a large number of particles or agents can be often effectively described by continuous models such as partial differential equations, or stochastic partial differential equations. There is a well-established interface between these problems, and the workshop would address the state of the art of the interaction between the two fields, and possible extensions to new problems,including equations of fluid mechanics. The range of topics covered by the speakers is, therefore, quite large, in order to maximize the chances of cross-fertilization.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5134

Participants:

Addario-Berry, Louigi (McGill University)
Bakhtin, Yuri (New York University)
Berestycki, Julien (Oxford University)
Brunet, Eric (École Normale Supérieure Paris)
Butkovsky, Oleg (Technische Universitat Berlin)
Cerrai, Sandra (University of Maryland)
Chen, Le (University of Nevada, Las Vegas)
Corwin, Ivan (Columbia University)
Ducasse, Romain (PSL university)
Dunlap, Alexander (Stanford University)
Etheridge, Alison (University of Oxford)
Ferrari, Pablo (Universidad de Buenos Aires)
Gu, Yu (CMU)
Hamel, Francois (Universite d'Aix-Marseille)
Henderson, Christopher (the University of Chicago)
Hong, Jieliang (UBC)
Huang, Hui (Simon Fraser University)
Hughes, Thomas (University of British Columbia)
Khanin, Konstantin (University of Toronto)
Kiselev, Alexander (Duke University)
Kosygina, Elena (The CUNY Graduate Center)
Leculier, Alexis (Universite Paul Sabatier)
Maillard, Pascal (Université Paris-Sud)
Matano, Hiroshi (Meiji University)
Mirrahimi, Sepideh (Université Paul Sabatier)
Mukherjee, Chiranjib (University of Muenster)
Mytnik, Leonid (Technion)
Nolen, James (Duke University)
Olla, Stefano (Université Paris Dauphine)
Penington, Sarah (University of Oxford)
Perlman, Mark (Stanford University)
Roquejoffre, Jean-Michel (Universite Paul Sabatier, Toulouse)
Rossi, Luca (EHESS (Paris))
Ryzhik, Lenya (Stanford University)
Silvestre, Luis (University of Chicago)
Tsai, Li-Cheng (Columbia University)
Zeitouni, Ofer (Weizmann)

Tau Functions of Integrable Systems and Their Applications
September 2 - 7, 2018

Organizers:

Dmitry Korotkin (Concordia University)
Marco Bertola (Scuola Internazionale Superiore di Studi Avanzati)
Alexander Its (Indiana University)

"Tau-functions and Integrable systems" was intended as a 5-day workshop hosted by BIRS, where the leading experts in integrable systems, random matrices, algebraic geometry and dynamical systems along with young researchers from all over the world, discussed the latest trends and ideas interconnecting these fields of mathematics. The theory of tau-functions of integrable systems started to emerge about 30 years ago; now it unifies many different areas of mathematics and physics: combinatorics, algebraic geometry, spectral geometry, quantum field theory, to name a few. The workshop sought to set the ground for future developments on the frontiers of these fields. Connections with other fields such as symplectic geometry and analysis, were also strongly emphasized.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5025

Participants:

Abenda, Simonetta (University of Bologna)
Baker, Michael (Concordia University)
Balogh, Ferenc (John Abbott College)
Baraglia, David (Univ. of Adelaide)
Basor, Estelle (American Institute of Mathematics)
Bershtein, Mikhail (Landau Institute)
Bertola, Marco (Scuola Internazionale Superiore di Studi Avanzati)
Bobenko, Alexander (TU Berlin)
Chekhov, Leonid (Michigan State University)
Clarkson, Peter (University of Kent)
Deift, Percy (New York University)
Del Monte, Fabrizio (SISSA)
Desiraju, Harini (SISSA)
Dzhamay, Anton (The University of Northern Colorado)
Escobar, Adrian (Univ. of Montreal)
Gavrylenko, Pavlo (Higher School of Economics)
Girotti, Manuela (Colorado State University)
Grava, Tamara (SISSA)
Grushevsky, Samuel (Stony Brook University)
Guzzetti, Davide (Scuola Internazionale Superiore di Studi Avanzati)
Haine, Luc (UC Louvain)
Harnad, John (Concordia University)
Hurtubise, Jacques (McGill University)
Joshi, Aniket (University of Alberta)
Klein, Christian (Institut de Mathématiques de Bourgogne)
Klimov, Roman (Concordia University)
Korotkin, Dmitry (Concordia University)
Krasnov, Kirill (Univ. of Nottingham)
Lisovyi, Oleg (Université François Rabelais de Tours)
Marshakov, Andrey (The Lebedev Physical Institute of the Russian Academy of Sciences)
McLaughlin, Ken (Colorado State University)
Nakayashiki, Atsushi (Tsuda University)
Norton, Chaya (Concordia University)
Ooms, Adrien (University of Alberta)
Prokhorov, Andrei (IUPUI)
Ruzza, Giulio (SISSA)
Shchechkin, Anton (Higher School of Economics)
Tonni, Erik (SISSA)
Tracy, Craig (University of California, Davis)
Zvonkine, Dimitri (Versailles University)

Geometry and Physics of Quantum Curves
September 9 - 14, 2018

Organizers:

Olivia Dumitrescu (Central Michigan University)
Ron Donagi (University of Pennsylvania)
Marco Gualtieri (University of Toronto)
Motohico Mulase (University of California, Davis)

At the time of its birth, quantum mechanics was a mystery. From the 21st century perspective, quantum theory looks to have popped up instantaneously. In reality, it took over 30 years to be developed. Only very slowly mathematicians and physicists came to the understanding of quantum theory in the early 20th century. 100 years later, we are encountering a similar excitement and mysteries in geometry. On one side, we have a number of data coming from symplectic geometry known as Gromov-Witten invariants. The mirror symmetry idea tells us that they should also come from holomorphic geometry of complex manifolds. So far we have not identified the full scope of the holomorphic geometry that explains quantum invariants.

There are three amazing developments in this area of research. One is the analysis of Fredholm determinants of quantum operators that mysteriously reproduces the quantum invariants. The second is holomorphic geometry of the very notion of quantization. And the third is a beautiful theory of quantizing Hitchin spectral curves into differential operators. The workshop aimed at identifying these ideas behind the quantization, and to produce a more perfect union of disparate theories.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5078

Participants:

Baraglia, David (Univ. of Adelaide)
Borot, Gaetan (Max Planck Institute for Mathematics)
Bouchard, Vincent (University of Alberta)
Brini, Andrea (Imperial College London/CNRS)
Brinzanescu, Vasile (Institute of Mathematics IMAR)
Chekhov, Leonid (Michigan State University)
Chidambaram, Nitin Kumar (University of Alberta)
Chiodo, Alessandro (Jussieu, Paris 6)
Dillies, Jimmy (Georgia Southern University)
Do, Norman (Monash University)
Donagi, Ron (University of Pennsylvania)
Dumitrescu, Olivia (Central Michigan University)
Ellegaard Andersen, Jorgen (Aarhus University)
Fang, Bohan (Peking University)
Garcia-Failde, Elba (Max-Planck Institute Bonn)
Grassi, Alba (Simons Center Stony Brook)
Guigo Corominas, Roderic (Boston University)
Hilburn, Justin (University of Pennsylvania)
Hollands, Lotte (Heriot-Watt University)
Kelly, Tyler (University of Birmingham)
Kidwai, Omar (University of Oxford)
Kshirsagar, Priya (University of California Davis)
Logares, Marina (University of Plymouth)
Mahadeo, Christopher (University of Saskatchewan)
Malusà, Alessandro (University of Saskatchewan)
Mariño, Marcos (Université de Genève)
Mazzocco, Marta (University of Birmingham)
Mochizuki, Takuro (Kyoto University)
Mulase, Motohico (University of California, Davis)
Nikolaev, Nikita (Université de Genève)
Norbury, Paul (University of Melbourne)
Ooms, Adrien (University of Alberta)
Osuga, Kento (University of Alberta)
Pei, Du (QGM, Aarhus University/Caltech)
Priddis, Nathan (Brigham Young University)
Saenz, Axel (University of Virginia)
Saito, Masa-Hiko (Kobe University)
Sawon, Justin (University of North Carolina)
Sulkowski, Piotr (University of Warsaw)
Zakharov, Dmitry (Central Michigan University)
Zong, Zhengyu (Tsinghua University)

Affine Algebraic Groups, Motives and Cohomological Invariants
September 16 - 21, 2018

Organizers:

Nikita Karpenko (University of Alberta)
Alexander Merkurjev (University of California - Los Angeles)
Anne Quéguiner-Mathieu (Université Paris 13)

The theory of affine algebraic groups was developed by Chevalley, Borel, Serre, and Tits as an algebraic analogue of the highly successful and widely applied theory of Lie groups, and it now provides deep connections between algebra, number theory, and geometry. The purpose of this workshop was to bring together specialists and young researchers in these areas that will establish new links and projects, exploiting new emerging applications of algebraic groups.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5021

Participants:

Alsaody, Seidon (University of Alberta)
Ananyevskiy, Alexey (St.Petersburg University)
Auel, Asher (Yale University)
Baek, Sanghoon (Korea Advanced Institute of Science and Technology)
Bayer-Fluckiger, Eva (Ecole Polytechnique Federale de Lausanne)
Bhaskhar, Nivedita (University of California at Los Angeles)
Chernousov, Vladimir (University of Alberta)
De Clercq, Charles (Université Paris 13)
Devyatov, Rostislav (Universityof Alberta)
Duncan, Alexander (University of South Carolina)
Florence, Mathieu (Université Paris 6)
Garibaldi, Skip (Center for Communications Research La Jolla)
Garrel, Nicolas (Université Paris 13)
Gille, Philippe (Université Claude Bernard Lyon 1)
Gille, Stefan (University of Alberta)
Haution, Olivier (LMU Munich)
Hoffmann, Detlev (TU Dortmund)
Karpenko, Nikita (University of Alberta)
Krashen, Daniel (Rutgers University)
Kunyavskii, Boris (Bar-Ilan University)
Lemire, Nicole (University of Western Ontario)
MacDonald, Mark (Lancaster University)
Merkurjev, Alexander (University of California - Los Angeles)
Neshitov, Aleksandr (University of Southern California)
Parimala, Raman (Emory University)
Petrov, Viktor (St. Petersburg State University)
Pevtsova, Julia (University of Washington)
Popov, Vladimir (Steklov Mathematical Institute, Russian Academy of Sciences)
Quéguiner-Mathieu, Anne (Université Paris 13)
Rapinchuk, Andrei (University of Virginia)
Rapinchuk, Igor (Michigan State University)
Saltman, David J (Center for Communications Research - Princeton)
Scully, Stephen (University of Alberta)
Semenov, Nikita (Universität München)
Stavrova, Anastasia (St. Petersburg State University)
Suresh, Venapally (Emory University)
Tignol, Jean-Pierre (Université Catholique de Louvain)
Vishik, Alexander (University of Nottingham)
Zainoulline, Kirill (University of Ottawa)
Zhykhovich, Maksim (Universität München)

The Traveling Salesman Problem: Algorithms & Optimization
September 23 - 28, 2018

Organizers:

Joseph Cheriyan (University of Waterloo)
Sylvia Boyd (University of Ottawa)
Amin Saberi (Stanford University)
Ola Svensson (Ecole Polytechnique Federale de Lausanne)

The Traveling Salesman Problem (TSP) is a key topic in the area of discrete optimization. It has many applications and it occupies a central place in the theory of algorithms as well as in mathematical programming. The problem has been studied intensely for over 60 years. Almost all of the emerging new ideas and techniques in the areas of algorithms and optimization have been applied to the TSP. In turn, these efforts have given rise to important new sub-disciplines such as survivable network design. The workshop focused on a small number of themes that are attracting high interest in the areas of algorithms and optimization. Each of these has taken shape over the past few years, and the potential for significant progress is ripe.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5088

Participants:

An, Hyung-Chan (Yonsei University)
Anari, Nima (Stanford University)
Applegate, David (Google NYC)
Boyd, Sylvia (University of Ottawa)
Cheriyan, Joseph (University of Waterloo)
Cheung, Kevin (Carleton University)
Cohen-Addad, Vincent (CNRS & Sorbonne Université)
Cook, Bill (University of Waterloo)
Faenza, Yuri (Columbia University)
Friggstad, Zachary (University of Alberta)
Goemans, Michel (Massachusetts Institute of Technology)
Gupta, Anupam (Carnegie Mellon University)
Gutekunst, Sam (Cornell University)
Held, Stephan (University of Bonn)
Ibrahimpur, Sharat (University of Waterloo)
Khodamoradi, Kamyar (University of Alberta)
Le, Hung (Oregon State University)
Linhares, Andre (University of Waterloo)
McCormick, Tom (University of British Columbia)
Moemke, Tobias (University of Bremen and Saarland University)
Mucha, Marcin (University of Warsaw)
Naegele, Martin (ETH)
Nagarajan, Viswanath (University of Michigan)
Newman, Alantha (CNRS and Université Grenoble-Alpes)
Olver, Neil (Vrije Universiteit Amsterdam)
Oveis Gharan, Shayan (University of Washington)
Paluch, Katarzyna (University of Wroclaw)
Quanrud, Kent (Univ. Illinois at Urbana-Champaign)
Ravi, Ramamoorthi (Carnegie Mellon University)
Rothvoss, Thomas (University of Washington)
Saberi, Amin (Stanford University)
Sebo, Andras (CNRS & INP Grenoble)
Shmoys, David (Cornell University)
Svensson, Ola (Ecole Polytechnique Federale de Lausanne)
Swamy, Chaitanya (University of Waterloo)
Takazawa, Kenjiro (Hosei University)
Tarnawski, Jakub (Ecole Polytechnique Federale de Lausanne)
Traub, Vera (University of Bonn)
Vygen, Jens (University of Bonn)
Williamson, David (Cornell University)

Spin Glasses and Related Topics
September 30 - October 5, 2018

Organizers:

Dmitry Panchenko (University of Toronto)
Antonio Auffinger (Northwestern University)
Wei-Kuo Chen (University of Minnesota)
Lenka Zdeborova (Institut de Physique Theorique, France)

Spin glasses and related models of disordered media have been studied since the sixties, and have their roots in experimental physics and chemistry. The original motivation was understanding the behaviour of magnetic alloys of ferromagnets and conductors, such as AuFe or CuMg, which gave rise to a class of theoretical models whose analysis by both physicists and mathematicians has grown into one of the most fascinating fields of statistical mechanics over the last fifty years. The methodology developed in the study of these models led to further important tools and ideas that found applications in different branches of computer science, including combinatorial optimization theory, machine learning and signal processing. Fundamental concepts appeared relating average algorithmic complexity of optimization and inference problems with phase transitions in spin glass models. In the last two decades this connection flourished and spin glass theory was used for algorithmic development and analysis in many applications including error correcting codes, clustering of graphs and data, compressed sensing, training of neural networks, reconstruction of interaction networks from biological data, to name a few.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5036

Participants:

Arguin, Louis-Pierre (CUNY)
Auffinger, Antonio (Northwestern University)
Baik, Jinho (University of Michigan)
Barbier, Jean (Queen Mary University of London)
Belius, David (University of Zurich)
Ben Arous, Gerard (New York University)
Berthet, Quentin (University of Cambridge)
Bresler, Guy (MIT)
Chen, Wei-Kuo (University of Minnesota)
Coja-Oghlan, Amin (University of Frankfurt)
Concetti, Francesco (Sapienza University of Rome)
Dembo, Amir (Stanford)
Dhara, Souvik (MIT)
Dudeja, Rishabh (Columbia University)
El Alaoui, Ahmed (Berkeley)
Fyodorov, Yan (King's College London)
Gamarnik, David (Massachusetts Institute of Technology)
Gayrard, Veronique (Centre National de la Recherche Scientifique)
Jagannath, Aukosh (Harvard University)
Ko, Justin (University of Toronto)
Krzakala, Florent (Ecole Normale Superieure)
Lam, Wai-Kit (University of Minnesota)
Macris, Nicolas (Ecole Polytechnique Federale de Lausanne)
Massoulie, Laurent (Inria)
Mei, Song (Stanford University)
Miolane, Leo (ENS)
Moore, Cris (Santa Fe Institute)
Panchenko, Dmitry (University of Toronto)
Pohorence, Sean (Northwestern University)
Reeves, Galen (Duke)
Sen, Subhabrata (Microsoft Research and MIT)
Sly, Allan (Princeton)
Sohn, Youngtak (Stanford University)
Subag, Eliran (Courant Institute)
Sun, Nike (UC Berkeley)
Tetali, Prasad (Georgia Institute of Technology)
Urbani, Pierfrancesco (CNRS, IPhT)
Wein, Alexander (NYU Courant)
Wu, Hao (University of Michigan)
Zeng, Qiang (CUNY Queens College)
Zhang, Yumeng (Stanford University)

Moduli Spaces: Birational Geometry and Wall Crossings
October 7 - 12, 2018

Organizers:

Dan Abramovich (Brown University)
Jim Bryan (University of British Columbia)
Dawei Chen (Boston College)

A moduli space parametrizes geometric objects with similar structures and encodes in itself the geometry of all possible families of such objects. Moduli spaces play a significant role in the development of mathematics, dating back to the parameterization of linear subspaces in the 19th century and of Riemann surfaces in the 20th century. The moduli-theoretic approach has produced an abundance of results by exploiting the universality of moduli spaces. This allows one to establish properties of all parameterized objects at once by a single argument. Inspired by a number of recent advances, this workshop focused on two aspects of moduli spaces: Birational geometry and Wall crossings. When objects transition from being stable to unstable, one often obtains a birational transformation of the moduli space. When such a transition occurs, geometric invariants on the two sides of the transition often have fascinating yet mysterious correspondences. Such is the case with the phenomenon of wall crossings in enumerative geometry. Most mathematicians working in moduli theory only focus on one aspect of the entire story. By bringing experts in these fields together, we aimed to inspire new ideas and achieve progress on open problems both in birational geometry and the study of wall crossings in enumerative invariants.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5084

Participants:

Abramovich, Dan (Brown University)
Alper, Jarod (University of Washington)
Asgarli, Shamil (Brown University)
Bayer, Arend (University of Edinburgh)
Behrend, Kai (University of British Columbia)
Bejleri, Dori (MIT)
Bolognese, Barbara (University of Sheffield)
Bryan, Jim (University of British Columbia)
Chen, Dawei (Boston College)
Chen, Qile (Boston College)
Coskun, Izzet (UIC)
Deopurkar, Anand (Australian National University)
DeVleming, Kristin (UCSD)
Dumitrescu, Olivia (Central Michigan University)
Fedorchuk, Maksym (Boston College)
Gibney, Angela (Rutgers University)
Han, Changho (Harvard University)
Hassett, Brendan (Brown University)
Ionel, Eleny (Stanford University)
Janda, Felix (U Michigan)
Li, Wei-Ping (Hong Kong University of Science and Technology)
Liu, Yu-Hsiang (University of British Columbia)
Maciocia, Antony (University of Edinburgh)
Manolache, Cristina (Imperial College)
Morishige, Nina (UBC)
Patel, Anand (Oklahoma State University)
Pietromonaco, Stephen (UBC)
Pixton, Aaron (MIT)
Rennemo, Jorgen (University of Oslo)
Ross, Dustin (San Francisco State University)
Ruan, Yongbin (University of Michigan)
Sacca, Giulia (Massachusetts Institute of Technology)
Thaddeus, Michael (Columbia University)
Wang, Xiaowei (Rutgers university)

Fusion Categories and Subfactors
October 14 - 19, 2018

Organizers:

David Penneys (Ohio State University)
Terry Gannon (University of Alberta)
Scott Morrison (Australian National University)
Julia Plavnik (Texas A&M University)

Classically, the symmetries of a given object are described mathematically by the notion of a group. Over the past few decades, we have seen the emergence of new `quantum' mathematical objects whose symmetries are best captured by the notion of a fusion category. Thus we say that fusion categories encode quantum symmetry. In turn, each of these fusion categories gives us a new topological field theory and associated quantum invariants for links and 3-manifolds. In recent years, we have seen that unitary fusion categories and closely related unitary modular categories describe the physics of topological phases of matter and topological quantum computation. Subfactors give a rich source of examples of unitary fusion categories. Indeed, all unitary fusion categories arise from subfactors, so subfactors are universal hosts for quantum symmetries. On the other hand, techniques from fusion categories have led to strong classification results for subfactors of small index. The purpose of this workshop was to build on the 2014 BIRS workshop on Subfactors and fusion categories. This conference brought together the world's experts in these related fields to unify existing results and to collaborate for future breakthroughs.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5195

Participants:

Barter, Daniel (Australian National University)
Bernstein, Tobias (University of Alberta)
Bisch, Dietmar (Vanderbilt University)
Bischoff, Marcel (Ohio University)
Creutzig, Thomas (University of Alberta)
Davydov, Alexei (Ohio University)
Delaney, Colleen (UC Santa Barbara)
Edie-Michell, Cain (Australian National University)
Evans, David (Cardiff University)
Galindo Martinez, César Neyit (Universidad de los Andes)
Gannon, Terry (University of Alberta)
Grossman, Pinhas (University of New South Wales)
Huston, Peter (The Ohio State University)
Izumi, Masaki (Kyoto University)
Johnson-Freyd, Theo (Perimeter Institute)
Jones, Corey (Ohio State University)
Kawahigashi, Yasuyuki (The University of Tokyo)
Lan, Tian (U Waterloo)
Liu, Zhengwei (Harvard University)
Morrison, Scott (Australian National University)
Mueger, Michael (Radboud Universiteit)
Ng, Siu-Hung (Louisiana State University)
Nikshych, Dmitri (University of New Hampshire)
Ostrik, Victor (University of Oregon)
Penneys, David (Ohio State University)
Peters, Emily (Loyola University Chicago)
Plosker, Sarah (Brandon University)
Ros Camacho, Ana (Universiteit Utrecht)
Rowell, Eric (Texas A&M University)
Ruth, Lauren (Vanderbilt University)
Schauenburg, Peter (Université de Bourgogne)
Schopieray, Andrew (University of New South Wales)
Schweigert, Christoph (U Hamburg)
Snyder, Noah (Indiana University)
Tener, James (Australian National University)
Walker, Kevin (Microsoft Station Q)
Walton, Chelsea (University of Illinois at Urbana–Champaign)
Wang, Zhenghan (Microsoft Research)
Weiller, Dominic (Australian National University)
Yamashita, Makoto (Ochanomizu University)
Yang, Jinwei (University of Alberta)
Zhang, Qing (Texas A&M)

Crossing Numbers: Theory and Applications
October 21 - 26, 2018

Organizers:

Bojan Mohar (Simon Fraser University)
Eva Czabarka (University of South Carolina)
Gelasio Salazar (Universidad Autónoma de San Luis Potosí)

An ancient problem asks: A town contains three cottages and three utilities. Each cottage needs to be connected to each utility. Can all nine connections be made without any of the lines crossing?

The application raises many interesting questions. For example, can we determine exactly which networks can be laid out without crossings? If a network must have some crossings, how do we find the layout with the fewest number? This minimum is called the crossing number. The exact number is difficult to calculate even for relatively simple networks. It has an interesting relation to the geometry of the plane. The main focus of this conference was the study of crossing numbers. We brought together experts from around to world who study both the theoretical side and practical applications. Issues important to each perspective should enhance those studied by the other.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5029

Participants:

Aichholzer, Oswin (TU Graz)
Arroyo, Alan (IST Austria)
Biedl, Therese (University of Waterloo)
Bokal, Drago (University of Maribor)
Chimani, Markus (University Osnabrueck)
Czabarka, Eva (University of South Carolina)
Dvorak, Zdenek (Charles University)
Fernandez-Merchant, Silvia (California State University - Northridge)
Gonzalez Hermosillo de la Maza, Sebastian (Simon Fraser University)
Hlineny, Petr (Masaryk University)
Kyncl, Jan (Charles University)
Leaños, Jesús (Universidad Autónoma de Zacatecas)
McQuillan, Daniel (Norwich University)
Mohar, Bojan (Simon Fraser University)
Mutzel, Petra (Technische Universität Dortmund)
Pach, Janos (Ecole Polytechnique Federale de Lausanne)
Schaefer, Marcus (DePaul University)
Szekely, Laszlo (University of South Carolina)
Vogtenhuber, Birgit (Graz University of Technology)
Wiedera, Tilo (Osnabrück University)

Hessenberg Varieties in Combinatorics, Geometry and Representation Theory
October 21 - 26, 2018

Organizers:

Patrick Brosnan (University of Maryland - College Park)
Megumi Harada (McMaster University)
John Shareshian (Washington University - St. Louis)
Michelle Wachs (University of Miami)

Hessenberg varieties were invented in the late 1980s to study problems in applied mathematics. Since then, they have become important in three different fields within pure mathematics: combinatorics, algebraic geometry and representation theory. This conference was a much-needed opportunity for researchers from these three different fields to come together to share ideas.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5130

Participants:

Abe, Hiraku (Osaka City University)
Abe, Takuro (Kyushu University)
Brosnan, Patrick (University of Maryland - College Park)
Carrell, James (University of British Columbia)
Chow, Timothy (Center for Communications Research)
Crooks, Peter (Northeastern University)
Guay-Paquet, Mathieu (Université du Québec à Montréal)
Haglund, Jim (University of Pennsylvania)
Harada, Megumi (McMaster University)
Horiguchi, Tatsuya (Osaka University)
Insko, Erik (Florida Gulf Coast University)
Masuda, Mikiya (Osaka City University)
Murai, Satoshi (Osaka University)
Precup, Martha (Northwestern University)
Shareshian, John (Washington University - St. Louis)
Skandera, Mark (Lehigh University)
Tymoczko, Julianna (Smith College)
Vilonen, Kari (University of Melbourne)
Wachs, Michelle (University of Miami)
Wilson, Andy (Portland State University)
Xue, Ting (University of Melbourne)

Intersection of Information Theory and Signal Processing: New Signal Models, their Information Content and Acquisition Complexity
October 28 - November 2, 2018

Organizers:

Petros Boufounos (Mitsubishi Electric Research Laboratories)
Stark Draper (University of Toronto)
Yonina Eldar (Israel Institute of Technology - Technion)

Recent advances in signal processing and signal representation have brought to the forefront the need for a new understanding of the information content of signals and signal models. Developments such as sparsity and compressive sensing have led to great innovations in signal processing theory and practice. It is now widely appreciated that appropriate signal modeling can significantly reduce the acquisition burden and improve processing performance. However, there remains a lack of understanding of the information content of the new signal models, as well as the interaction between information content and signal acquisition complexity. This workshop brought together the signal processing, machine learning and information theory communities, foster interaction and collaboration across the fields, and promote cross-pollination of ideas. In light of initial efforts and results, we believe the time is ripe to spearhead this interaction.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5162

Participants:

Bajwa, Waheed (Rutgers University)
Berk, Aaron (University of British Columbia)
Boufounos, Petros (Mitsubishi Electric Research Laboratories)
Chandrasekaran, Venkat (California Institute of Technology)
Draper, Stark (University of Toronto)
Effros, Michelle (California Institue of Technology)
Eldar, Yonina (Israel Institute of Technology (Technion))
Goukhshtein, Maxim (University of Toronto)
Jacques, Laurent (University of Louvain)
Jalali, Shirin (Nokia Bell Labs)
Kipnis, Alon (Stanford University)
Li, Xiaowei (University of British Columbia)
Lybrand, Eric (University of California San Diego)
Maleki, Arian (Columbia University)
Murray-Bruce, John (Boston University)
Rodrigues, Miguel (University College London)
Saab, Rayan (UC San Diego)
Salamatian, Salman (Massachusetts Institute of Technology)
Schellekens, Vincent (Université Catholique de Louvain)
Shen, Kaiming (University of Toronto)
Shlezinger, Nir (Technion)
Taeb, Armeen (California Institute of Technology)
Wu, Xiugang (University of Delaware)
Yilmaz, Ozgur (University of British Columbia)
Yu, Wei (University of Toronto)
Zheng, Lizhong (Massachusetts Institute of Technology)
Zhou, Wenda (Columbia University)

Women in Operator Algebras
November 4 - 9, 2018

Organizers:

Astrid an Huef (Victoria University of Wellington)
Sara Arklint (University of Copenhagen)
Karen Strung (Radboud University)
Dilian Yang (University of Windsor)

The study of operator algebras is a very active branch of functional analysis dealing with problems that are intrinsically infinite-dimensional. Such problems arise in quantum mechanics where, for example, a famous theorem of von Neumann says that the only solutions of Heisenberg's commutation relations are families of operators on an infinite-dimensional Hilbert space. Operator algebras have a rich and remarkably rigid structure, and there is a powerful general theory which makes this precise and applicable. Over the past few decades, operator algebras have influenced diverse areas of mathematics, including number theory, harmonic analysis, knot theory, dynamical systems and ergodic theory. This workshop brought together women working in operator algebras and focussed on active collaborative research.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5168

Participants:

Adamo, Maria Stella (University of Catania)
Afsar, Zahra (University of Sydney)
an Huef, Astrid (Victoria University of Wellington)
Archey, Dawn (University of Detroit Mercy)
Arici, Francesca (MPI for Mathematics in the Sciences)
Armstrong, Becky (University of Sydney)
Azzali, Sara (Universität Potsdam)
Browne, Sarah (Pennsylvania State University)
Clark, Lisa Orloff (Victoria University of Wellington)
Courtney, Kristin (WWU Münster)
Duwenig, Anna (University of Victoria)
Fabre Sehnem, Camila (University of Göttingen)
Farsi, Carla (University of Colorado - Boulder)
Georgescu, Magdalena (Ben Gurion University)
Gillaspy, Elizabeth (University of Montana)
Gomez Aparicio, Maria Paula (Universite Paris-Sud 11)
Griesenauer, Erin (Eckerd College)
Jeong, Ja A (Seoul National University)
Larsen, Nadia (University of Oslo)
Lin, Ying-Fen (Queen's University Belfast)
McCormick, Kathryn (University of Minnesota)
Norton, Rachael (Northwestern University)
Nucinkis, Brita (University of London)
Packer, Judith (University of Colorado - Boulder)
Pagani, Chiara (Università del Piemonte Orientale, Alessandria)
Patnaik, Sasmita (Indian Institute of Technology)
Plosker, Sarah (Brandon University)
Ramagge, Jacqui (University of Sydney)
Redelmeier, Emily (Independent)
Reznikoff, Sarah (Kansas State University)
Ruth, Lauren (Vanderbilt University)
Strung, Karen (Radboud University)
Viola, Maria Grazia (Lakehead University)
Wang, Hang (East China Normal University)
Wright, Sarah (Fitchburg State University)
Yang, Dilian (University of Windsor)

Mathematical and Statistical Challenges in Bridging Model Development, Parameter Identification and Model Selection in the Biological Sciences
November 11 - 16, 2018

Organizers:

Ruth Baker (University of Oxford)
Daniel Coombs (University of British Columbia)
Matthew Simpson (Queensland University of Technology)

A key challenge for the future is to understand how to integrate multiplex biological data to develop models, identify model parameters, select between models that encode different hypotheses, and determine the best experiments for testing model-derived hypotheses. Novel mathematical, statistical and computational tools are needed to meet this challenge. They will enable the development of a standardised pipeline for the integration of quantitative experimental data with models so that we can accelerate progress in our understanding of complex biological systems. This workshop brought together researchers specialist in using a range of mathematical and statistical techniques to share ideas and make progress towards tackling this challenge.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5144

Participants:

Baker, Ruth (University of Oxford)
Barnes, Chris (University College London)
Bouchard-Cote, Alexandre (UBC)
Browning, Alexander (Queensland University of Technology)
Campbell, David (Simon Fraser University)
Chkrebtii, Oksana (The Ohio State University)
Chung, Matthias (Virginia Tech)
Coombs, Daniel (University of British Columbia)
Coster, Adelle (University of New South Wales)
Cotter, Simon (University of Manchester)
Deardon, Rob (University of Calgary)
Dowd, Mike (Dalhousie University)
Dushoff, Jonathan (McMaster University)
Finkenstadt, Barbel (University of Warwick)
Francois, Paul (McGill University)
Fricks, John (Arizona State University)
Gallaher, Jill (Moffitt Cancer Center)
Greenwood, Priscilla (UBC)
Grima, Ramon (University of Edinburgh)
Harrison, Jonathan (University of Oxford)
Holland, Barbara (University of Tasmania)
King, Aaron (University of Michigan)
Lewis, Mark (University of Alberta)
Lutscher, Frithjof (University of Ottawa)
Maclaren, Oliver (University of Auckland)
MacLean, Adam (University of Southern California)
Mirams, Gary (University of Nottingham)
Pak, Thomas (University of Oxford)
Peacock, Stephanie (University of Calgary)
Plank, Michael (University of Canterbury)
Prangle, Dennis (Newcastle University)
Prescott, Thomas (University of Oxford)
Röblitz, Susanna (University of Bergen)
Simpson, Matthew (Queensland University of Technology)
Umulis, David (Purdue University)
Wilkinson, Darren (Newcastle University)
Wilkinson, Richard (University of Sheffield)
Woodhouse, Francis (University of Oxford)

Unifying Themes in Ramsey Theory
November 18 - 23, 2018

Organizers:

Claude Laflamme (University of Calgary)
Jaroslav Nesetril (Charles University)
Slawomir Solecki (University of Illinois)
Stevo Todorcevic (University of Toronto)

There are some fundamental mathematical objects which contain very rich structures. These include for example the rational numbers, the Rado graph, and the Urysohn space just to name a few, each exhibiting deep symmetry and universality. Indeed all countable linear orders will be found inside the rational numbers, all countable graphs will be found in the Rado graph, and similarly all countable metric spaces will appear as subspaces of the Urysohn space. The process of finding nice substructures within such large structures is a central theme of Ramsey Theory, and it is thus natural and the purpose of this workshop to study these methods and impact to other mathematical areas.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5180

Participants:

Balko, Martin (Charles University)
Bartosova, Dana (Carnegie Mellon University)
Ben Yaacov, Itaï (Université Lyon 1)
Braunfeld, Sam (University of Maryland, College Park)
Chodounsky, David (Charles University)
de Rancourt, Noé (Université Paris Diderot)
Di Prisco, Carlos (Universidad de los Andes)
Dobrinen, Natasha (University of Denver)
Ferenczi, Valentin (Universidade de São Paulo)
Guevara Parra, Francisco (University of Toronto)
Gunderson, David S. (University of Manitoba)
Hartman, David (Charles University in Prague)
Horowitz, Haim (University of Toronto)
Hrusak, Michael (UNAM)
Hubička, Jan (Charles University)
Jahel, Colin (Institut de Mathématiques de Jussieu)
Komjath, Peter (Eotvos University)
Konecny, Matej (Charles University)
Kubis, Wieslaw (Czech Academy of Sciences)
Kurilic, Milos S. (University of Novi Sad)
Kwiatkowska, Aleksandra (University of Münster/ University of Wrocław)
Laflamme, Claude (University of Calgary)
Lopez-Abad, Jordi (UNED)
Lupini, Martino (Victoria University of Wellington)
Malicki, Maciej (Warsaw School of Economics)
Masulovic, Dragan (University of Novi Sad, Serbia)
Mottet, Antoine (Technische Universität Dresden)
Nesetril, Jaroslav (Charles University, Prague)
Nguyen Van Thé, Lionel (University of Aix-Marseille)
Noquez, Victoria (Harvey Mudd College)
Pawliuk, Micheal (University of Calgary)
Pinsker, Michael (Technische Universität Wien)
Sabok, Marcin (McGill University)
Sauer, Norbert (University of Calgary)
Schneider, Friedrich Martin (Technische Universitat Dresden)
Solecki, Slawomir (University of Illinois)
Todorcevic, Stevo (University of Toronto)
Woodrow, Robert (University of Calgary)
Zapletal, Jindrich (University of Florida)
Zucker, Andy (Institut de Mathématique de Jussieu)

Model Theory and Operator Algebras
November 25 - 30, 2018

Organizers:

Isaac Goldbring (University of California at Irvine)
Ilijas Farah (York University)
Dimitri Shlyakhtenko (University of California, Los Angeles)
Wilhelm Winter (Munster)

Operator algebra has developed into a field of its own since the time of von Neumann. C*-algebras and von Neumann algebras can be represented as algebras of bounded operators on a Hilbert space and although the relevant topology is different in the study of these algebras (the operator norm for C*-algebras and the weak-* topology for von Neumann algebras), both classes have interesting ultraproduct constructions. There are many interesting current directions to pursue but we wish to concentrate on three general themes: 1) Interaction with the Elliott classification programme 2) Relationship with free probability 3) Model theoretic considerations. There are several things that model theory brings to the table in this endeavour. First of all, the theory of an algebra is an invariant which is complementary to many of the operator algebraic invariants on offer. The utility and consequences of recognizing when two algebras do not have the same theory will be highlighted below. Second, model theory provides methods of constructing examples which are different from those in operator algebra.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5155

Participants:

Ben Yaacov, Itaï (Université Lyon 1)
Browne, Sarah (Pennsylvania State University)
Chifan, Ionut (Iowa)
Courtney, Kristin (WWU Münster)
Dabrowski, Yoann (Université Claude Bernard Lyon 1)
Elliott, George (University of Toronto)
Farah, Ilijas (York University)
Fox, Alec (University of California, Irvine)
Gabe, James (University of Glasgow)
Gardella, Eusebio (University of Muenster)
Goldbring, Isaac (University of California at Irvine)
Hart, Bradd (McMaster University)
Hayes, Ben (University of Virginia)
Henson, C. Ward (University of Illinois at Urbana-Champaign)
Hirshberg, Ilan (Ben Gurion University of the Negev)
Houdayer, Cyril (Université Paris-Sud)
Ioana, Adrian (University of California San Diego)
Ivanescu, Cristian (MacEwan University)
Jekel, David (UCLA)
Kerr, David (Texas A&M University)
Lazzaro, Steven (McMaster University)
Lupini, Martino (Victoria University of Wellington)
Musat, Magdalena (University of Copenhagen)
Peterson, Jesse (Vanderbilt University)
Phillips, Chris (University of Oregon)
Pisier, Gilles (Texas A & M University)
Robert, Leonel (University of Louisiana at Lafayette)
Rordam, Mikael (University of Copenhagen)
Schafhauser, Christopher (University of Waterloo)
Sherman, David (University of Virginia)
Sinclair, Thomas (Purdue)
Skoufranis, Paul (York University)
Spaas, Pieter (University of California San Diego)
Szabo, Gabor (University of Copenhagen)
Thiel, Hannes (University of Münster)
Tikuisis, Aaron (University of Ottawa)
Vacarro, Andrea (York University & Pisa University)
Vaes, Stefaan (KU Leuven)
Vignati, Alessandro (Institut de Mathematiques de Jussieu)
White, Stuart (University of Glasgow)
Winter, Wilhelm (Munster)

Integrating the Integrators for Nonlinear Evolution Equations: from Analysis to Numerical Methods, High-Performance-Computing and Applications
December 2 - 7, 2018

Organizers:

Alexander Ostermann (University of Innsbruck)

Mayya Tokman (University of California - Merced)

Nonlinear evolution equations are widely used in science and engineering to describe dynamics of systems ranging from Earth's atmosphere to fusion reactors and internal combustion engines. The objectives of the workshop included (i) facilitating collaborative interactions between researchers in analysis, numerical methods, HPC and applications, (ii) identifying promising research directions in development of innovative integrators for a range of important applications, (iii) providing a forum for exchange of ideas and knowledge across interdisciplinary boundaries and among researchers of varied level of expertise and seniority.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5152

Participants:

Abdulle, Assyr (Ecole Polytechnique Fédérale de Lausanne)
Akrivis, Georgios (University of Ioannina)
Ascher, Uri (University of British Columbia)
Birken, Philipp (Lund University)
Buvoli, Tommaso (University of Washington)
Cai, Yongyong (Beijing Computational Science Research Center)
Calhoun, Donna (Boise State University)
Caliari, Marco (University of Verona)
Constantinescu, Emil (Argonne National Laboratory)
Crouseilles, Nicolas (INRIA Rennes)
Dallerit, Valentin (University of California)
Einkemmer, Lukas (University of Innsbruck)
Faou, Erwan (INRIA)
Gander, Martin (Université de Genève)
Gaudreault, Stephane (Environment Canada)
Grant, Zachary (Oak Ridge National Laboratory)
Johansen, Hans (Lawrence Berkeley National Lab)
Ketcheson, David (Mathematical and Computer Sciences and Engineering)
Kovács, Balázs (University of Tuebingen)
Lambers, James (University of Southern Mississippi)
Loffeld, John (Lawrence Livermore National Laboratory)
Michels, Dominik (KAUST)
Minion, Michael (Lawrence Berkeley National Lab)
Ostermann, Alexander (University of Innsbruck)
Piazzola, Chiara (University of Innsbruck)
Poncet, Philippe (University of Pau)
Reynolds, Daniel (Southern Methodist University)
Rüde, Ulrich (University of Erlangen)
Sandu, Adrian (Virginia Tech)
Sanz-Serna, Jesús María (Universidad Carlos III de Madrid)
Schratz, Katharina (Karlsruhe Institute of Technology)
Schreiber, Martin (Technical University of Munich)
Seal, David (U.S. Naval Academy)
Shang, Xiaocheng (ETH Zürich)
Simoncini, Valeria (Universita' di Bologna)
Tokman, Mayya (University of California, Merced)
Woodward, Carol (Lawrence Livermore National Laboratory)
Zhang, Hong (Argonne National Laboratory)
Zivcovich, Franco (University of Trento)

Shape Analysis, Stochastic Mechanics and Optimal Transport
December 9 - 14, 2018

Organizers:

François-Xavier Vialard (University Paris-Dauphine)
Martin Bauer (Florida State University)
Martins Bruveris (Brunel University London)
Tanya Schmah (University of Ottawa)
Stefan Sommer (University of Copenhagen)

The comparison and analysis of shapes, whether of organs, cells or engineering structures such as airfoils, pose important mathematical and statistical challenges. Shape analysis has recently seen a tremendous development in both theory and practice, driven by a wide range of applications from biological imaging to fluid dynamics. For example, organ shapes observed in medical images can now be used for diagnostic and prognostic purposes, and optimization of shapes has become an important tool in engineering. On the theoretical side, recent developments have highlighted the strong connections between shape analysis and the related fields of optimal transport and stochastic geometric mechanics, both very active fields in their own right. The workshop brought together researchers in these three fields, to share methodological developments and open problems, and generally to link and accelerate research in all three fields.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5151

Participants:

Arnaudon, Marc (Université de Bordeaux)
Arnaudon, Alexis (Imperial College London)
Bauer, Martin (Florida State University)
Benamou, Jean-David (INRIA Rocquencourt)
Charon, Nicolas (Johns Hopkins University)
Cruzeiro, Ana (University of Lisbon)
Feydy, Jean (Ecole Normale Supérieure)
Georgiou, Tryphon (University of California, Irvine)
Glaunès, Joan Alexis (Université Paris Descartes)
Gris, Barbara (Université Pierre-et-Marie-Curie)
Harms, Philipp (University of Freiburg)
Joshi, Sarang (University of Utah)
Khesin, Boris (University of Toronto)
Klassen, Eric (Florida State University)
Kuang, Dongyang (University of Ottawa)
Le Brigant, Alice (Ecole Nationale de l'Aviation Civile)
Léonard, Christian (Universite Paris Nanterre)
Maor, Cy (University of Toronto)
Marsland, Stephen (Victoria University of Wellington)
Memoli, Facundo (The Ohio State University)
Miolane, Nina (Stanford)
Misiolek, Gerard (University of Notre Dame)
Modin, Klas (University of Gothenburg)
Natale, Andrea (Inria)
Needham, Tom (Ohio State University)
Pennec, Xavier (Université Côte d'Azur and INRIA)
Preston, Stephen (Brooklyn College)
Ratiu, Tudor (Shanghai Jiao Tong University)
Rumpf, Martin (University Bonn)
Schmah, Tanya (University of Ottawa)
Schmitzer, Bernhard (University of Münster)
Schönlieb, Carola-Bibiane (University of Cambridge)
Sommer, Stefan (University of Copenhagen)
Stoica, Cristina (Wilfrid Laurier University)
Takao, So (Imperial College London)
Trouve, Alain (ENS Cachan)
Vialard, François-Xavier (University Paris-Dauphine)
Younes, Laurent (John Hopkins University)

Banff International Research Station

2018

2-Day Workshops

Impact of Women Mathematicians on Research and Education in Mathematics
March 16 - 18, 2018

Organizers:

Amenda Chow (York University)

Lillian Beltaos (Nikola Tesla Historical Society of Alberta)

A unique workshop, “Putting Women into the Equation”, was held at BIRS in Banff in 2018 focusing on the history of mathematics, education and research as impacted by a number of well, and not-so-well known women mathematicians, dating back to the 6th century BC to current times. The gathering of like-minded mathematicians of all ages fostered collaborations furthering research and enhancing education of mathematics. From local to international speakers, a broad exposure to current knowledge coupled with the continuum of 26 centuries of contributions, provided an invaluable experience to all participants. Finally, getting to know about such women mathematicians as Theano, Hypatia, Emmy Noether and Maryam Mirzakhani in itself, enriched the perspectives of teaching, research and communications, with an intention of spreading this experience into the classrooms and research rooms of today and tomorrow.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2043

Participants:

Bauer, Kristine (University of Calgary)
Beltaos, Lillian (Nikola Tesla Historical Society of Alberta)
Beltaos, Andrew (University of Waterloo)
Beltaos, Angela (University of Alberta/NRC Nanotechnology Research Centre)
Brown, Hannah (University of Alberta)
Burak, Katie (University of Calgary)
Buro, Karen (Grant MacEwan University)
Carrero, Gustavo (Athabasca University)
Catral, Minnie (Xavier University)
Chow, Amenda (York University)
Connolly, Dennis (University of Lethbridge)
de Vries, Gerda (University of Alberta)
DeDieu, Lauren (University of Calgary)
Etropolski, Anastassia (Rice University)
Garcia, Amanda (University of Waterloo)
Gerofsky, Susan (University of British Columbia)
Haas, Ruth (University of Hawaii at Manoa)
Hepler, Charles (Mount Royal University)
Johnson-Leiva, Rose (San Francisco State University)
Lumley, Allysa (York University)
Mainali, Sreyasa (Nikola Tesla Historical Society of Alberta)
Mayes-Tang, Sarah (University of Toronto)
Mynhardt, Kieka (University of Victoria)
Pitsili-Chatzi, Dionysia (University of Ottawa)
Roodal Persad, Veda (Thompson Rivers University)
Sadeghi, Samira (INVIDI Technologies Corporation)
Sellaroli, Giuseppe (University of Waterloo)
Solomon, Yohana (York University)
Torres, Maria (University of Athabasca)

Ted Lewis SNAP Math Fair Workshop 2018
April 27 - 29, 2018

Organizers:

Sean Graves (University of Alberta)
Tiina Hohn (MacEwan University)
Ted Lewis (SNAP Mathematics Foundation)

During this pivotal time of K-9 curriculum reform in our province it is important to find the correct balance between inquiry-based problem solving and practicing basic facts in the mathematics classroom. The purpose of a SNAP math fair is to provide a meaningful problem-solving experience for all students.

This was the sixteenth 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. Problem solving and puzzles in the classroom is now a specific area of the K-9 curriculum and in-service teachers have had very little training in using these tools effectively. This is not limited to Alberta schools, and the SNAP math fair idea is now spreading around the world. This type of 2-day workshop is considered front line 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.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2221

Participants:

Andrea, Caitlin (preservice teacher)
Ashworth, Michelle (University of Alberta)
Brown, April (Peace Wapiti Schools)
Burrows, Andrew (Edmonton Public Schools)
Connor, Janessa (Grasslands School District)
D'Astous, Hélène (Edmonton Catholic Schools)
Desaulniers, Shawn (University of Alberta)
Graves, Sean (University of Alberta)
Henderson, Kari (UofA Grande Prairie Campus)
Hildebrandt, Maxine (Mother Earth's Children's Charter School)
Hoffman, Janice (Edmonton Public Schools)
Hohn, Tiina (MacEwan University)
Lewis, Ted (SNAP Mathematics Foundation)
Lorway, Geri (Thinking 101/University of Alberta)
Mayer, Alyssa (Edmonton Public Schools)
McLeod, Vanessa (Edmonton Public Schools)
Miller, Leann (Peace Wapiti Schools)
Nichols, Ryan (Edmonton Schools)
Pasanen, Trevor (University of Alberta)
Persaud, Barbara (University of Alberta)
Pettipas, Erin (Edmonton Public Schools)
Polushin, Beth (Grasslands School District)
Press, Lorraine (Edmonton Catholic Schools)
Radloff, Erin (Edmonton Public Schools)
Radtke, Jennifer (Edmonton Public Schools)
Raju, Bindya (Calgary Board of Education)
Sarango-Loayza, dalton (Edmonton Catholic Schools)
Shaw, Dolph (Edmonton Public Schools)
Strungaru, Nicolae (MacEwan University)

Alberta Number Theory Days X
May 11 - 13, 2018

Organizers:

Nathan Ng (University of Lethbridge)
Wolfgang Riedler (University of Alberta)
Ha Tran (University of Calgary)

Number theory is a broad and central area of research with many connections and applications to other areas of mathematics and science. It is also an extremely active and diverse area of research. The annual Alberta Number Theory Days provide a unique venue for these researchers, their students, and their visitors for face to face discussion of ideas and for facilitating collaborations. New connections are made and old associations are renewed. The workshop also allows for the exchange of knowledge, which will improve the progress of current projects.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2226

Participants:

Ali, Abid (University of Alberta)
Bauer, Mark (University of Calgary)
Bernstein, Tobias (University of Alberta)
Booker, Andrew (University of Bristol)
Caranay, Perlas (University of Calgary)
Chalker, Kirsty (University of Lethbridge)
Chidambaram, Nitin Kumar (University of Alberta)
Cunningham, Clifton (University of Calgary)
Das, Parthasarathi (Univ. of Calgary)
Feaver, Amy (The King's University)
Fiori, Andrew (University of Lethbridge)
Francis, Forrest (University of Lethbridge)
Galbraith, Steven (University of Auckland)
Gannon, Terry (University of Alberta)
Guy, Richard (The University of Calgary)
Jacobson, Michael (University of Calgary)
Joshi, Aniket (University of Alberta)
Kadiri, Habiba (University of Lethbridge)
Lybbert, Reggie (University of Calgary)
MacNeil, Evan (University of Calgary)
Ng, Nathan (University of Lethbridge)
Nguyen, Dang Khoa (University of Calgary)
Riedler, Wolfgang (University of Alberta)
Roettger, Eric (Mount Royal University)
Scheidler, Renate (University of Calgary)
Shen, Quanli (University of Lethbridge)
Silverberg, Alice (University of California, Irvine)
Tran, Ha (University of Calgary)
Troupe, Lee (University of British Columbia)
Wilk, Kirsten (University of Lethbridge)
Wong, Peng-Jie (University of Lethbridge)

10th Seminar for Next Generation of Researchers in Power Systems
May 25 - 27, 2018

Organizers:

Claudio Canizares (University of Waterloo)

Kankar Bhattacharya (Univeristy of Waterloo)

This workshop brought together the top PhD students from the top power system academic programs from renowned universities from all around the world to share and discuss their research work in electricity grid analysis, modeling, simulation, dynamics, control, and optimization, and thus learn from and discuss with each other, directed by the organizers, who are award-recipient researchers in power systems, about the state-of-the-art, future directions, and hot trends in different and relevant topics in power networks, and their related applied math fields.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2217

Participants:

Anagnostou, Georgios (Imperial College)
Basnet, Ashim (University of Hong Kong)
Bhattacharya, Kankar (Univeristy of Waterloo)
Bosisio, Alessandro (Politecnico di Milano)
Calero, Ivan (University of Waterloo)
Canizares, Claudio (University of Waterloo)
Dhaliwal, Navdeep (McGill University)
Doenges, Kai (IIT - Universidad Pontifica Comillas)
Du, Ershun (Tsinghua University)
Estebsari, Abouzar (Politecnico di Torino)
Fisher, Michael (University of Michigan - Ann Arbor)
Karagiannopoulos, Stavros (ETH Zurich)
Mandoulidis, Panagiotis (University of Athens)
Maurer, Jona (Karlsruhe Institute of Technology)
Ortega Manjavacas, Alvaro (University College Dublin)
Petrou, Kyriacos (The University of Melbourne)
Ponocko, Jelena (The University of Manchester)
Rosehart, NA (Schulich School of Engineering)
Wu, Xuan (The Ohio State University)
Xu, Bolun (University of Washington)
Zuloaga, Scott (Arizona State University)

Restructuring IEEE VIS for the Future
June 15 - 17, 2018

Organizers:

Tamara Munzner (University of British Columbia)
Sheelagh Carpendale (University of Calgary)
Hans Hagen (University of Kaiserslautern)
Daniel Keim (University of Konstanz)
Stephen North (Infovisible)
Hanspeter Pfister (Harvard University)

The IEEE VIS conference, which began in 1990 and now has over 1000 attendees, is the premiere venue for visualization research. It encompasses three main conferences whose proceedings are published as a special issue of the IEEE journal Transactions on Visualization and Computer Graphics, and many symposia and workshops. We brought together senior and earlier-career visualization researchers who organized and participated in VIS to discuss and develop proposals for its possible restructuring to meet the current needs of the research community, which may be different than the current structure that evolved over the past decades.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2230

Participants:

Ahrens, James (Los Alamos National Laboratory)
Bertini, Enrico (NYU)
Brehmer, Matthew (Microsoft Research)
Bremer, Peer-Timo (LLNL)
Carpendale, Sheelagh (University of Calgary)
Chen, Jian (The Ohio State University)
Chevalier, Fanny (University of Toronto)
Collins, Christopher (University of Ontario Institute of Technology)
Dou, Wenwen (UNC Charlotte)
Dykes, Jason (University of London)
Elmqvist, Niklas (University of Maryland - College Park)
Endert, Alex (Georgia Tech)
Fisher, Brian (Simon Fraser University)
Forbes, Angus (UCSC)
Fujishiro, Issei (Keio University)
Hagen, Hans (University of Kaiserslautern)
Henry Riche, Nathalie (Microsoft Research)
Hong, Seokhee (University of Sydney)
Hullman, Jessica (University of Washington)
Isaacs, Kate (University of Arizona)
Keim, Daniel (University of Konstanz)
Lee, Bongshin (Microsoft Research)
Levine, Joshua (University of Arizona)
Lex, Alexander (University of Utah)
Lindstrom, Peter (Lawrence Livermore National Laboratory)
Liu, Shixia (Tsinghua University)
Ma, Kwan-Liu (University of California, Davis)
Marai, Liz (University of Illinois at Chicago)
Meyer, Miriah (University of Utah)
Munzner, Tamara (University of British Columbia)
North, Stephen (Infovisible)
Papka, Michael (Argonne National Laboratory)
Perer, Adam (IBM Research)
Pfister, Hanspeter (Harvard University)
Qu, Huamin (HKUST)
Rheingans, Penny (University of Maryland)
Scheidegger, Carlos (University of Arizona)
Shen, Han-Wei (The Ohio State University)
Silver, Deborah (Rutgers University)
Strobelt, Hendrik (IBM Research)
Szafir, Danielle (University of Colorado Boulder)
Tory, Melanie (Tableau Research)
Turkay, Cagatay (City, University of London)
Yoo, Terry (National Library of Medicine, NIH)
Yuan, Xiaoru (Peking University)

Advancement of Stochastic and Statistical Techniques for Natural and Environmental Simulation
August 17 - 19, 2018

Organizers:

Gordon Huang (University of Regina) **Zhong Li (McMaster University)**

A 2-day workshop on inexact optimization theory for stochastic analysis in natural and environmental simulation was held in Banff, Canada in the second half year of 2018. This workshop aimed to strengthen the capacity of involved institutions in the development of innovative stochastic analysis methods for characterizing the randomness in natural and environmental systems. This workshop also analyzed potential barriers in revealing the random features in climate dynamics, pollutant transportation in surface and subsurface flow systems, hydrologic processes and other natural and environmental systems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2232

Participants:

Chen, Cong (University of Science and Technology Beijing)
Chen, Jiapei (University of Regina)
Chen, Su (Kevin) (Advisian of WorleyParsons Canada)
Fan, Yurui (International Society for Environmental Information Sciences)
Guo, Ping (China University of Agriculture)
Huang, Gordon (University of Regina)
Huang, Wendy (McMaster University)
Li, Zhong (McMaster University)
Li, Gongchen (Alberta Environment and Parks)
Liao, Rafael (University of Regina)
Liu, Lirong (University of Regina)
Pan, Siyue (Saskatchewan Ministry of Environment)
Shen, Jian (University of Regina)
Song, Tangnyu (University of Regina)
Wang, Xiuquan (University of Prince Edward Island)
Weng, Shuqing (SC Engineering Ltd)
Wu, Michael (North China Electrical Power University)
Xie, Yulei (University of Science and Technology Beijing)
Yu, Hui (Temple University)
Zhang, Peng (Nankai University)
Zhang, Xiaoyue (University of Regina)
Zhang, Helen (Memorial University of Newfoundland)
Zhang, Ju (China Women's University)
Zhang, Jinyu (PetroChina International (Canada) Trading Ltd.)
Zhang, Jianan (University of Regina)
Zhao, Shan (Shandong University)
Zhou, Xiong (Xiamen University of Technology)
Zhou, Changyu (North China Electric Power University)
Zhu, Hua (Marie) (Saskatchewan Ministry of Environment)

Privacy Compliance Tools Workshop
August 24 - 26, 2018

Organizers:

Joel Reardon (University of Calgary)

Serge Egelman (University of California at Berkeley)

It's often said that people don't care about privacy. Yet in reality they actually do and its hard to find someone who doesn't personally care about it. The problem is that there is a feeling of helplessness about the whole affair. Simply put, privacy isn't presented as option in the first place, and then when people choose not to entirely opt-out of technology by, for example, having a cell phone, it is taken as proof for the false narrative that no one cares about privacy.

Thankfully law is beginning to step in to regulate the privacy market where competition has failed. Stringent laws such as COPPA to protect children in the states and the European Union's comprehensive GDPR are set to change the privacy landscape. Nevertheless, these laws require that tools are developed to both make supporting the law easier for companies and to help regulators find those violating the law. Our work is supporting both these goals, by providing tools to monitor the privacy behaviour of different technologies to help developers better comply with the law and automate the large-scale detection of predatory behaviours.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2236

Participants:

Alomar, Noura (University of California at Berkeley)
Chen, Jung-Wei (Good Research, LLC)
Egelman, Serge (University of California at Berkeley and the International Computer Science Institute)
Frik, Alisa (University of California Berkeley)
Han, Catherine (UC Berkeley)
Johnson, Maritza (International Computer Science Institute)
Kosinski, Tomasz (Chalmers University of Technology)
Malkin, Nathan (University of California, Berkeley)
Okoyomon, Ehimare (UC Berkeley)
Reardon, Joel (University of Calgary)
Reyes, Irwin (International Computer Science Institute)
Samarin, Nikita (University of California, Berkeley)
Wijesekera, Primal (University of California, Berkeley)

Retreat for Young Researchers in Stochastics
October 12 - 14, 2018

Organizers:

Ed Perkins (UBC)
Chris Hoffman (University of Washington)
Yaozhong Hu (University of Alberta)

Probability is a powerful technique which plays a central role in modelling in finance, genetics, and physics. This small meeting gathered together some of the most promising young researchers in probability in W. Canada and Washington State, together with leading Faculty from Simon Fraser, U. Washington, U. British Columbia, U. Alberta and U. Calgary. The topics ranged from theoretical advances in stochastic pde to recent applications in mathematical finance.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2239

Participants:

Barlow, Martin (University of British Columbia)
Barrera Vargas, Gerado (University of Alberta)
Forman, Noah (University of Washington)
Foxall, Eric (U. Alberta)
Hernandez Torres, Sarai (University of British Columbia)
Hu, Yaozhong (University of Alberta)
Kozdron, Michael (University of Regina)
Liu, Shuo (University of Alberta)
Murugan, Mathav (University of British Columbia)
Perkins, Ed (UBC)
Podder, Moumanti (University of Washington)
Qi, Weiwei (Chinese Academy of Sciences)
Ray, Gourab (University of Victoria)
Schmirler, Matthew (University of Saskatchewan)
Sezer, Deniz (University of Calgary)
Shen, Zhongwei (University of Alberta)
Spinka, Yinon (University of British Columbia)
Swishchuk, Anatoliy (University of Calgary)
Wang, Xiong (University of Alberta)
Wang, Shirou (U. Alberta)
Ware, Tony (The University of Calgary)
Wei, Wenning (University of Calgary)
Xu, Liping (University of Washington)
Zeller, Gabriela (Technical Universitat Munchen)
Zhang, Junxi (Yaozhong Hu)

CS-Can / Info-Can State-of-the-Discipline and Planning Retreat
November 16 - 18, 2018

Organizers:

Kellogg Booth (University of British Columbia)
Yvonne Coady (University of Victoria)
Doina Precup (McGill University)
Carey Williamson (University of Calgary)

CS-Can / Info-Can is the focal point for computer science research and education in Canada. Our members include the leading computer science researchers and educators at the university level in Canada. Membership in CS-Can/Info-Can is open to any university faculty member in Canada who is active in computer science research and education, students with an interest in computer science, industry researchers and member of government laboratories and departments. Our Mission is to foster excellence in computer science research and higher education in Canada, drive innovation and benefit society. Our aim is to grow computer science in Canada in an inclusive way that includes women, visible minorities and members of first nations.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/2-day-workshops/18w2240

Participants:

Baghaei Ravari, Parastoo (University of Waterloo)
Barker, Ken (University of Calgary)
Bernat, Andrew (Computing Research Association)
Booth, Kellogg (University of British Columbia)
Chiasson, Julien (Université de Moncton)
Coady, Yvonne (University of Victoria)
Condon, Anne (University of British Columbia)
Demmans Epp, Carrie (University of Alberta)
Durand, Audrey (McGill University)
Fiume, Eugene (Simon Fraser University)
Ghorbani, Ali (University of New Brunswick)
Gopalakrishnan, Sathish (University of British Columbia)
Green, Mark (University of Ontario Institute of Technology)
Gupta, Arvind (University of Toronto)
Langlois, Pierre (École Polytechnique)
Larson, Kate (University of Waterloo)
Lyons, Kelly (Faculty of Information)
McCalla, Gord (University of Saskatchewan)
Nascimento, Mario (University of Alberta)
Orji, Rita (Dalhousie University)
Özsu, M. Tamer (University of Waterloo)
Poulin, Pierre (Université de Montréal)
Powley, Wendy (Queen's University)
Precup, Doina (McGill University)
Pushak, Yasha (University of British Columbia)
Sack, Jörg-Rüdiger (Carleton University)
Seiradaki, Eirene (Borealis AI)
Vassileva, Julita (University of Saskatchewan)
Vicencio-Heap, Felipe (University of Toronto)
Williamson, Carey (University of Calgary)

Banff International Research Station

2018

Focussed Research Groups

Focussed Research Groups

The Crystal Structure of the Plethysm of Schur Functions
April 1 - 8, 2018

Organizers:

Mike Zabrocki (York University)

Franco Saliola (Université du Québec à Montréal)

The objective of this BIRS Focused Research Group was to study the decomposition of the representation obtained when we compose two representations of the general linear group. Special cases of this problem have been solved in the decades immediately following the 1950's, but even with close to 70 years of attempts, the problem remains elusive. Our goal was to apply the theory of crystals and define a crystal graph for the composition of two general linear group representations. We built on and adapted a construction by Loehr and Warrington that has already yielded conjectured special cases. The solution of this problem will have important applications in physics, invariant theory and quantum computing.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg224

Participants:

Colmenarejo, Laura (University of Massachusetts at Amherst)
Orellana, Rosa (Dartmouth College)
Saliola, Franco (Université du Québec à Montréal)
Schilling, Anne (University of California Davis)
Zabrocki, Mike (York University)

Algebraic Structure of Cyclic Combinatorial Objects
April 29 - May 6, 2018

Organizers:

Nantel Bergeron (York University)
Federico Ardila (San Francisco State University)
Carolina Benedetti (Universidad de los Andes in Bogotá)

Discrete objects that can be decomposed into smaller pieces and that can be put together to create bigger ones give rise to well-defined algebraic structures, as long as the label of the objects is not relevant. As an example, on any matroid M one can perform operations such as restriction, contraction, and direct sum. If one permutes the ground set of M, one obtains a matroid M' isomorphic to M and the operations performed in M will be the same as in M', up to permutation of the ground set. This allows us to define a Hopf algebra structure on isomorphism classes of matroids. Moreover, the Hopf algebra structure can be lifted to a Hopf monoid structure on Joyal's species, in such a way that each isomorphism class is encoded in a single object. This powerful point of view unifies many constructions and theorems concerning a wide variety of combinatorial objects. Our goal was to lay down the algebraic foundations for this theory and reap its combinatorial benefits.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg223

Participants:

Aguiar, Marcelo (Cornell University)
Ardila, Federico (San Francisco State University)
Arizmendi, Octavio (CIMAT)
Bastidas, Jose (Cornell University)
Benedetti, Carolina (Universidad de los Andes in Bogotá, Colombia)
Bergeron, Nantel (York University)
González D'León, Rafael S. (Universidad Sergio Arboleda)
Sanchez, Mario (University of California - Berkeley)

Stability Indices for Nonlinear Waves and Patterns in Many Space Dimensions
June 17 - 24, 2018

Organizers:

Graham Cox (Memorial University of Newfoundland)
Margaret Beck (Boston University)
Christopher Jones (University of North Carolina at Chapel Hill)
Yuri Latushkin (University of Missouri)

An important goal when using mathematical equations to model physical systems is to be able to use those equations to predict observable, real-world behaviours. One key aspect of this is being able to identify important solutions to the equations, which represent corresponding structures in the physical system such as vortices in fluids and periodic patterns in chemical reactions, and determine their stability. Mathematically, it is well understood how to determine the stability of solutions to models with only one spatial dimension. However, most real-world systems occur in multiple spatial dimensions. There are very few techniques for determining stability in this case, and those techniques that do exist have proved to be of limited practical use. The goal of this focused research group was to develop a method for determining stability in multiple spatial dimensions that is applicable to models of real physical systems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg225

Participants:

Baird, Tom (Memorial University)
Cox, Graham (Memorial University)
Jones, Christopher (University of North Carolina at Chapel Hill)
Latushkin, Yuri (University of Missouri)
Sukhtaiev, Selim (Rice University)
Sukhtayev, Alim (Miami University)

Investigating Linear Codes via Commutative Algebra
July 22 - 29, 2018

Organizers:

Alexandra Seceleanu (University of Nebraska Lincoln)
Susan Cooper (University of Manitoba)
Stefan Tohaneanu (University of Idaho)
Adam Van Tuyl (McMaster Univeristy)

Informally, a code is a way of representing information. Codes are studied by various scientific disciplines - such as information theory, electrical engineering, mathematics, and computer science - for the purpose of designing efficient and reliable data transmission methods. Some codes are constructed using methods from areas of mathematics such as linear algebra and algebraic geometry. In our work, we study properties of these codes by associating to them sets of points with multiplicity in multi-dimensional spaces. By investigating the structure and properties of these geometric objects with techniques pertaining to commutative algebra we are able to infer information about the code which reflects its error-correcting capabilities.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg220

Participants:

Cooper, Susan (University of Manitoba)
Seceleanu, Alexandra (University of Nebraska -- Lincoln)
Tohaneanu, Stefan (University of Idaho)
Vaz Pinto, Maria (Universidade de Lisboa)
Villarreal, Rafael (Center of Investigations and Advanced Studies)

Measuring the Connectedness of Graphs and Digraphs
August 5 - 12, 2018

Organizers:

Ortrud Oellermann (The University of Winnipeg)

Networks play an increasingly important role in modern society. People rely on communication networks, social networks, transportation or distribution networks, and computer networks, to name but a few. In many situations, the components of a network can fail, and reliability is the study of how well a network stands up to such failures. The broad objective of the workshop was to study several measures of the reliability of a network. Our work has applications to the design, assessment, and improvement of a wide variety of large-scale networks, including those mentioned above.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg233

Participants:

Casabalanca, Rocío (University of Seville)
Dankelmann, Peter (University of Johannesburg)
Goddard, Wayne (Clemson University)
Mol, Lucas (The University of Winnipeg)
Oellermann, Ortrud (The University of Winnipeg)

Microlocal Geometry of Langlands Parameter Spaces for p-adic Groups
August 12 - 19, 2018

Organizers:

Clifton Cunningham (University of Calgary)
Andrew Fiori (University of Lethbridge)
Ahmed Moussaoui (Université Versailles Saint-Quentin)
Bin Xu (Tsinghua University)

Recent work by Arthur on the classification of automorphic representations has shed new light on the transfer of these representations between groups. Following a suggestion by Arthur, this Focused Research Group is developing a geometric characterization of this transfer for p-adic groups, based in part on ideas developed by Adams, Barbasch and Vogan in the early 1990s. This geometric version of transfer of Arthur packets is surprisingly amenable to calculation and promises to give new tools to understand the transfer coefficients that appear in Arthur's main local result in the endoscopic classification of representations.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/focussed-research-groups/18frg237

Participants:

Cunningham, Clifton (University of Calgary)
Fiori, Andrew (University of Lethbridge)
Moussaoui, Ahmed (Université Versailles Saint-Quentin)
Tam, Kam-Fai (Max Planck Institute for Mathematics)
Xu, Bin (Tsinghua University)

Banff International Research Station

2018

Summer School

2018 Summer IMO Training Camp
June 24 - July 12, 2018

Organizers:

Jacob Tsimerman (University of Toronto)

Bill Sands (University of Calgary)

The International Mathematical Olympiad (IMO) is the "world championships" among high school math contests. It is held every year somewhere in the world, with Canada and about 100 other countries each sending up to six high school students to compete. The contest lasts two days, and on each day the students are given three very tough math problems to solve within 4 1/2 hours. Here the Math Team Canada will receive intensive training in the form of practice contests and lectures.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/summer-schools/18ss020

Participants:

Chan, Vincent (University of Calgary)
Deng, Calvin (IMO)
Guo, Thomas (IMO)
Halim, Howard (IMO)
Pawliuk, Mike (IMO)
Rickards, James (Colonel By Secondary School Ottawa)
Rong, Victor (IMO)
Sun, Nicholas (IMO)
Zhao, William (IMO)
Zhou, Zixiang (IMO)

CMO 2018 Program

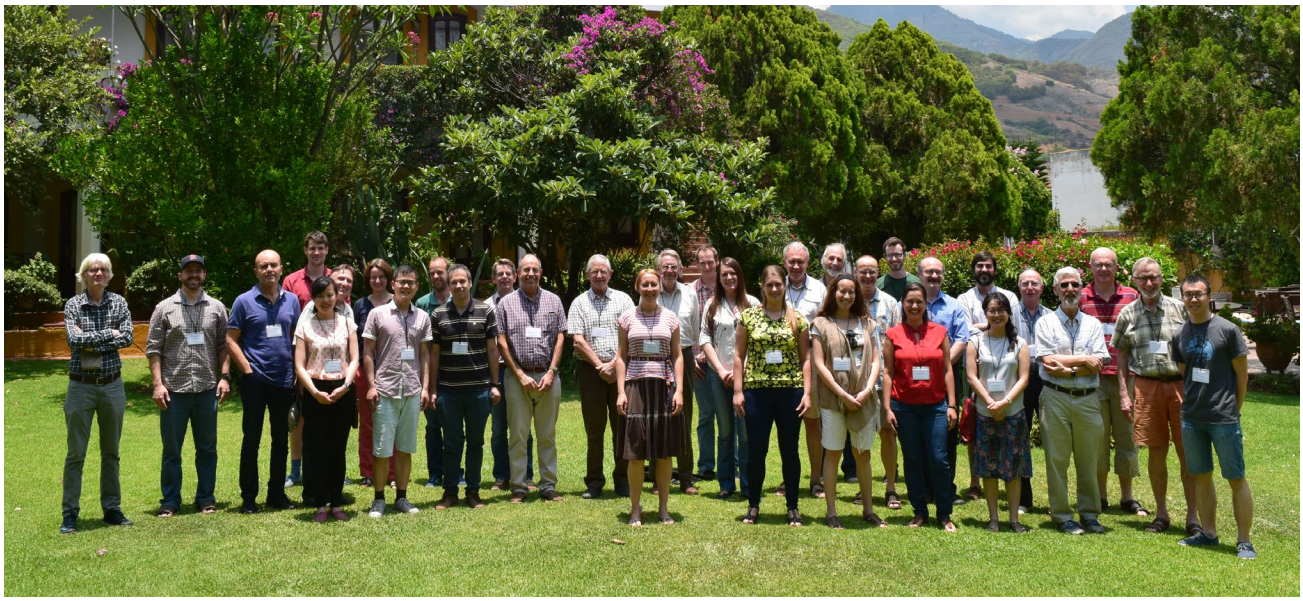
5-Day Workshops 2018

Apr 29	May 4	Recent Advances in Banach lattices
May 6	May 11	Infinity-Categories, Infinity-Operads, and their Applications
May 13	May 18	Stochastic Analysis and its Applications
May 20	May 25	Recent Developments in Statistical Theory and Methods Based on Distributed Computing
May 27	Jun 1	Rational and Integral Points via Analytic and Geometric Methods
Jun 3	Jun 8	Rules of Protein-DNA Recognition: Computational and Experimental Advances
Jun 10	Jun 15	Mexican Mathematicians in the World: Perspectives and Recent Contributions
Jun 17	Jun 22	Self-Similarity, Long-Range Dependence and Extremes
Jun 24	Jun 29	Quantitative Analysis of Immune Cell Migration and Spatial Processes in Health and Disease
Jul 1	Jul 6	Higgs Bundles and Harmonic Maps of Riemann Surfaces
Jul 29	Aug 3	Numerical Analysis of Coupled and Multi-Physics Problems with Dynamic Interfaces
Aug 5	Aug 10	Multiparameter Persistent Homology
Aug 12	Aug 17	Analytic techniques in Theoretical Computer Science
Aug 19	Aug 24	New Frontiers in Multiphase CFD for the 21st Century Energy Mix
Aug 26	Aug 31	Theory and Practice of Satisfiability Solving
Sep 2	Sep 7	Quantum Transport Equations and Applications
Sep 9	Sep 14	Theoretical and Applied Stochastic Analysis
Sep 16	Sep 21	Symmetry Breaking in Discrete Structures
Sep 23	Sep 28	Geometric and Categorical Aspects of CFTs
Sep 30	Oct 5	Special Values of Automorphic L-functions and Associated p-adic L-Functions
Oct 14	Oct 19	Neostability Theory
Oct 21	Oct 26	Lipschitz Geometry of Singularities
Oct 28	Nov 2	Stability Conditions and Representation Theory of Finite-Dimensional Algebras
Nov 4	Nov 9	Statistical and Computational Challenges in High-Throughput Genomics with Application to Precision Medicine
Nov 11	Nov 16	Computational Statistics and Molecular Simulation: A Practical Cross-Fertilization
Nov 25	Nov 30	Mathematical Challenges in the Analysis of Continuum Models for Cancer Growth, Evolution and Therapy

Recent Advances in Banach lattices
April 29 - May 4, 2018

Organizers:

Vladimir Troitsky (University of Alberta)
Gerard Buskes (University of Mississippi)
Ben de Pagter (Delft University of Technology)
Anthony Wickstead (Queen's University Belfast)



In recent years, several areas of Banach lattice theory have experienced high rate of growth. The workshop concentrated on these recent developments, including martingales in Banach and vector lattices, tensor products of Banach lattices, polynomials on Banach lattices, geometry of Banach latices, unconditional structures in Banach lattices, and multinorms. The goal of the workshop was to bring together the leading experts and active young researchers to discuss the current and future directions of these developments and to identify potential applications and the main open problems. We also planned to try to understand the "big picture" of connections between these developments and other areas of Functional Analysis.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5087

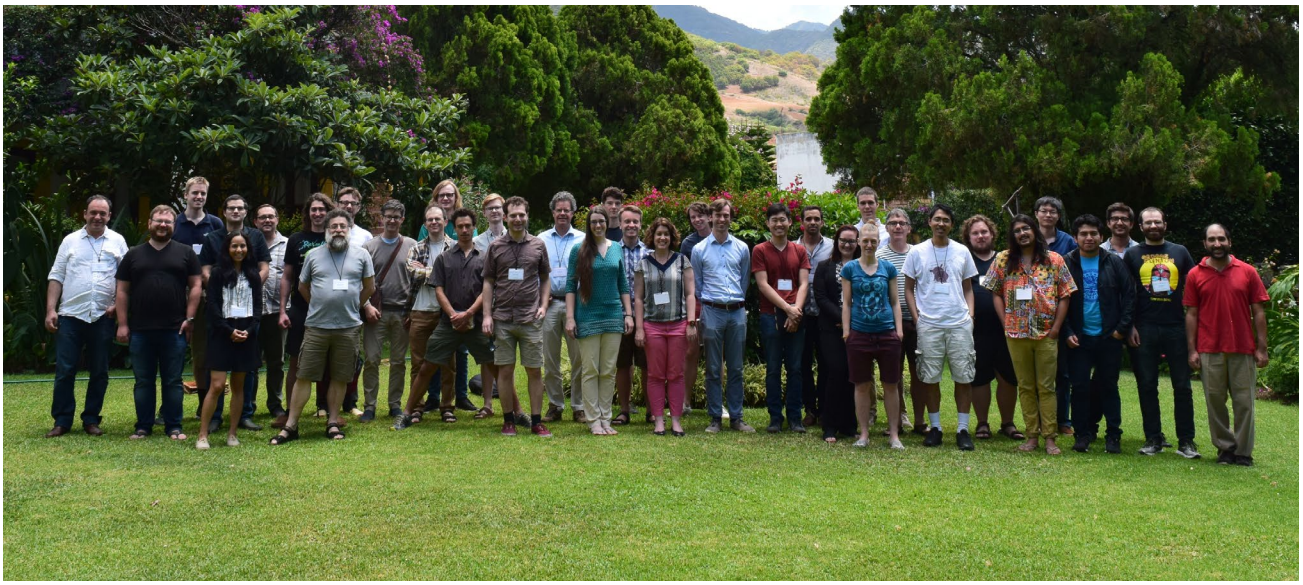
Participants:

Avalos-Ramos, Celia (Universidad de Guadalajara)
Boulabiar, Karim (University of Tunis-El Manar)
Buskes, Gerard (University of Mississippi)
Conradie, Jurie (University of Cape Town)
Dales, Harold Garth (University of Lancaster)
Dashiell, Frederick (University of California, Los Angeles)
Deng, Yang (Leiden University)
Drnovsek, Roman (University of Ljubljana)
Emelyanov, Eduard (Middle East Tech University)
Erkursun Ozcan, Nazife (Hacettepe University)
Grobler, Jacobus (North-West University)
Helemskii, Alexander (Moscow State University)
Hernández, Francisco Luis (Madrid Complutense University)
Hernández Barradas, José Luis (CIMAT)
Jiang, Xingni (Leiden University)
Kalauch, Anke (TU Dresden)
Kandić, Marko (University of Ljubljana)
Kitover, Arkady (Community College of Philadelphia)
Kuo, Wen-Chi (University of Witwatersrand)
Laustsen, Niels (Lancaster University)
Malinowski, Helena (North West University)
Oikhberg, Timur (University of Illinois at Urbana)
Ortega Castillo, Sofía (CIMAT)
Roelands, Mark (North-West University)
Rogans, Michael (University of Witwatersrand)
Schep, Anton (University of South Carolina)
Schwanke, Chris (North-West University)
Straatman, Mayke (Leiden University)
Tradacete, Pedro (Universidad Carlos III de Madrid)
Troitsky, Vladimir (University of Alberta)
van der Walt, Jan Harm (University of Pretoria)
van Gaans, Onno (Leiden University)
van Imhoff, Hent (Leiden University)
Xanthos, Foivos (Ryerson University)
Zhang, Feng (Leiden University)

Infinity-Categories, Infinity-Operads, and their Applications
May 6 - 11, 2018

Organizers:

Rune Haugseng (University of Copenhagen)
David Gepner (Purdue University)
Bertrand Toën (University of Toulouse)
Gabriele Vezzosi (University of Florence)



Homotopy-coherent structures are becoming increasingly important in many areas of mathematics. The formalism of oo-categories and oo-operads, which was the focus of this workshop, is a powerful framework for dealing with such structures that has seen a lot of development and many applications over the last few years. The workshop gathered mathematician working on both the foundations of this theory and on its applications in areas such as algebraic geometry, geometric representation theory, and algebraic topology, with the aim of spurring both further applications of the theory and new foundational developments inspired by potential applications.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5147

Participants:

Antieau, Benjamin (University of Illinois at Chicago)
Antolín Camarena, Omar (UBC)
Ayala, David (Montana State University)
Bergner, Julie (University of Virginia)
Cantarero Lopez, Jose Maria (CONACYT)
Carchedi, David (George Mason University)
Castro, Juan Carlos (Cinvestav)
Chu, Hongyi (University of Lille)
Francis, John (Northwestern University)
Fresse, Benoit (Université de Lille - Sciences et Technologies)
Gepner, David (Purdue University)
Getzler, Ezra (Northwestern University)
Glasman, Saul (University of Minnesota)
Gregoric, Rok (University of Texas Austin)
Haugseng, Rune (University of Copenhagen)
Heuts, Gijs (University of Copenhagen)
Hinich, Vladimir (University of Haifa)
Hoyois, Marc (University of Southern California)
Jackson, Artur (Purdue University)
Macpherson, Andrew (Kavli IPMU)
Magaña Zapata, Janeth Anabelle (Universidad Autónoma Metropolitana-Iztapalapa)
Mazel-Gee, Aaron (University of Southern California)
McCandless, Jonas (University of Copenhagen)
Moerdijk, Ieke (Utrecht University)
Mostovoy, Jacob (CINVESTAV)
Nielsen, Espen Auseth (University of Copenhagen)
Reyes, Nicolas (University of Texas Austin)
Riehl, Emily (Johns Hopkins University)
Rischel, Eigil Fjeldgren (University of Copenhagen)
Rivera, Manuel (CINVESTAV/University of Miami)
Robalo, Marco (Pierre and Marie Curie University)
Robertson, Marcy (University of Melbourne)
Safronov, Pavel (University of Zürich)
Salvatore, Paolo (Univ. of Rome Tor Vergata)
Scheimbauer, Claudia (Oxford University)
Shah, Jay (University of Notre Dame)
Sulyma, Yuri (University of Texas Austin)
Yuan, Allen (MIT)

Stochastic Analysis and its Applications
May 13 - 18, 2018

Organizers:

Gordan Zitkovic (The University of Texas at Austin)
Constantinos Kardaras (London School of Economics)
Walter Schachermayer (University of Vienna)

Probabilistic tools, together with a variety of methods from stochastic, functional and convex analysis and partial differential equations are routinely used in mathematical finance; in fact, the field draws from a host of other mathematical disciplines to accomplish its goals. Prior advances in this field have not only made a huge impact on the financial practice, but have also inspired a number of breakthroughs in related areas of mathematics traditionally regarded as theoretical. In this workshop, we brought together a group of experts and young researchers in various sub-areas of mathematical finance, with a special focus on those whose work draws heavily on stochastic analysis. Our goal was to foster a free interchange of ideas and facilitate sharing of some of the recent results in this challenging field.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5080

Participants:

Acciaio, Beatrice (London School of Economics)
Anthropelos, Michail (University of Piraeus)
Backhoff Veraguas, Julio (TU Wien)
Beiglböck, Mathias (University of Vienna)
Bouchard, Bruno (University Paris-Dauphine)
Callegaro, Giorgia (Università degli Studi di Padova)
Çetin, Umut (London School of Economics)
Cuchiero, Christa (University of Vienna)
De Marco, Stefano (Ecole Polytechnique)
dos Reis, Goncalo (University of Edinburgh)
Hernández, Daniel (Centro de Investigación en Matemáticas)
Horvath, Blanka (Imperial College London)
Ichiba, Tomoyuki (University of California Santa Barbara)
Jacquier, Antoine (Imperial College London)
Källblad, Sigrid (TU Wien)
Kardaras, Constantinos (London School of Economics)
Lacker, Daniel (Columbia University)
Larsson, Martin (ETH Zurich)
Lim, Tongseok (University of Oxford)
Mastrolia, Thibaut (Ecole Polytechnique-CMAP)
Nutz, Marcel (Columbia University)
Obloj, Jan (University of Oxford)
Pal, Soumik (University of Washington)
Pennanen, Teemu (King's College London)
Podolskij, Mark (Aarhus University)
Possamai, Dylan (Columbia University New York)
Pulido, Sergio (ENSIIE ÉVRY)
Robertson, Scott (Boston University)
Ruf, Johannes (LSE)
Santacroce, Marina (Politecnico di Torino)
Schachermayer, Walter (University of Vienna)
Shkolnikov, Misha (Princeton University)
Sirbu, Mihai (The University Of Texas at Austin)
Teichmann, Josef (ETH Zurich)
Treviño Aguilar, Erick (University of Guanajuato)
Weston, Kim (Rutgers)
Zhang, Yuchong (Columbia University)
Zitkovic, Gordan (The University of Texas at Austin)

Recent Developments in Statistical Theory and Methods Based on Distributed Computing
May 20 - 25, 2018

Organizers:

Sujit Ghosh (North Carolina State University)
Xiaoming Huo (Georgia Institute of Technology)
Hua Zhou (University of California, Los Angeles)
Mu Zhu (University of Waterloo)

In the era of so-called “big data”, it is almost impossible to store data in a single device or central location and thus it has become a major challenge to make inference by developing methodologies that can be performed on data distributed across many devices or locations. This workshop brought together researchers from both statistics and applied mathematics who were working on distributed inference and distributed computing. The applied focus of this workshop was on the explorations of the methodology for the computing and modeling architecture for distributed data, including data ingestion and staging platform, enterprise data warehouse and analytics platform. To do so, this workshop brought academic and industrial researchers together for the exploration and scientific discussions on recent challenges faced by practitioners and related cutting-edge theories and proven best practices in both academia and industries on distributed data analytics.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5089

Participants:

Álvarez González, Ernesto (Universidad Autónoma Benito Juárez de Oaxaca)
Cao, Shanshan (Georgia institute of technology)
Day, Josh (Julia Computing)
Guha, Sharmistha (University of California at Santa Cruz)
Guhaniyogi, Rajarshi (UC Santa Cruz)
Hector, Emily (University of Michigan)
Huo, Xiaoming (Georgia Institute of Technology)
Jia, Bochao (University of Florida)
Jimenez, Edgar (CIMAT Unidad Monterrey)
Lagunas Pinacho, Sergio Adrián (Cognizant)
Lysy, Martin (University of Waterloo)
Minsker, Stanislav (University of South California)
Song, Peter (University of Michigan)
Villandré, Luc (HEC Montréal)
Won, Joong-Ho (Seoul National University)
Xie, Min-ge (Rutgers University)
Zhang, Zhengwu (University of Rochester)
Zhou, Hua (University of California, Los Angeles)
Zhou, Jin (University of Arizona)
Zhou, Ding-Xuan (City University of Hong Kong)

Rational and Integral Points via Analytic and Geometric Methods
May 27 - June 1, 2018

Organizers:

Tim Browning (University of Bristol)
Ulrich Derenthal (Leibniz Universität Hannover)
Cecília Salgado (Universidade Federal do Rio de Janeiro)

The study of rational or integral solutions to systems of polynomial equations is a topic that is almost as old as mathematics itself. Such systems define algebraic varieties and a driving force, historically, has been the decidability question for the existence (or non-existence) of rational or integral points on varieties. In the event that such points exist, furthermore, it is natural to try and understand their density. This meeting brought together researchers in analytic number theory and arithmetic geometry to push the boundaries of these fundamental questions.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5012

Participants:

Berg, Jennifer (Rice University)
Bright, Martin (Universiteit Leiden)
Browning, Tim (University of Bristol)
Cao, Yang (MPI Bonn)
Corona, Miguel (Universidad Autónoma Metropolitana)
Derenthal, Ulrich (Leibniz Universität Hannover)
Desjardins, Julie (Max Planck Institute for Mathematics)
Destagnol, Kevin (Max Planck Institute for Mathematics, Bonn)
Etropolski, Anastassia (Rice University)
Farfán, Victoria Cantoral (ICTP)
Frei, Christopher (TU Graz)
Gallegos-Ruiz, Homero (DNA)
Gunther, Joseph (University of Wisconsin-Madison)
Heath-Brown, Roger (Oxford University)
Hindry, Marc (Paris VII)
Ho, Wei (University of Michigan)
Huang, Zhizhong (Université Grenoble Alpes)
Landesman, Aaron (Stanford University)
Loughran, Daniel (University of Manchester)
Manzateanu, Adelina (University of Bristol)
Mitankin, Vladimir (Federal University of Rio de Janeiro)
Morgan, Adam (Kings College London)
Morrow, Jackson (Emory University)
Newton, Rachel (University of Reading)
Overkamp, Otto (Imperial College London)
Park, Jennifer (University of Michigan)
Pieropan, Marta (École Polytechnique Fédérale de Lausanne)
Rome, Nick (University of Bristol)
Salgado, Cecília (Universidade Federal do Rio de Janeiro)
Schindler, Damaris (Utrecht University)
Skorobogatov, Alexei (Imperial College London)
Sofos, Efthymios (Max Planck Institute for Mathematics, Bonn)
Tanimoto, Sho (University of Copenhagen)
Top, Jaap (University of Groningen)
van Luijk, Ronald (Universiteit Leiden)
Varilly-Alvarado, Anthony (Rice University)
Vishe, Pankaj (Durham University)
Vogt, Isabel (Massachusetts Institute of Technology)
Voloch, Felipe (University of Canterbury)
Wilsch, Florian (University of Hannover)
Wittenberg, Olivier (Centre National de la Recherche Scientifique - École normale supérieure)
Zureick-Brown, David (Emory University)

Rules of Protein-DNA Recognition: Computational and Experimental Advances June 3 - 8, 2018

Organizers:

Trevor Siggers (Boston University)

Marcus Noyes (New York University, Langone Medical Center)

The information that determines our genetic make-up – from our eye color to our propensity to get cancer or Alzheimer's – is encoded in the DNA sequence of our genomes. This DNA information is interpreted by proteins called transcription factors that 'read' the four-letter code in our DNA, promoting the activation or repression of genetic programs. Unfortunately we have been unable to decipher the non-protein-coding portion of our genomes, which comprises >95% of our DNA even though we now have access to thousands of fully sequenced human genomes and the numbers are increasing daily. A fundamental problem of modern biology will be how to discern DNA differences between people that affect our physical differences and the manifestation of disease. As a result, a major challenge facing computational and structural biologists is to crack the DNA code that will allow us to understand the impact of DNA differences on protein-DNA interactions and gene expression. The solution to this challenge will likely come from the convergence of theoretical, computational, biophysical, and structural approaches.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5045

Participants:

Ansari, Aseem (University of Wisconsin)
Bussemaker, Harmen J. (Columbia University)
Camacho, Carlos (University of Pittsburgh)
Chen, Kai (Princeton University)
Cohen, Barak (Washington University)
Collado-Vides, Julio (UNAM)
Deplancke, Bart (EPFL)
Fordyce, Polly (Stanford University)
Fuxman Bass, Juan (Boston University)
Gordan, Raluca (Duke University)
Hughes, Tim (University of Toronto)
Ibarra Del Río, Ignacio (EMBL Heidelberg)
Levy, Yaakov (Weizmann)
Llinas, Manuel (Penn State)
Mandel-Gutfreund, Yael (Technion-Israel Institute of Technology)
Mann, Richard (Columbia University)
Medina Rivera, Alejandra Eugenia (Universidad Nacional Autonoma de Mexico)
Morozov, Alexandre (Rutgers University)
Mueller, April (NYU)
Noyes, Marcus (New York University)
Orenstein, Yaron (Ben-Gurion University)
Ortlund, Eric (Emory University)
Penvose, Ashley (Boston University)
Pratt, Henry (UMass Medical School)
Pufall, Miles (University of Iowa)
Rastogi, Chaitanya (Columbia University)
Rodriguez-Martinez, Jose (University of Puerto Rico - Rio Piedras)
Rogers, Julia (Brigham and Women's Hospital and Harvard Medical School)
Rohs, Remo (University of Southern California)
Siggers, Trevor (Boston University)
Singh, Mona (Princeton University)
Spencer, Jeffrey (NYU Langone)
Stormo, Gary (Washington University in St. Louis)
Taipale, Jussi (University of Cambridge)
Thornton, Joe (University of Chicago)
Tierrafría, Víctor H. (UNAM)
Trejo-Sánchez, Joel Antonio (CIMAT-Mérida)
Tullius, Tom (Boston University)
Vierstra, Jeff (Altius Institute for Biomedical Sciences)
Vinson, Charles (NIH)
Weirauch, Matthew (Cincinnati Children's Hospital)

Mexican Mathematicians in the World: Perspectives and Recent Contributions
June 10 - 15, 2018

Organizers:

Cecilia González Tokman (University of Queensland)
Xavier Gomez-Mont (CIMAT)
Rita Jiménez Rolland (IMATE Oaxaca)
José Antonio Seade Kuri (UNAM)

The biennial conference "Mexican Mathematicians in the World" connects Mexican mathematicians residing abroad with their counterparts in Mexico by showcasing state-of-the-art research of promising and well-established Mexican mathematicians, and by fostering focused, in-depth discussions about different aspects of the overall situation of mathematics in Mexico. This conference aimed to raise the academic profile and visibility of Mexican mathematics within the international scientific community, and to strengthen the individual and institutional links among Mexican mathematicians and Mexican institutions.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5142

Participants:

Adem, Alejandro (University of British Columbia)
Arévalo Loyola, Alma Rosario (UNAM)
Ballesteros Chavez, Daniel (Durham University)
Bonifant, Araceli (University of Rhode Island)
Cantoral Farfán, Victoria (ICTP)
Cárdenas Cruz, Herón (Universidad Autónoma de Chiapas)
Castillejos, Jorge (KU Leuven)
Caudillo Mata, Luz Angelica (UBC)
Chávez Casillas, Jonathan (University of Rhode Island)
Chávez Domínguez, Javier (University of Oklahoma)
Corro Tapia, Diego (Karlsruhe Insitute of Technology)
Duenez, Eduardo (Spelman College)
García Acosta, Manuel Alejandro (UNAM)
Garcia-Ramos, Felipe (Universidad Autonoma de San Luis Potosi)
Garibay Valladolid, Tania Raquel (UMSNH)
González Tokman, Cecilia (University of Queensland)
Gutierrez Rodriguez, Ixchel Dzohara (Universidade de Santiago de Compostela)
Herrera Reyes, Alejandra Donaji (UBC)
Hubard, Alfredo (Université Marne la Vallée-Paris Est.)
Jaramillo Velez, Delio (CIMAT)
Jardón Kojakhmetov, Hildeberto (Universidad Técnica de Munich)
Jiménez Gómez, Carlos Hugo (PUC Rio)
Jiménez Rolland, Rita (IMATE Oaxaca)
Juan Pineda, Daniel (UNAM)
León Álvarez, Porfirio Leandro (UNAM)
Lomeli, Luis (Pontificia Universidad Catolica de Valparaiso)
Lozano Huerta, César (CONACYT)
Maldonado, Cesar (Instituto Potosino de Investigación Científica y Tecnológica)
Maldonado, Miguel (Universidad Autónoma de Zacatecas)
Peralta Alvarez, Gari Yamel (Universidad de Colima)
Prado Godoy, Miguel Angel (Universidad de Guanajuato)
Prieto Langarica, Alicia (Youngstown State University)
Rechtman Bulajich, Ana (UNAM)
Rivero Mercado, Victor Manuel (CIMAT)
Rodríguez Guzmán, Diego (Universidad Autónoma de Aguascalientes)
Salazar, Gelasio (Universidad Autonoma de San Luis Potosi)
Saldaña García, Fernando (CIMAT)
Sánchez Vizuet, Tonatiuh (New York University)
Santos Rodríguez, Jaime (Universidad Autonoma de Madrid)
Serrato Martínez, Arelis (UNAM)
Sotolongo Aguiar, Alina (Centro de Investigación en Matemáticas)
Tagüeña, Julia (Consejo Nacional de Ciencia y Tecnología)
Treviño López, Enrique (Lake Forest College)
Uribe, Alejandro (University of Michigan)
Velázquez Richards, Eduardo Iván (UNAM)
Vera Licona, Paola (University of Connecticut)

Self-Similarity, Long-Range Dependence and Extremes
June 17 - 22, 2018

Organizers:

Rafal Kulik (University of Ottawa)
Gennady Samorodnitsky (Cornell University)
Yi Shen (University of Waterloo)
Stilian Stoev (University of Michigan, Ann Arbor)
Yizao Wang (University of Cincinnati)

This workshop focused on self-similarity, long-range dependence and extremes, three closely related areas in stochastic modeling. Problems from these areas are often motivated by real data from various fields, including econometrics, finance, computer network and climate studies, among others. The difficulties of dealing with such data lie in the fact that many modeling questions cannot be addressed by traditional methods, which often assume the data to have very weak or relatively easy dependence structure. From the mathematical point of view, the complex dependence structures often present new challenges and new directions in the development of probability theory. This workshop provided an opportunity to present the recent advances in the three closely related areas, and facilitate exchanges and further collaborations between researchers from different groups. Common themes of interest to be presented here are limit theorems for heavy-tailed processes and long-range dependence processes, stable and max-stable processes and random fields, multivariate regular variations, and their applications.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5086

Participants:

Bai, Shuyang (University of Georgia)
Basrak, Bojan (University of Zagreb)
Basse-O'Connor, Andreas (University of Aarhus)
Betken, Annika (Ruhr-University Bochum)
Bhattacharya, Ayan (Indian Statistical Institute)
Chen, Zaoli (Cornell University)
Cissokho, Youssouph (University of ottawa)
Das, Bikramjit (Singapore University of Technology and Design)
Dombry, Clément (Université de Franche-Comté)
Drees, Holger (University of Hamburg)
Durieu, Olivier (Université de Tours)
Engelke, Sebastian (University of Geneva)
Fu, Zuopeng (University of Cincinnati)
Gao, Zheng (University of Michigan)
Garcia, Andres (CIMAT)
Janssen, Anja (KTH Royal Institute of Technology)
Jaramillo, Arturo (The University of Kansas)
Kartsioukas, Rafail (University of Michigan)
Kechagias, Stefanos (SAS Institute)
Kiriliouk, Anna (Erasmus University Rotterdam)
Kulik, Rafal (University of Ottawa)
Kuznetsov, Alexey (York University)
Lam, Henry (Columbia University)
Mendoza Rosas, Ana Teresa (CIDESI)
Molchanov, Ilya (University of Bern)
Pipiras, Vladas (University of North Carolina)
Resnick, Sidney (Cornell University)
Roueff, Francois (TELECOM ParisTech)
Roy, Parthanil (Indian Statistical Institute)
Saidani, Becem (University of Ottawa)
Samorodnitsky, Gennady (Cornell University)
Shen, Jinqi (University of Michigan Ann Arbor)
Soulier, Philippe (Universite Paris Nanterre)
Spodarev, Evgeny (Ulm University)
Stoev, Stilian (University of Michigan, Ann Arbor)
Strokorb, Kirstin (Cardiff University)
Wan, Phyllis (Columbia University)
Wintenberger, Olivier (Université Pierre et Marie Curie)
Wu, Lifan (Cornell University)
Yslas Altamirano, Jorge (UNAM)

Quantitative Analysis of Immune Cell Migration and Spatial Processes in Health and Disease
June 24 - 29, 2018

Organizers:

Judith Mandl (McGill University)
Rob de Boer (Utrecht University)
Johannes Textor (Radboud University Medical Center)

Much of what we know about the immune system has come from studying immune cells that were harvested from organs and put into single cell suspension to probe their function. However, immune cells are highly motile and their migratory behaviour has a large impact on immune responses during health and disease. Understanding the complex choreography of immune cells, and the impact of that their migratory behaviour, is only now beginning to become accessible to study, as recent advances in microscopy enable us to film the behaviour of individual immune cells within live animals. Such videos hold critical information on how cells talk to each other, how tissue structure influences immune cell behaviour, and how infections or tumours impair cell migration. The desire to understand the motion of immune cells, and how it influences immune responses, has brought together mathematicians, physicists, and immunologists, who have recently begun to address these exciting questions in a cross-disciplinary effort.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5153

Participants:

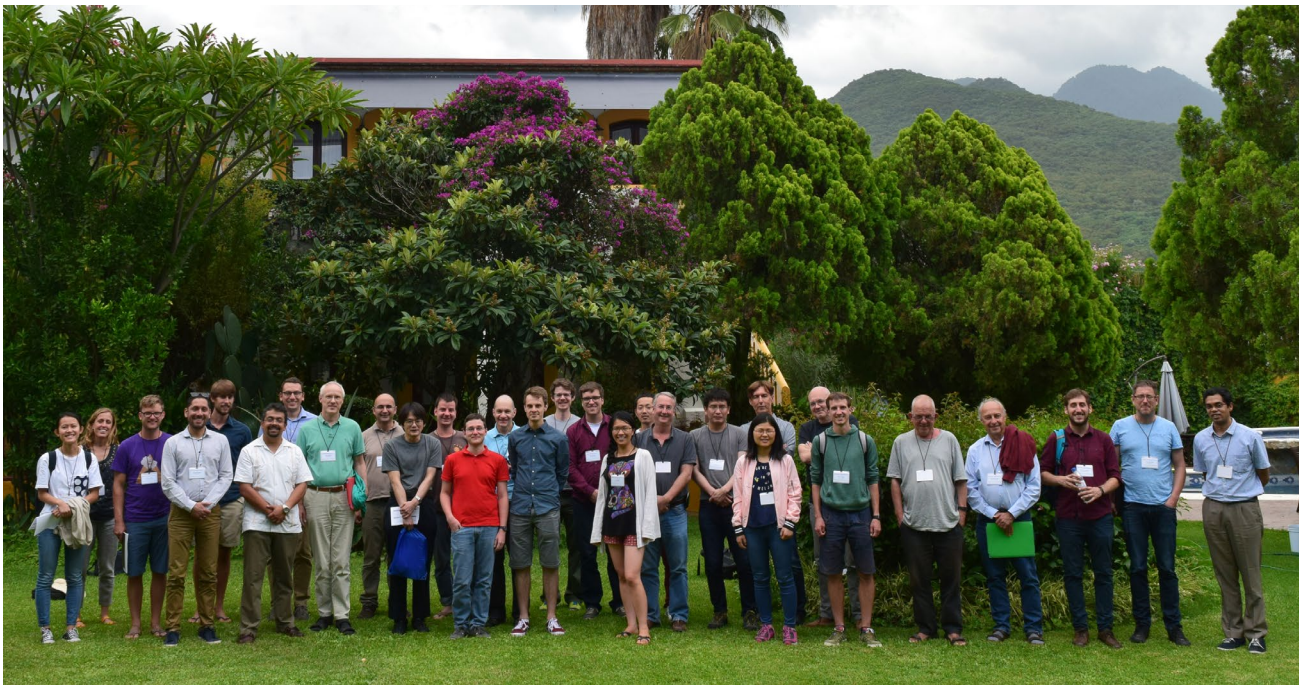
Abe, Jun (University of Bern)
Abedi, Majid (HZI Braunschweig)
Beltman, Joost (Leiden University)
Camley, Brian (Johns Hopkins University)
Cannon, Judy (University of New Mexico)
Coley, Shana (Columbia University)
Coombes, Janine (University of Liverpool)
de Boer, Rob (Utrecht University)
Gerard, Audrey (University of Oxford)
Grigorova, Irina (University of Michigan)
Huang, Alex (Case Western Reserve University)
Hunter, Christopher (University of Pennsylvania)
Khadra, Anmar (McGill University)
Konradt, Christoph (University of Pennsylvania)
Krummel, Matthew (UCSF)
Labernadie, Anna (IBEC)
Lennon-Duménil, Ana-Maria (Institut Curie)
Lythe, Grant (University of Leeds)
Mandl, Judith (McGill University)
Melichar, Heather (University of Montreal)
Miller, Mark J. (Washington University School of Medicine)
Moses, Melanie (University of New Mexico)
Mueller, Scott (The University of Melbourne)
Novkovic, Mario (Kantonsspital St. Gallen)
Okada, Takaharu (RIKEN)
Park, Morag (McGill University)
Schiffer, Joshua (Fred Hutchinson Cancer Research Center)
Textor, Johannes (Radboud University Medical Center)
Thanabalasuriar, Ajitha (University of Calgary)
Voituriez, Raphael (Universite Pierre et Marie Curie)
Weigelin, Bettina (MD Anderson Cancer Center)
Yates, Andrew (Columbia University)

Higgs Bundles and Harmonic Maps of Riemann Surfaces
July 1 - 6, 2018

Organizers:

Franz Pedit (University of Massachusetts)

Michael Wolf (Rice University)



Higgs bundles and harmonic maps are two-dimensional analogues of four-dimensional gauge field equations which describe substantial portions of modern physics. Their study, in addition to providing a strong link between mathematics and theoretical physics, has revealed deep connections among important areas of mathematics, such as algebraic and differential geometry, representation theory, integrable systems, dynamics and partial differential equations. The workshop brought together researchers working on the different strands of this theory to learn about their respective ideas, results, methods, important open problems, and to foster long-term collaboration.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5198

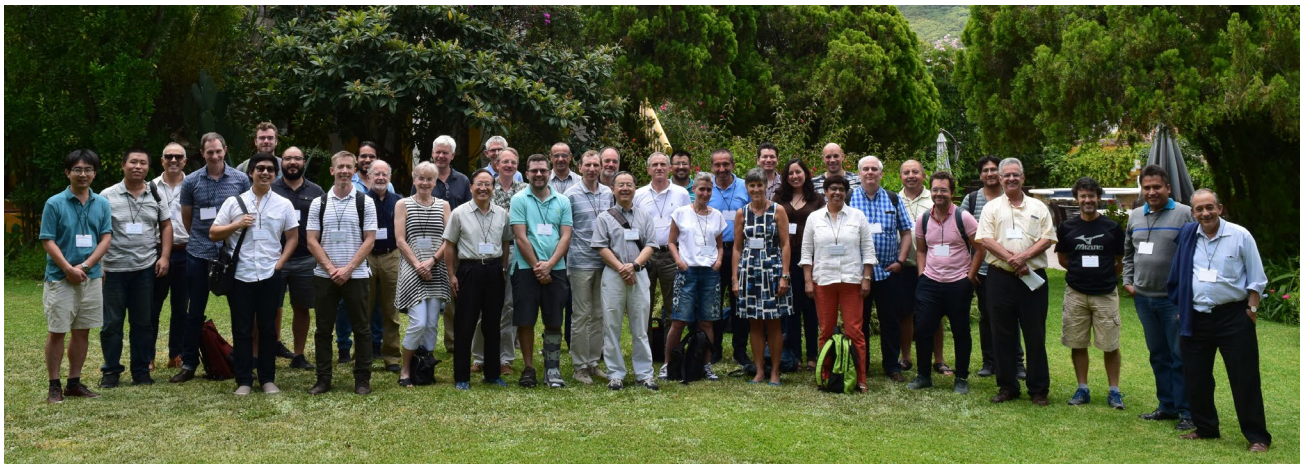
Participants:

Alim, Murad (University of Hamburg)
Beck, Florian (University of Hamburg)
Bonsante, Francesco (University of Pavia)
Bradlow, Steve (University of Illinois Champaign-Urbana)
Brambila-Paz, Leticia (CIMAT)
Burstall, Francis (University of Bath)
Collier, Brian (Univ. of Maryland - College Park)
Dai, Xian (Rice University)
Dorfmeister, Josef (Technical University of Munich)
Fredrickson, Laura (Stanford University)
Gupta, Subhojoy (Indian Institute of Science)
Heller, Lynn (University of Hannover)
Hertling, Claus (Universitaet Manheim)
Holguín Cardona, Sergio Andrés (UNAM)
Koga, Isami (Meiji University)
Komyo, Arata (Osaka University)
Labourie, François (University of Nice)
li, qiongling (Caltech)
Martone, Giuseppe (University of Southern California)
Meneses, Claudio (University of Kiel)
Mochizuki, Takuro (Kyoto University)
Neitzke, Andrew (University of Texas at Austin)
Ouyang, Charles (Rice University)
Pedit, Franz (University of Massachusetts Amherst)
Röser, Markus (Leibniz University Hannover)
Seppi, Andrea (University of Luxembourg)
Slegers, Ivo (Max Plancks Institute for Mathematics)
Smillie, Peter (Harvard)
Solórzano, Pedro (UNAM)
Tamburelli, Andrea (University of Luxembourg)
Toulisse, Jeremy (USC Dornsife)
Weiss, Hartmut (University of Kiel)
Wolf, Michael (Rice University)

Numerical Analysis of Coupled and Multi-Physics Problems with Dynamic Interfaces
July 29 - August 3, 2018

Organizers:

Johnny Guzman (Brown University)
Gabriel Gatica (Universidad de Concepcion)
Gerardo Hernández Dueñas (UNAM)
Maxim Olshanskiy (University of Houston)



Over the last decade, multi-physics problems coupled with interfacial dynamics have been a focus of research for several distinct applied and computational mathematics communities, including those interested in fluid-structure interaction problems, multi-phase flow dynamics, biological membranes and cell mobility models, and the study of pattern formation. The goal of this workshop was to bring together senior experts and junior researchers to foster communication between scientifically and geographically diverse research groups working on numerical analysis of multi-physics problems and to establish new links and joint projects.The topics of the workshop included numerical analysis of fluid--structure interaction problems, finite element methods for partial differential equations posed on manifolds and surface--bulk coupled problems and computational mathematics of interfacial flows.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5077

Participants:

Ayuso, Blanca (Universita degli Studi di Bologna)
Badia, Santiago (Universitat Politècnica de Catalunya)
Balam, Reymundo Itzá (CIMAT)
Balbas, Jorge (California State University-Northridge)
Barahona, Igor (UNAM)
Becker, Roland (Université de Pau)
Boffi, Daniele (University of Pavia)
Caballero, Rogelio Oscar (UNAM)
Capistrán, Marcos A. (CIMAT)
Chan, Jesse (Rice University)
Díaz Viera, Martín Alberto (Instituto Mexicano del Petóleo)
Ern, Alexandre (University Paris-Est)
Gastaldi, Lucia (Università degli Studi di Brescia)
Gonzalez Casanova, Pedro (UNAM)
Guermond, Jean-Luc (Texas A&M University)
Guerrero, Zamantha (UNAM)
Guzman, Johnny (Brown University)
Hao, Wenrui (Penn State University)
Hernández Dueñas, Gerardo (UNAM)
Herrera, Ismael (UNAM)
Li, Zhilin (North Carolina State University)
Lin, Tao (Virginia Tech)
Madureira, Alexandre (Laboratorio Nacional de Computacao Cientifica)
Massing, Andre (Umea U.)
Mori, Yoichiro (University of Minnesota)
Neilan, Michael (University of Pittsburgh)
Olshanskiy, Maxim (University of Houston)
Owen, Justin (Texas A&M University)
Peña García, José Alberto (UNAM)
Peszynska, Malgorzata (Oregon State University)
Quezada de Luna, Manuel (U.S. Army Corps of Engineers)
Reusken, Arnold (RWTH Aachen University)
Rosales Alcantar, César Alberto (UNAM)
Ruiz-Baier, Ricardo (Oxford U.)
Salgado, Abner (U. Tennessee)
Sandoval Solís, María Luisa (Universidad Autónoma Metropolitana)
Sarkis, Marcus (Worcester Polytechnic Institute)
Showalter, Ralph E. (Oregon State University)
Siegel, Michael (New Jersey Institute of Technology)
Vassilevski, Yuri (Inst. Numerical Mathem RAS)
Velasco García, Ulises (UNAM)

Multiparameter Persistent Homology
August 5 - 10, 2018

Organizers:

Ryan Budney (University of Victoria)
Peter Bubenik (University of Florida)
Michael Lesnick (Princeton University)

Topological data analysis is a young field where we apply the tools of topology to see the coarse `shapes' of potentially large or high-dimensional data sets. Multi-parameter persistent homology is a relatively new thread of ideas, that allows for topological data analysis to be forgiving of `noise' in data sets. Being a young field, there are connections to an array of disciplines in mathematics as well as the sciences. We brought together experts from within the field of topological data analysis, neighboring areas of mathematics and statistics, as well as users of topological data analysis for the purpose of data exploration and visualization. The workshop was to further extend the machinery of multi-parameter persistent homology for the purpose of having an effective and pleasant apparatus for studying large data sets.

Participants:

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5140

Bauer, Ulrich (Technische Universität München)
Botnan, Magnus Bakke (Technical University Munich/VU Amsterdam)
Bubenik, Peter (University of Florida, Mathematics)
Budney, Ryan (University of Victoria)
Catanzaro, Michael (University of Florida)
Cruz, Joshua (Duke University)
Curry, Justin (SUNY Albany)
de Silva, Vin (Pomona College)
Dey, Tamal (Ohio State University)
Díaz Patiño, Juan Carlos (UNAM)
Edwards, Parker (University of Florida)
Elchesen, Alex (University of Florida)
Heo, Giseon (University of Alberta)
Kaczynski, Tomasz (Université de Sherbrooke)
Keller, Bryn (Intel Labs)
Kerber, Michael (TU Graz)
Knudson, Kevin (University of Florida)
Lenzen, Fabien (Technical University Munich)
Lesnick, Michael (Princeton University)
Martin del Campo, Abraham (CIMAT)
Mendoza-Smith, Rodrigo (Oxford)
Meyer, David (U. Missouri)
Milicevic, Nikola (University of Florida)
Miller, Ezra (Duke University)
Morozov, Dmitriy (Lawrence Berkeley National Laboratory)
Mukherjee, Sayan (Duke University)
Munch, Elizabeth (Michigan State University)
Oudot, Steve (Inria Saclay)
Perea, José (Michigan State University)
Rathod, Abishek (Technical University of Munich)
Reininghaus, Jan (CD-adapco)
Rieser, Antonio (CONACYT-CIMAT)
Roa, Erika Berenice (The Ohio State University)
Schenck, Hal (Iowa State University)
Scott, Jonathan (Cleveland State University)
Steen, Johan (NTNU)
Thomas, Ashleigh (Duke University)
Vargas Obieta, Carlos (CONACYT-CIMAT)
Vipond, Oliver (University of Oxford)
Wagner, Alexander (University of Florida)
Wang, Yusu (Ohio State University)

Analytic techniques in Theoretical Computer Science
August 12 - 17, 2018

Organizers:

Shachar Lovett (University of California, San Diego)
Hamed Hatami (McGill University)
Raghu Meka (University of California, Los Angeles)
Ryan O'Donnell (Carnegie Mellon University)

Analytic techniques have become influential in many areas in theoretical computer science, such as: approximation algorithms, hardness of approximation, learning theory, cryptography, sub-linear algorithms, coding theory, communication complexity, social choice theory, and more. The workshop brought together researchers in these areas, allowing them to learn from each other and facilitate new collaborations.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5197

Participants:

Anari, Nima (Stanford University)
Bun, Mark (Princeton University)
Chattopadhyay, Eshan (Cornell University and IAS)
Cohen, Gil (Princeton University)
Filmus, Yuval (Technion)
Franks, Cole (Rutgers University)
Gal, Anna (University of Texas at Austin)
Hambardzumyan, Lianna (McGill University)
Harsha, Prahladh (Tata Institute of Fundamental Research, Mumbai)
Hatami, Hamed (McGill University)
Kabanets, Valentine (Simon Fraser University)
Khot, Subhash (New York University)
Kindler, Guy (Hebrew University of Jerusalem)
Kolokolova, Antonina (Memorial University of Newfoundland)
Kothari, Pravesh (Princeton University)
Lee, James (University of Washington)
Lovett, Shachar (University of California, San Diego)
Meka, Raghu (University of California, Los Angeles)
Moitra, Ankur (MIT)
Moshkovitz, Danna (University of Texas at Austin)
O'Donnell, Ryan (Carnegie Mellon University)
Oveis Gharan, Shayan (University of Washington)
Paredes García, Wilfrido Jacobo (Universidad Autónoma de Querétaro)
Pitassi, Toniann (University of Toronto)
Regev, Oded (New York University)
Saks, Michael (Rutgers University)
Schramm, Tselil (Harvard/MIT)
Schwartz, Roy (Technion)
Servedio, Rocco (Columbia University)
Sherstov, Alexander (UCLA)
Srivastava, Nikhil (Berkeley)
Tal, Avishay (Stanford University)
Thaler, Justin (Georgetown University)
Tulsiani, Madhur (Toyota Technological Institute at Chicago)
Vidick, Thomas (Caltech)

New Frontiers in Multiphase CFD for the 21st Century Energy Mix
August 19 - 24, 2018

Organizers:

Anthony Wachs (University of British Columbia)
Sarah Hormozi (Ohio University)
Christine Hrenya (University of Colorado)
Sreekanth Pannala (SABIC)

Advanced numerical models and High Performance Computing are changing the way engineers are designing and operating new facilities and production processes. Although many industries have already incorporated multiphase Computational Fluid Dynamics (CFD) as a reliable tool in their practices, the process industry is trailing behind. This is both due to a presumably higher level of complexity in these flows as well as a somehow more conservative operational governance. However, the next generational breakthrough in the process industry will not happen without multiphase CFD. As one of the main goals of the process industry is to secure clean and sustainable energy sources, the necessity of success in this endeavor has extremely important societal implications. So the scenery is set: crucial societal needs, expected benefits from a more effective academia-industry partnership, unprecedented computing resources. It constitutes a strong vector of incentives and creates great opportunities for fluid mechanicists, chemical engineers, computational scientists, applied mathematicians and decision makers to make a significant step towards shaping the future of sustainable and clean processes.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5139

Participants:

Balachandar, Sivaramakrishnan (University of Florida)
Brandt, Luca (KTH Mechanics)
Capecelatro, Jesse (University of Michigan)
Cocco, Ray (PSRI)
Desjardins, Olivier (Cornell universtiy)
Dufresne, Yann (CORIA CNRS)
Emady, Heather (Arizona State University)
Esmaily, Mahdi (Cornell University)
Fox, Rodney (Iowa State University)
Ge, Wei (Chinese Academy of Sciences)
Gibou, Frederic (University of California, Santa Barbara)
Guzman, Enrique (UNAM)
Hormozi, Sarah (Ohio University)
Horwitz, Jeremy (Stanford University)
Khanna, Samir (British Petroleum - USA)
Kuipers, J.A.M. (Technische Universiteit Eindhoven)
LaMarche, Casey (Particulate Solid Research, Inc.)
Larachi, Faical (Laval)
Li, Tingwen (NETL)
Liu, Peiyuan (University of Colorado)
Marchioli, Cristian (University of Udine)
Marchisio, Daniele (Politecnico Torino)
Mason, Lachlan (Imperial College London)
Moureau, Vincent (CORIA, CNRS)
Nandakumar, Krishnaswamy (Louisiana State University)
Ocone, Raffaella (Heriot-Watt University)
Ozel, Ali (Heriot-Watt University)
Pannala, Sreekanth (SABIC)
Popinet, Stephane (Institut Jean le Rond d'Alembert)
Selcuk, Can (University of British Columbia)
Shu, Shuli (Polytechnique Montreal)
Simonin, Olivier (Institut National Polytechnique de Toulouse)
Smith, Sean (University of Utah)
Tang, Yali (Eindhoven University of Technology)
Valdes Herrera, Rogelio (UNAM)
Vidal, David (Polytechnique Montreal)
Wassgren, Carl (Purdue University)
Witt, Peter (CSIRO Melbourne)
Zenit, Roberto (UNAM)
Zhang, Chenguang (Louisiana State University)

Theory and Practice of Satisfiability Solving
August 26 - 31, 2018

Organizers:

Jakob Nordstrom (KTH Royal Institute of Technology)
Sam Buss (University of California, San Diego)
Daniel Le Berre (Université d'Artois)
Moshe Vardi (Rice University)

How hard is it to prove a logic formula? This is a problem of immense importance both theoretically and practically, which lies right at the heart of mathematics and computer science. In this workshop, we gathered leading theoreticians and practitioners to stimulate an increased exchange of ideas between these two communities. We saw great opportunities for fruitful interplay between theoretical and applied research in this area, and believe that a more vigorous interaction between the two has potential for major long-term impact in computer science and mathematics, as well for applications in industry.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5208

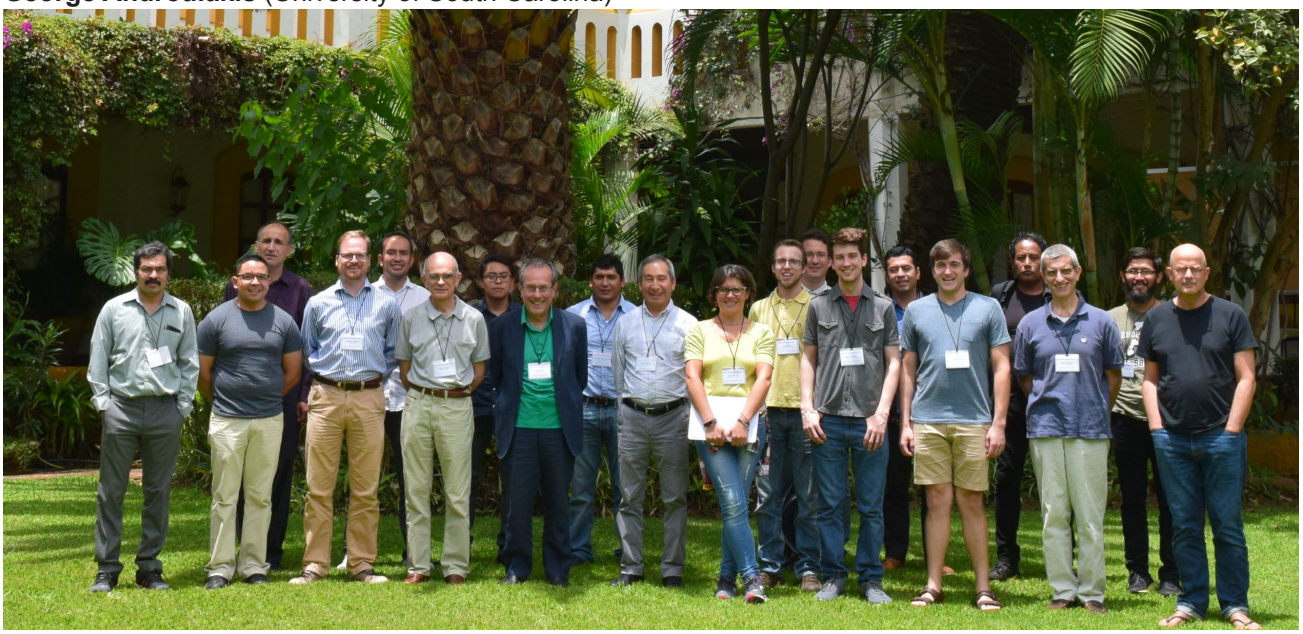
Participants:

Atserias, Albert (Universitat Politecnica de Catalunya)
Bacchus, Fahiem (University of Toronto)
Beame, Paul (University of Washington)
Beyersdorff, Olaf (University of Leeds)
Bjorner, Nikolaj (Microsoft Research)
Bonet, Maria Luisa (Universitat Politècnica de Catalunya)
Buss, Sam (University of California, San Diego)
Carboni Oliveira, Igor (University of Oxford)
de Rezende, Susanna (KTH Royal Institute of Technology)
Devriendt, Jo (KU Leuven)
Ganesh, Vijay (University of Waterloo)
Gleixner, Ambros (Zuse Institute Berlin)
Gocht, Stephan (KTH Royal Institute of Technology)
Gupta, Aarti (Princeton University)
Hadarean, Liana (Synopsys)
Heule, Marijn (University of Texas at Austin)
Janota, Mikoláš (IST/INESC-ID, U. of Lisbon)
Kauers, Manuel (Johannes Kepler University)
Knop, Alexander (UC San Diego)
Kolokolova, Antonina (Memorial University)
Kullmann, Oliver (Swansea University)
Lauria, Massimo (Università degli studi di Roma - La Sapienza)
Le Berre, Daniel (Université d'Artois)
Malik, Sharad (Princeton University)
Margulies, Susan (United States Naval Academy)
Markström, Klas (Umeå universitet)
Marques-Silva, Joao (University of Lisbon)
Martins, Ruben (Carnegie Mellon University)
Mull, Nathan (University of Chicago)
Narodytska, Nina (VMware Research)
Niemetz, Aina (Stanford University)
Nordstrom, Jakob (KTH Royal Institute of Technology)
Papakonstantinou, Periklis (Rutgers University)
Preiner, Mathias (Stanford University)
Rozier, Kristin Yvonne (Iowa State University)
Santhanam, Rahul (University of Oxford)
Seidl, Martina (Johannes Kepler University)
Simon, Laurent (LaBRI / University of Bordeaux)
Sorensson, Niklas (Mentor Graphics)
Vardi, Moshe (Rice University)
Vinyals, Marc (Tata Institute of Fundamental Research)
Wallon, Romain (Universite d'Artois)

Quantum Transport Equations and Applications
September 2 - 7, 2018

Organizers:

Roberto Quezada (Universidad Autonoma Metropolitana)
George Androulakis (University of South Carolina)
Eric Carlen (Rutgers University)
Franco Fagnola (Politecnico di Milano)



Transport equations are mathematical models describing transportation of particles, energy, momentum and many other quantities. They naturally arise in several contexts in physics, engineering and biology modeling several phenomena in various domains. Recently, around the world, much effort is going into the development of quantum technologies. Even the refinement of traditional electronic technologies is moving further and further into the quantum realm as semiconductor devices smaller and smaller numbers of electrons over smaller and smaller pathways. Against this background, and partly motivated by it, the study of quantum transport equations has undergone an active development in recent years as the mathematical framework of the theory. Because the new mathematical developments are being driven by problems arising in a wide variety of potential applications, it is especially timely to bring together researches who are leading the various different aspects of the recent advances in the field, and to develop a general perspective of the current research advances and opportunities. The main topics of the workshop included: 1) Transport equations 2) Stochastic limit type semigroups 3) Quantum kinetic equations 4) Applications to Physics, Information and Biology

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5059

Participants:

Accardi, Luigi (University of Roma Tor Vergata)
Agredo, Julian (Escuela Colombiana de Ingeniería Julio Garavito)
Androulakis, George (University of South Carolina)
Belton, Alexander (Lancaster University)
Bhat, B V Rajarama (Indian Statistical Institute)
Bolaños, Jorge (Universidad Autonoma Metropolitana-Iztapalapa Campus)
Cangas, Josue (IIMAS-UNAM)
Cruz de la Rosa, Marco Antonio (Universidad Autónoma Metropolitana)
Fagnola, Franco (Politecnico di Milano)
García, Julio Cesar (Universidad Autonoma Metropolitana)
Garduño Castañeda, Héctor Manuel (Universidad Autónoma Metropolitana)
Guerrero Poblete, Fernando (University of Rome 2)
Hernández Cervantes, Álvaro (Universidad Autonoma Metropolitana)
Koenig, Robert (TU Munich)
Olla, Stefano (Université Paris Dauphine)
Quezada, Roberto (Universidad Autonoma Metropolitana)
Regalado Hernández, Luis Daniel (UAM-Iztapalapa)
Sasso, Emanuela (University of Genova)
Stan, Aurel (Ohio State University at Marion)
Valdovinos, José Manuel (UAM-Iztapalapa)
Wiedemann, Alex (University of South Carolina)
Wright, Duncan (University of South Carolina)

Theoretical and Applied Stochastic Analysis
September 9 - 14, 2018

Organizers:

Samy Tindel (Purdue University)
Fabrice Baudoin (University of Connecticut)
Cheng Ouyang (University of Illinois at Chicago)

Probability theory is the mathematical theory concerned with the analysis of random phenomena. Many of such phenomena may be modeled by continuous time stochastic processes, which is the main concern of this conference. The first stochastic process that has been extensively studied is the celebrated Brownian motion, named in honor of the botanist Robert Brown, who observed and described in 1828 the random movement of particles suspended in a liquid or gas. Since then, stochastic processes have appeared in many different areas of sciences and economy, and their theoretical mathematical study has far reaching consequences in understanding and making predictions about the phenomena they model. The workshop brought together some of the top worldwide experts in this area and promising young researchers. Through expository talks and research presentations, the workshop will give a vibrant overview of the most recent developments and applications of stochastic analysis.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5129

Participants:

Alonso-Ruiz, Patricia (University of Connecticut)
Balan, Raluca (University of Ottawa)
Baudoin, Fabrice (University of Connecticut)
Bessaih, Hakima (University of Wyoming)
Cass, Thomas (Imperial College London)
Chen, Le (University of Nevada, Las Vegas)
Chen, Li (University of Connecticut)
Chen, Xia (University of Tennessee)
Delgado-Vences, Francisco (UNAM)
Driver, Bruce (University of California San Diego)
Feng, Qi (University of Southern California)
Geng, Xi (Carnegie Mellon University)
Hsu, Elton (Northwesthern University)
Hu, Yaozhong (University of Alberta)
Huang, Jingyu (University of Utah)
Inahama, Yuzuru (Kyushu University)
Kelleher, Daniel (University of Alberta)
Khoshnevisan, Davar (University of Utah)
Leon, Jorge A. (CINVESTAV-IPN)
Melcher, Tai (University of Virginia)
Mueller, Carl (University of Rochester)
Nourdin, Ivan (University of Luxembourg)
Nualart, David (University of Kansas)
Ouyang, Cheng (University of Illinois at Chicago)
Pérez Rojas, Mariana (Cinvestav)
Rivero Mercado, Victor Manuel (CIMAT)
Sturm, Karl-Theodor (University of Bonn)
Tindel, Samy (Purdue University)
Viens, Frederi (Michigan State University)
Wang, Jing (University of Illinois at Urbana Champaign)
Xiao, Yimin (Michigan State University)

Symmetry Breaking in Discrete Structures
September 16 - 21, 2018

Organizers:

Robert Bailey (Memorial University of Newfoundland)
Debra Boutin (Hamilton College)
Wilfried Imrich (Montanuniversität Leoben)
Thomas Tucker (Colgate University)

Can the vertices of cube colored with black and white so that no symmetry of the cube preserves the coloring? The answer is no; three colors are required. On the other hand, four are needed for the tetrahedron and only two for the dodecahedron. In general, one can ask how many colors are needed to break the symmetry of any mathematical structure. This workshop brought together graph theorists and group theorists to study symmetry-breaking in all its variations and contexts.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5050

Participants:

Alikhani, Saeid (Yazd University)
Babai, Laszlo (University of Chicago)
Bailey, Robert (Memorial University of Newfoundland)
Collins, Karen (Wesleyan University)
Conder, Marston (University of Auckland)
Ellingham, Mark (Vanderbilt University)
Godsil, Chris (University of Waterloo)
Hammack, Richard (Virginia Commonwealth University)
Harper, Scott (University of Bristol)
Hawtin, Daniel (Memorial University of Newfoundland)
Hermosillo-Reyes, Oyuki Hayde (Universidad Autónoma de Nayarit)
Hernández Rosales, Maribel (UNAM)
Hulpke, Alexander (Colorado State University)
Hüning, Svenja (Technische Universität Graz)
Imrich, Wilfried (Montanuniversität Leoben)
Kalinowski, Rafal (AGH University of Science and Technology)
Kivva, Bohdan (University of Chicago)
Lachmann, Thomas (Technische Universität Graz)
Laflamme, Claude (University of Calgary)
Lehner, Florian (University of Warwick)
López, Alitzel (UNAM Juriquilla)
Morgan, Luke (The University of Western Australia)
Morris, Joy (University of Lethbridge)
Pilsniak, Monika (AGH University of Science and Technology)
Schreiber, Hannah (Technische Universität Graz)
Shekarriz, Mohammad Hadi (Shiraz University)
Trenk, Ann (Wellesley College)
Tucker, Thomas (Colgate University)
Valdivia, Dulce (IMATE (UNAM-Juriquilla) / Universidad Autónoma de Aguascalientes)
Verret, Gabriel (University of Auckland)
Vince, Andrew (University of Florida)
Wozniak, Mariusz (AGH University of Science and Technology)
Yarza Acuña, Sergio Enrique (Universidad Autónoma de Nayarit)
Zemljič, Sara Sabrina (Comenius University in Bratislava)

Geometric and Categorical Aspects of CFTs
September 23 - 28, 2018

Organizers:

Gaetan Borot (Max Planck Institute for Mathematics)
Jorgen Ellegaard Andersen (Aarhus University)
David Ridout (University of Melbourne)
Ana Ros Camacho (Universiteit Utrecht)

This workshop aimed to be a melting pot for researchers (with such varied profiles as algebraic geometers, quantum topologists, category and representation theorists) working on geometrical and categorical approaches to conformal field theories. We focussed on 2 main areas and their numerous interactions: (1) representation theory of VOA and beyond MTCs ; (2) CohFTs and their generalizations coming from geometry via Chern character. There is an essential need for unification and diffusion of knowledge across these communities, issuing from the diversity of algebraic structures and sources of examples and motivation from geometry.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5131

Participants:

Arakawa, Tomoyuki (RIMS, Kyoto University)
Barron, Katrina (University of Notre Dame)
Belliard, Raphael (DESY Theorie)
Blanchet, Christian (Universite Paris Diderot)
Borot, Gaetan (Max Planck Institute for Mathematics)
Bouchard, Vincent (University of Alberta)
Chidambaram, Nitin Kumar (University of Alberta)
Fuchs, Jürgen (Karlstad University)
Gainutdinov, Azat (Universite de Tours)
Gannon, Terry (University of Alberta)
Geer, Nathan (Utah State University)
Giacchetto, Alessandro (Max Planck Institute for Mathematics)
Heluani, Reimundo (IMPA)
Jordan, David (University of Edinburgh)
Kanade, Shashank (University of Denver)
Kong, Liang (Southern University of Science Technology)
Krauel, Matthew (California State University, Sacramento)
Lewanski, Danilo (Max Planck Institut für Mathematik Bonn)
McRae, Robert (Vanderbilt University)
Miyamoto, Masahiko (University of Tsukuba)
Moreau, Anne (University of Lille)
Murfet, Daniel (University of Melbourne)
Orantin, Nicolas (Ecole Polytechnique Fédérale de Lausanne)
Orendain, Juan (UNAM)
Pei, Du (QGM, Aarhus University/Caltech)
Ridout, David (University of Melbourne)
Ros Camacho, Ana (Universiteit Utrecht)
Runkel, Ingo (U Hamburg)
Segovia, Carlos (UNAM)
Tener, James (Australian National University)
Vaintrob, Arkady (University of Oregon)
van Ekeren, Jethro (Universidade Federal Fluminense)
Walton, Chelsea (University of Illinois at Urbana–Champaign)
Wendland, Katrin (Albert-Ludwigs-Universität Freiburg)
Wenzl, Hans (University of California, San Diego)
Williams, Brian (Northeastern University)
Wood, Simon (Cardiff University)
Yang, Jinwei (University of Alberta)

Special Values of Automorphic L-functions and Associated p-adic L-Functions
September 30 - October 5, 2018

Organizers:

Tadashi Ochiai (Osaka University)
Khoai Hà Huy (Thang Long University)
Fabian Januszewski (Karlsruher Institut für Technologie)
Alexei Pantchichkine (Université Grenoble Alpes)
Vinayak Vatsal (University of British Columbia)

The p-adic L-function is a p-adic counterpart of Hasse-Weil L-functions for various motives or various automorphic L-functions. Thanks to Coates--Perrin-Riou and others, we have a precise conjecture which predicts the existence of p-adic L-functions for motives. However, the conjectural existence of such p-adic L-functions turns out to be related to a lot of problems of automorphic representations and automorphic L-functions. This workshop focussed on recent advances on the construction of various cyclotomic p-adic L-functions as well as various recent technical advances on automorphic theory. Putting these things together, we hope to find and fix new motivating problems on p-adic Galois representation, automorphic representation theory, arithmetic of Shimura varieties etc.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5053

Participants:

Barrera, Daniel (Universitat Politècnica de Catalunya)
Böcherer, Siegfried (University of Mannheim)
Burungale, Ashay (Caltech)
Castella, Francesc (Princeton University)
Cornut, Christophe (CNRS)
Dabrowski, Andrzej (University of Szczecin)
Darmon, Henri (McGill University)
Disegni, Daniel (Ben Gurion University of the Negev)
Eischen, Ellen (University of Oregon)
Furusawa, Masaaki (Osaka City University)
Gehrmann, Lennart (Universität Duisburg-Essen)
Greenberg, Ralph (University of Washington)
Hara, Takashi (Tokyo Denki University)
Harikumar, Guhanvenkat (Universite Laval)
Hida, Haruzo (University of California, Los Angeles)
Hsieh, Ming-Lun (Academia Sinica)
Ichino, Atsushi (Kyoto University)
Januszewski, Fabian (Karlsruher Institut für Technologie)
Kobayashi, Shinichi (Kyushu University)
Lemma, Francesco (Institut de Mathématiques de Jussieu-Paris Rive Gauche)
Liu, Zheng (McGill University)
Longo, Matteo (Università di Padova)
Morimoto, Kazuki (Kobe University)
Namikawa, Kenichi (Kyushu University)
Nicole, Marc-Hubert (Université d'Aix-Marseille-AMU)
Ochiai, Tadashi (Osaka University)
Pantchichkine, Alexei (Université Grenoble Alpes)
Pérez Buendía, Jesús Rogelio (CONACyT)
Ramdorai, Sujatha (University of British Columbia)
Rosso, Giovanni (Concordia University)
Sharifi, Romyar (University of California, Los Angeles)
Skinner, Christopher (Princeton University)
Spiess, Michael (Univ. Bielefeld)
Tilouine, Jacques (Université Paris 13)
Vatsal, Vinayak (University of British Columbia)
Williams, Chris (Imperial College London)
Xiao, Liang (University of Connecticut)
Yamana, Shunsuke (Kyoto University)
Zenteno, Adrián (Universidad Autónoma Metropolitana)
Zhou, Yiwen (University of Chicago)

Neostability Theory
October 14 - 19, 2018

Organizers:

Thomas Scanlon (University of California - Berkeley)
Alf Onshuus (Universidad de los Andes)
Anand Pillay (University of Notre Dame)
Frank Wagner (Université Claude Bernard Lyon 1)

Stability theory, in the sense of mathematical logic, consists of a collection of technical methods first developed to address the logical problem of classifying abstract models of mathematical theories. Stability theory has proven to be applicable to other mathematical problems such as understanding rational solutions of algebraic equations. It has recently been shown that the techniques and methods used for the classification described above can be used in much more general settings with applications to other areas of mathematics such as algebraic geometry, additive combinatorics and extremal graph theory. Researchers at this meeting studied these developments to deepen these applications, and to extend the scope of stability theory to an even wider range of mathematical theories.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5193

Participants:

Anscombe, Sylvy (University of Central Lancashire)
Baldwin, John (University of Illinois at Chicago)
Ben Yaacov, Itaï (Université Lyon 1)
Casanovas, Enrique (Universitat de Barcelona)
Chase, Hunter (University of Illinois at Chicago)
Chatzidakis, Zo'e (Ecole Normal Superieure)
Chernikov, Artem (University of California, Los Angeles)
Conant, Gabriel (University of Notre Dame)
d'Elbee, Christian (Ecole Normale Superieure)
Dobrowolski, Jan (University of Leeds)
Ealy, Clifton (Western Illinois University)
Garcia, Dario (University of Leeds)
Guido, Carlos Alfonso (Oxford University)
Hasson, Assaf (Ben Gurion University of the Negev)
Hempel, Nadja (University of California, Los Angeles)
Jimenez, Leo (University of Notre Dame)
Kaplan, Itay (Hebrew University of Jerusalem)
Kestner, Charlotte (Imperial College of London)
Kim, Byunghan (Yonsei University)
Kruckman, Alex (Indiana University)
Krupinski, Krzysztof (Uniwersytet Wroclawski)
Laskowski, Chris (University of Maryland)
Loesch, Michael (University of Freiburg)
MacPherson, Dugald (University of Leeds)
Moconja, Slavko (University of Wroclaw)
Montenegro, Samaria (Universidad de Costa Rica)
Mueller, Isabel (Hebrew University)
Newelski, Ludomir (Uniwersytet Wroclawski)
Onshuus, Alf (Universidad de los Andes)
Peterzil, Kobi (University of Haifa)
Pillay, Anand (University of Notre Dame)
Ramsey, Nick (University of California at Berkeley)
Rideau, Silvain (CNRS, Paris 7 Diderot)
Rzepecki, Tomasz (Uniwersytet Wroclawski)
Scow, Lynn (California State University, San Bernardino)
Simon, Pierre (University of California at Berkeley)
Starchenko, Sergei (University of Notre Dame)
Steinhorn, Charles (Vassar College)
Vicaria, Mariana (University of California at Berkeley)
Wagner, Frank (Université Claude Bernard Lyon 1)
Zou, Tingxiang (Universite Lyon I)

Lipschitz Geometry of Singularities
October 21 - 26, 2018

Organizers:

Anne Pichon (Aix Marseille University)
Walter Neumann (Columbia University)
Jawad Snoussi (Universidad Nacional Autonoma de México)

"Singularities" are points in a geometric region which are different from most nearby points in the region. They are points of particular interest, arising in many areas of science such as biology, chemistry, physics and social science. They also lead to applications in technological domains, for example in robotics, control theory, optic, medical imaging, etc. Their study uses many mathematical tools. One of these tools is what is called "bi-Lipschitz geometry", which permits alteration of a geometric object by applying limited local stretching and shrinking. For example, a bi-Lipschitz change to the geometry of a knife preserves the sharpness of the knife, but may turn a dinner knife into a butter knife. Applying bi-Lipschitz geometry to singularities retains their basic structure while making them much easier to classify and therefore easier to work with. Despite this, it is only fairly recently that bi-Lipschitz geometry has been applied much in singularity theory, but its use has grown rapidly in the last decade as an increasing number of researchers are starting to work with it. It is a powerful tool for a variety of mathematical problems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5011

Participants:

Araújo dos Santos, Raimundo Nonato (Universidade de São Paulo)
Aroca, Fuensanta (UNAM)
Birbrair, Lev (Universidad do Ceara)
Curmi, Octave (Université Lille 1)
Da Silva, Otoniel Nogueira (UNAM)
Dutertre, Nicolas (Angers University)
Fantini, Lorenzo (Aix-Marseille Université)
Fernandes, Alexandre (Universidade Federal do Ceara)
Fernandez de Bobadilla, Javier (Basque Center for Applied Mathematics)
Gabrielov, Andrei (Purdue University)
Gaffney, Terence (Northeastern University)
Giles Flores, Arturo Enrique (Universidad Autónoma de Aguascalientes)
Gomez-Mont, Xavier (CIMAT)
Gonzalez Villa, Manuel (CIMAT)
Grandjean, Vincent (Universidad Fedreral do Ceara)
Kerner, Dmitry (Ben Gurion University)
Lê, Dung Trang (Aix Marseille University)
Leyton, Maximiliano (Universidad de Talca)
López de Medrano, Santiago (UNAM)
Ludwig, Ursula (Universität Duisburg Essen)
Maugendre, Hélène (Université Grenoble Alpes)
Mendes Pereira, Rodrigo (UNILAB-Ceará)
Michalska, Maria (ICMC-USP/University of Lodz)
Misev, Filip (Max-Planck-Institut für Mathematik)
Neumann, Walter (Columbia University)
Nguyen, Nhan (ICMC-USP)
Parusinski, Adam (Nice-Sophia Antipolis University)
Pedersen, Helge Møller (Universidade Federal Do Ceará - Fortaleza)
Pichon, Anne (Aix Marseille University)
Popescu-Pampu, Patrick (Lille University)
Portilla, Pablo (UNAM)
Seade Kuri, José Antonio (UNAM)
Sigurdsson, Baldur (Basque Center for Applied Mathematics)
Snoussi, Jawad (UNAM)
Trivedi, Saurabh (ICMC-USP)
Trotman, David (Aix Marseille University)
Viu-Sos, Juan (ICMC-USP)
Wilson, Leslie (University of Hawaii)

Stability Conditions and Representation Theory of Finite-Dimensional Algebras
October 28 - November 2, 2018

Organizers:

Thomas Brüstle (Bishop's University and Université de Sherbrooke)
José Antonio de la Peña (UNAM)
David Pauksztello (Lancaster University)
David Ploog (Universität Hannover)

The workshop takes its offspring in the area of stability spaces with a focus on the wall and chamber structure and mutations. The joint efforts of a group of internationally leading experts from many different areas of mathematics yielded new insight in the difficult nature of their object of study.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5178

Participants:

Allegretti, Dylan (University of Sheffield)
Amiot, Claire (Institut Fourier)
Argudín, Alejandro (UNAM)
Barbieri, Anna (University of Sheffield)
Bocklandt, RRJ (University of Amsterdam)
Bossinger, Lara (University of Cologne)
Broomhead, Nathan (University of Plymouth)
Brüstle, Thomas (Bishop's University and Université de Sherbrooke)
Castillo, Alberto (UNAM)
Coelho Simoes, Raquel (University of Lisbon)
de la Peña, José Antonio (UNAM)
Derksen, Harm (University of Michigan)
Faber, Eleonore (University of Leeds)
Garver, Alexander (Université du Québec à Montréal)
Geiss, Christof (UNAM)
Gratz, Sira (University of Glasgow)
Hassoun, Souheila (Sherbrooke University)
Hille, Lutz (University Münster)
Huerta Pérez, Mindy (UNAM)
Iyama, Osamu (Nagoya University)
Joergensen, Peter (Newcastle University)
King, Alastair (University of Bath)
Labardini-Fragoso, Daniel (UNAM)
LaBelle, Patrick (Bishop's University)
Langford, Denis (Sherbrooke University)
Lekili, Yanki (King's College London)
Mase, Makiko (Tokyo Metropolitan University)
Meinhardt, Sven (University of Sheffield)
Mou, Lang (UC Davis)
Nájera Chávez, Alfredo (UNAM)
Pauksztello, David (Lancaster University)
Pressland, Matthew (Universität Stuttgart)
Schroer, Jan (University of Bonn)
Schroll, Sibylle (University of Leicester)
Stellari, Paolo (University of Milan)
Sutherland, Tom (University of Mainz)
Thomas, Hugh (Université du Québec à Montréal)
Treffinger, Hipolito (University of Leicester)
Valdivieso Diaz, Yadira (Universidad Anahuac)
Velasco Martínez, Diego (UNAM)
Weyman, Jerzy (University of Connecticut)
Zvonareva, Alexandra (Universität Stuttgart)

Statistical and Computational Challenges in High-Throughput Genomics with Application to Precision Medicine
November 4 - 9, 2018

Organizers:

Adam Olshen (University of California, San Francisco)
Benilton Carvalho (State University Campinas)
Gabriela Cohen-Freue (UBC)
Julio Collado-Vides (UNAM)
Ronglai Shen (Memorial Sloan-Kettering Cancer Center)

High-throughput genomic experiments are a key component of precision medicine. Such experiments are expensive and time consuming. Effort and resources are wasted by poor experimental design, inadequate pre-processing to adjust for technological artifacts, and sub-optimal analytical strategies. Addressing these problems is fundamental to realizing the promise of precision medicine. The primary objective of this workshop was to bring together Biomathematicians, Biostatisticians and Computational Biologists to discuss analytic challenges in high-throughput genomic data in the context of precision medicine.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5202

Participants:

Altamirano, Ana Beatriz (UNAM)
Avila, Maria (UNAM)
Baghela, Arjun (UBC)
Barbosa-Morais, Nuno Luis (Instituto de Medicina Molecular João Lobo Antunes)
Bonneau, Richard (New York University & Simons Foundation)
Carvalho, Benilton (State University Campinas)
Chikina, Maria (University of Pittsburgh)
Cohen-Freue, Gabriela (UBC)
Hansen, Kasper (Johns Hopkins University)
Hernández Rosales, Maribel (UNAM)
Hoadley, Katherine (University of North Carolina)
Huff, Chad (MD Anderson Cancer Center)
Kammers, Kai (Johns Hopkins University)
Keles, Sunduz (UW Madison)
Kimes, Patrick (Dana-Farber Cancer Institute)
Long, Qi (University of Pennsylvania)
Lyalina, Svetlana (Genentech Inc.)
McDavid, Andrew (University of Rochester)
Medina Rivera, Alejandra Eugenia (UNAM)
Molinaro, Annette (University of California San Francisco)
Mostavafi, Sara (University of British Columbia)
Nishimura, Aki (UCLA)
Olshen, Adam (University of California, San Francisco)
Patrick, Ellis (The University of Sydney)
Quon, Gerald (University of California, Davis)
Ritchie, Matt (The Walter and Eliza Hall Institute of Medical Research)
Ruczinski, Ingo (Johns Hopkins Bloomberg School of Public Health)
Scharpf, Rob (Johns Hopkins University)
Scheet, Paul (MD Anderson Cancer Center)
Segal, Mark (UCSF)
Seshan, Venkatraman (Memorial Sloan Kettering Cancer Center)
Shah, Sohrab (Memorial Sloan Kettering Cancer Center)
Shen, Ronglai (Memorial Sloan-Kettering Cancer Center)
Siegmund, Kimberly (University of Southern California)
Sohail, Mashaal (LANGEBIO, Cinvestav)
Street, Kelly (UC Berkeley)
Wang, Pei (Icahn School of Medicine at Mount Sinai)
Weaver, Garrett (University of Southern California)
Yang, Jean (University of Sydney)

Computational Statistics and Molecular Simulation: A Practical Cross-Fertilization November 11 - 16, 2018

Organizers:

Gabriel Stoltz (Ecole des Ponts)
Luke Bornn (Simon Fraser University)
Christian Robert (Paris Dauphine University)

The increasing computational power at our disposal allows us to simulate many aspects of life -- ranging from the intimate properties of matter to handling data bases such as those of daily web search patterns or online customer browsing habits. The workshop brought together a mixed audience of statisticians who are using and developing computational methods, researchers involved in computational statistical mechanics and its applications (e.g., materials science, biophysics), and applied mathematicians studying numerical methods used in the field of application from a mathematical viewpoint. The workshop built a pragmatic cross-fertilization between fields through the exchange of ideas and methods such as research lectures, discussions, and practical sessions based on benchmark systems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5023

Participants:

Agazzi, Andrea (Duke University)
Andrieu, Christophe (University of Bristol)
Barahona, Igor (UNAM)
Bitto-Nemling, Angela (WU Vienna University of Economics and Business)
Chen, Yang (University of Michigan)
Durmus, Alain (ENS Cachan)
Fass, Josh (Memorial Sloan Kettering Cancer Center)
Fort, Gersende (Institut de Mathématiques de Toulouse)
Hartmann, Carsten (BTU Cottbus-Senftenberg)
Heng, Jeremy (Harvard University)
Holmes-Certon, Miranda (New York University)
Iacobucci, Alessandra (Universite Paris Dauphine)
Lelievre, Tony (Ecole des Ponts)
Lu, Jianfeng (Duke University)
Maire, Florian (Universite de Montreal)
Martin, Gael (Monash University)
Martinsson, Anton (Univ. Edinburgh)
Mattingly, Jonathan (Duke University)
Mengersen, Kerrie (Queensland University of Technology)
Moores, Matt (University of Wollongong)
Pereyra, Marcelo (Heriot Watt University)
Pollock, Murray (University of Warwick)
Power, Samuel (University of Cambridge)
Rey-Bellet, Luc (University of Massachussetts)
Robert, Christian (Paris Dauphine University)
Roberts, Gareth 0. (University of Warwick)
Sanders, David P. (UNAM)
Sanz-Serna, Jesús María (Universidad Carlos III de Madrid)
Stoltz, Gabriel (Ecole des Ponts)
Vanden-Eijnden, Eric (Courant Institute)
Voter, Arthur (Los Alamos National Laboratory)
Weare, Jonathan (New York University)

Mathematical Challenges in the Analysis of Continuum Models for Cancer Growth, Evolution and Therapy
November 25 - 30, 2018

Organizers:

Jean Clairambault (INRIA)
Tomás Alarcón (Centre de Recerca Matemàtica - Bellaterra)
Thomas Hillen (University of Alberta)

The idea of cancer as an evolutionary disease, not only due to genetic mutations, but also, and maybe mainly, due to adaptations to a radical changing tissue environment, may be taken into account by models of 'adaptive dynamics' that are amenable to theoretically optimised therapeutic strategies, intended to be ultimately transferred to the clinic. Among the viewpoints on cancer that can change its future and transform it to a chronic disease by designing new types of models directed towards rationally combined treatments are those of epigenetics (modifications of gene expression without mutations), and of the so-called 'atavistic theory of cancer', that considers cancer as a reversal of evolution from normal multicellularity in our organisms towards elementary, localised and selfish forms of cellular cooperation. These viewpoints were debated in the workshop, with the aim to propose new theoretical models of cancer and new practical ways to circumvent it.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2018/5-day-workshops/18w5115

Participants:

Adimy, Mostafa (INRIA Lyon)
Alarcón, Tomás (Centre de Recerca Matemàtica - Bellaterra)
Ayala, Luis Enrique (Universidad de Castilla-La Mancha)
Badoual, Mathilde (Paris Diderot University)
Ballesta, Annabelle (University of Warwick)
Bearon, Rachel (University of Liverpool)
Benzekry, Sebastien (Inria)
Brigandt, Ingo (University of Alberta)
Buttenschoen, Andreas (UBC)
Calvo, Juan (Universidad de Granada)
Camacho Gutierrez, Jose Ariel (CIMAT)
Chimal Eguia, Juan Carlos (Centro de Investigación en Computacion del IPN)
Clairambault, Jean (Institut National de Recherche en Informatique et en Automatique)
Curtius, Kit (Barts Cancer Institute)
Doron, Levy (University of Maryland)
Hall, Meghan (University of Alberta)
Hillen, Thomas (University of Alberta)
Lepoutre, Thomas (Inria Lyon)
Martínez González, Alicia (Universidad de Castilla-La Mancha)
Morales Bárcenas, José Héctor (UAM Mexico)
Plaza, Ramon (UNAM)
Ramírez Santiago, Guillermo (UNAM)
Resendiz, Alba Margarita (University of Alberta)
Rhodes, Adam (University of Alberta)
Rutter, Erica (North Carolina State University)
Sfakianakis, Nikolaos (Universität Heidelberg)
Shen, Shensi (Institut Gustave Roussy Villejuif)
Stéphanou, Angélique (CNRS Grenoble)

Casa Matemática Oaxaca (CMO) is an International research facility affiliated with the Banff International Research Station (BIRS) of Canada. CMO will host scientific activities and gather mathematicians from around the world in an environment that will promote innovative ideas in the mathematics field. CMO will also support activities to promote local development through research and teaching of mathematics.

Contact Us:

CMO-BIRS Director:
Dr. José Antonio Seade Kuri
Phone: +52 (951) 520 1682
Phone: +52 (55) 5622 4523
Email: jseade@im.unam.mx

CMO-BIRS Coordinator:
Claudia Arias Cao Romero
Phone: +52 (951) 520 1682
Email: cmo-birs@im.unam.mx

CMO-BIRS IT:
Miguel Ricardo Altamirano Ibarra
Phone: +52 (951) 231 0100
Email: maltamirano@im.unam.mx

CMO Mailing Address:
CMO OFFICE
Calle Hidalgo #21 Col. San Felipe del Agua
C.P. 68020
Oaxaca, Oax.
Mexico

Web: http://www.birs.ca/cmo
Twitter: @CMO_oaxaca

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. Nassif Ghoussoub
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

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

Program Assistant: Dominique Vaz
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: Jacob Posacki
Phone: 403-763-6996 Fax: 403-763-6990
Email: birs-facilitator@birs.ca

Technology Manager: Brent Kearney
Phone: 403-763-6997 Fax: 403-763-6990
Email: brentk@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