VIth AMMCS 2023
INTERNATIONAL CONFERENCE

AUGUST 14–18
WATERLOO, ONTARIO, CANADA

Mathematics and Computation in Biological Sciences and
Partial Differential and Integral Equations in Mathema
Applications of Dynamical Systems and Differential Equations
Computational Physics and Chemistry
Computational Algebra, Combinatorics and Optimization
Mathematical Models in Social Sciences
Computational Mechanics and Engineering
Financial Mathematics and Computation
Statistical Modelling
Mathematical Modelling in Environmental Sciences
Mathematics and Computation in Biological Sciences and Medicine
Partial Differential and Integral Equations in Mathematical Modeling
Applications of Dynamical Systems and Differential Equations

CONFERENCE PROGRAM

Program Chair
Herb Kunze

Interdisciplinary AMMCS Conference Series

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1. Acknowledgments

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2. Welcome

Welcome to the VIth AMMCS International Conference

On behalf of the Organizing, Scientific, and Technical Committees of the 2023 AMMCS International Conference, it is our pleasure to welcome you to this exciting event to be held from August 14 through 18, 2023 on the Waterloo Campus of Wilfrid Laurier University.

AMMCS-2023 is an international and interdisciplinary conference, the sixth in the series of AMMCS meetings held in Waterloo, Ontario, Canada. Since the first AMMCS meeting in 2011, the AMMCS Conference Series has aimed to promote interdisciplinary research and collaboration involving mathematical, statistical, and computational sciences within the larger international community, and to highlight recent advances in Applied Mathematics, Modeling and Computational Science.

This year the AMMCS Conference has an ambitious scientific program featuring

- 10 one-hour plenary presentations by distinguished mathematicians and scientists,
- about 30 special and contributed sessions in up to 6 parallel tracks,
- 4 semi-plenary and award speakers.

At the end of the Conference, there will be a special presentation of student prizes and young researcher awards, including the AMMCS Kolmogorov-Wiener Prize for Young Researchers.

Starting on Monday 14 August, the morning and afternoon scientific programs will open with a plenary given by one of our distinguished plenary speakers. The AMMCS-2023 scientific program has been designed to provide a unique opportunity for in-depth technical discussions and exchange of ideas in applied mathematics, statistical science, computational science, and mathematical modeling, including their applications in natural and social sciences, engineering and technology, industry, finance, economics, and management. We are proud that our Conference follows the AMMCS tradition of promoting interdisciplinary research.

The Conference venue is the Waterloo campus of Wilfrid Laurier University, the oldest university in the Cambridge-Kitchener-Waterloo-Guelph area. This beautiful part of Southwestern Ontario is a comfortable drive from some of North America's major tourist destinations, including the Niagara Escarpment (a UNESCO World Biosphere Reserve), Toronto and Niagara Falls.

On behalf of the Organizing, Scientific, and Technical Committees, we thank everyone involved in the organization of this event. In particular, we express our sincere thanks to all of the organizers of Special Sessions, to all the authors who submitted their work and provided the valuable results that form the basis of the Conference, and to all of our sponsors. Thank you for helping to make AMMCS-2023 a dynamic, enjoyable, and professionally fulfilling event. We hope that every attendee will have an opportunity to enjoy this beautiful part of the world. And we hope that AMMCS-2023 will be an intellectually inspiring and socially satisfying experience that you will take home with you.

Marc Kilgour, Roderick Melnik, and Sunny Wang, General Chairs
The VIth AMMCS International Conference

3. Registration

The AMMCS Conference registration desk is located in Lazaridis Hall, Sunday through Friday. It will be staffed at the following times:

Day	Time	Location
Sunday, August 13	16:00-18:00 19:00-21:00	Lazaridis Hall Atrium
Monday, August 14	7:30-11:30 13:30-15:30	Lazaridis Hall Atrium
Tuesday, August 15	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Wednesday, August 16	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Thursday, August 17	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Friday, August 18	8:00-11:00	Lazaridis Hall Atrium

4. Information

Hyperlinks	Other than in this remark, • blue text signifies hyperlinks within this document • magenta text signifies external hyperlinks	
Parking	Conference delegates have the following parking options.	
	Permit parking is available in lot 37 at Northdale Campus (Monday to Friday).	Conference delegates registered by August 8 will receive an email from Laurier Parking Services regarding purchasing an online permit.
For more details on Visitor Parking Options, please visit the WLU Website and/or the parking map	**Pay & Display parking** is available, seven days a week, in Lots 4, 20, & 33. Please refer to a campus map for these locations.	Pay & Display can be accessed for \$3/hour or a \$12/day flat rate (from 7:00-23:00). The machine accepts Visa, Mastercard, and debit.
	There is **street parking** available as per signage indicated.	Please be advised that this parking is monitored by the City of Waterloo and there is a three-hour maximum.
Public Transit	Wilfrid Laurier University is serviced by routes 7, 8, 12, 29, 200, and 201 on University Ave. West and King St. North.	Route information is available at • the registration desk • www.grt.ca.
	The ION light train (Route 301) stops at the nearby Laurier–Waterloo Park Station.	If you interested in trying the train or exploring Kitchener-Waterloo, see the ION light train system map.
Wireless Network	Conference delegates have free wireless internet service on the Wilfrid Laurier University campus.	For connection information and to obtain a password • please go to the registration desk.

5. Events

(Campus Maps)

Day	Time	Event	Location	Details
Sunday August 13	19:00-21:00	Welcoming Reception	Lazaridis Hall Atrium	An informal social get-together, with food and drinks served. A conference registration table will be open.
Tuesday August 15	13:00-13:30	Maplesoft Session	LH1001	See next page.
Wednesday August 16	9:30-10:00 14:30-15:00	Conference Poster Session & Informal Networking	Lazaridis Hall atrium	Poster sessions over Wednesday's coffee breaks
Thursday August 17	12:00-12:30	Conference Photo Shoot	Lazaridis Hall Atrium	Meet in Lazaridis Hall atrium the Conference photo shoot
Thursday August 17	18:30-22:00	Conference Banquet Dinner	The Delta Hotel 110 Erb Street West (Directions)	Banquet tickets will be part of your registration package if you purchased them in advance. Tickets will also be available for purchase from the conference treasurer (ammcs2023treasurer@gmail.com). Parking at the hotel is complimentary. Reception starts at 18:30, and the dinner starts at 19:00.
Friday August 18	16:30-17:00	Conference Prizes, Closing	LH1009	Announcement and awarding of the Conference Prizes, and the closing of the Conference.

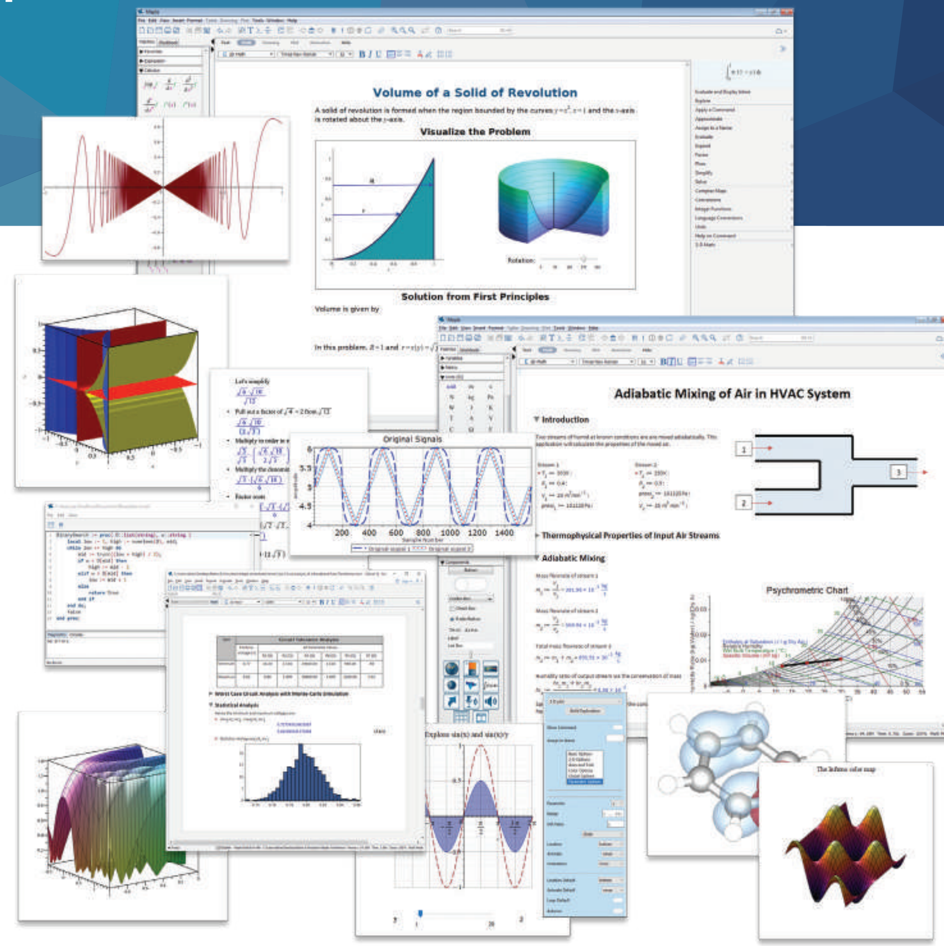
JOIN OUR PRESENTATION

Maple for Mathematics, Computation and Modelling

Tuesday, August 15 | 1:00 - 1:30pm

Location: Lazaridis Hall, LH1001

with Paulina Chin, Senior Architect, Maplesoft



In the past four decades, Maple has evolved from a symbolic computation engine to a fully featured mathematics software package that includes natural math notation for input and output and easy-to-use tools for creating interactive documents. Maple is well known for its vast library of commands for mathematical computations and its specialized packages for scientific, engineering and other applications, including ones for differential equations, dynamic systems, optimization, statistics and finance. Additionally, Maple has a multi-paradigm programming language and tools allowing connectivity to other products. In this talk, Maplesoft staff will provide a brief overview of Maple, focussing on the features that can serve your computational and modelling needs.

Can't make the session?
Visit **www.maplesoft.com/maple**
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6. Conference Student Prizes and Young Researcher Award

The Conference Prizes will be announced and awarded at the closing of the Conference on Friday, August 18, 17:00-17:30, in LH1009.

There are four student prizes, open to undergraduate and graduate students, described in the following table.

AMMCS 2023 Prize	Description: To be eligible,
Best Poster	the student must be a co-author of the work presented and a designer of the poster. This competition will include a 10-minute discussion related to the content of the poster with a judging panel.
Best Student Paper in a Special Session (SS)	the student must be a co-author of the work and present it during a special session or minisymposium.
Best Student Paper in a Contributed Session (CS)	the student must be a co-author of the work and present it during a contributed session.

One additional award is open to young researchers, meaning recent Ph.D. graduates and postdoctoral fellows under the age of 35.

AMMCS 2023 Award	Description: To be eligible,
Kolmogorov-Wiener Prize for Young Researchers	the young researchers must a. have earned their PhD degrees within 5 years of January 1 of the year of the award; b. have at least two peer refereed publications, minimum one of which has appeared in an internationally recognized journal; c. have presented their talks at an AMMCS event in the year of the award.

7. Conference Plenary Lectures

Monday, August 14, 9:00-10:00, in Room LH1001

Tuomas Sandholm, Carnegie Mellon University

About the speaker: Tuomas Sandholm is Angel Jordan University Professor of Computer Science at Carnegie Mellon University and a serial entrepreneur. His research focuses on the convergence of artificial intelligence, economics, and operations research. He is Co-Director of CMU AI, and Founder and Director of the Electronic Marketplaces Laboratory. In parallel with his academic career, he was Founder, Chairman, first CEO, and CTO/Chief Scientist of CombineNet, Inc. from 1997 until its acquisition in 2010. During this period the company commercialized over 800 of the world's largest-scale generalized combinatorial multi-attribute auctions, with over$60 billion in total spend and over $6 billion in generated savings. Since 2010, his algorithms have been running the national kidney exchange for the United Network for Organ Sharing, where they autonomously make the kidney exchange transplant plan for 80% of U.S. transplant centers together each week. He also co-invented never-ending altruist-donor-initiated chains and his algorithms created the first such chain. Such chains have become the main modality of kidney exchange worldwide and have led to around 10,000 life-saving transplants. He invented liver lobe and multi-organ exchanges, and the first liver-kidney swap took place in 2019. Sandholm has developed the leading algorithms for several general classes of game. The team that he leads is the multi-time world champion in computer heads-up no-limit Texas hold'em, which is the main benchmark and decades-open challenge problem for testing application-independent algorithms for solving imperfect-information games. Their AI Libratus became the first and only AI to beat top humans at that game. Then their AI Pluribus became the first and only AI to beat top humans at the multi-player game. That is the first superhuman milestone in any game beyond two-player zero-sum games. He is Founder and CEO of Strategic Machine, Inc., which provides solutions for strategic reasoning under imperfect information in a broad set of applications ranging from poker to other recreational games to business strategy, negotiation, strategic pricing, finance, cybersecurity, physical security, auctions, political campaigns, and medical treatment planning. He is also Founder and CEO of Strategy Robot, Inc., which focuses on defense applications. He is also Founder and CEO of Optimized Markets, Inc., which is bringing a new optimization-powered paradigm to advertising campaign sales, pricing, and scheduling. He holds a Ph.D. and M.S. in computer science and a Dipl. Eng. (M.S. with B.S. included) with distinction in Industrial Engineering and Management Science. Among his many honors are the AAAI Award for AI for the Benefit of Humanity, Minsky Medal, IJCAI McCarthy Award, AAAI/IAAI Engelmore Award, IJCAI Computers and Thought Award, inaugural ACM Autonomous Agents Research Award, CMU's Allen Newell Award for Research Excellence, Sloan Fellowship, NSF Career Award, Carnegie Science Center Award for Excellence, and Edelman Laureateship. He is Fellow of the ACM, AAAI, INFORMS, and AAAS. He holds an honorary doctorate from the University of Zurich.

The State of Representing and Solving Games

Game-theoretic solution concepts provide meticulous definitions of how rational parties should act. That has enabled humans to think rigorously about strategic interactions, leading to game theory revolutionizing many fields such as economics, political science, and biology. So far, game theory has mainly been used for reasoning by humans. The models have therefore been quite stylized and coarse: small enough for humans to solve in their heads or by paper and pen. The goal has been to draw insights from such models, which humans then judiciously apply to the drastically more complicated real world. The boundaries of game theory have thus been defined by the limits of humans. However, many - arguably most - important game classes lie beyond those boundaries. There is now another, more nascent, use of game theory that goes beyond human intelligence. The game is computationally solved in its full detail - or else in a large, faithful abstraction thereof - as opposed to solving a small, stylized version to obtain insights for humans. Novel approaches, game representations, and algorithms from the last 18 years have enabled game theory to advance significantly beyond its traditional boundaries. I will discuss that state of the art. The talk is based on my presentation at the December 2021 Nobel Symposium: 100 Years of Game Theory, and also includes brand new results.

Conference Plenary Lectures

Monday, August 14, 14:00-15:00, in Room LH1001

Hervé Moulin, University of Glasgow

About the speaker: Hervé Moulin graduated in 1971 from the Ecole Normale Superieure and received his Ph.D. in mathematics in 1975 at the university of Paris. After teaching at the University Paris-Dauphine, and the Virginia Polytechnic Institute, Duke and Rice universities in the US, he is currently the D.J. Robertson Chair in Economics at the University of Glasgow. A Fellow of the Econometric Society since 1983, of the Royal Society of Edinburgh since 2015, and of the British Academy since 2018, he is a past President of the Game Theory Society and of the Social Choice and Welfare Society. He is currently the Editor in Chief of Games and Economic Behaviour. His work has contributed to redefining the field of "normative economics", by borrowing concepts and techniques from social choice, game theory and mechanism design. The goal is to invent new mechanisms –or justify existing ones– in a variety of resource allocation problems. His textbook, Fair Division and Collective Welfare (MIT Press 2003), explains in simple terms the broad contributions of microeconomic analysis to fair division problems.

Ex Ante Fairness and Worst Case Analysis

Initiated by mathematicians in the 1940s, the formal analysis of fair division promptly attracted the interest of economists: what is a just allocation of scarce resources between agents with different needs and tastes?; political scientists: how to distribute fairly the collective decision power between the citizens?; and more recently computer scientists: which tests of fairness are computationally tractable when they involve a very large number of participants, e. g., on the internet?. A compelling message emerges from eight decades of mathematical and empirical research: mechanisms distributing valuable resources (be they commodities, decision power or computing resources) should always be evaluated from two complementary viewpoints on fairness: Ex Ante and Ex Post. If I can compare the way the mechanism treats me personally versus other participants, Ex Post fairness makes sure that I have no grounds to complain, no convincing objection questioning the legitimacy of the proposed solution. But ex ante, before the mechanism is implemented, I may have little or no prior knowledge of the other participants who will compete with me for these resources: what are the preferences guiding their choices, or is their behaviour dictated by other principles, is it strategically sophisticated or crudely myopic, or even adversarial to me? Then I must pay close attention to the worst case scenario where everything about them turns against me. A key parameter is how much protection the mechanism offers me in the gedankenexperiment of the worst case: my guarantee is my worst case welfare, the higher it is, the lower the risk that the other agents manhandle me, the safer it is to participate in - and abide by the outcome selected by - the mechanism. The seminal discussion of cake-cutting by the mathematicians Hugo Steinhaus and Harold Kuhn is about a canonical guarantee: how to divide a non atomic cake between agents with additive utilities in such a way that each participant can make sure to eat a share worth at least 1/n-th of the total cake to her (n is the number of participants). Later instances of guarantees underpin the fair division problem in the Arrow Debreu microeconomic model, cost and surplus sharing in the cooperative game model, and more recently the allocation of indivisible goods or bads. We discuss ex ante fairness first in the general collective decision problem variously interpreted as voting, bargaining or social choice. Guarantees there come from the veto rights allocated to individual as well as groups of agents: the proportional veto core gives more voice to minorities than the voting rules a la Condorcet or even Borda, in so doing it eliminates the "tyranny of the majority". The mathematical model of guarantees is more interesting but much harder to crack when we allow compromises by convex combinations of the final outcomes, interpreted as lotteries, time shares, or the division of a fixed budget. Veto rights still generate guarantees but so does the random dictator rule: everyone gets a 1/n chance of selecting his/her best outcome. Vetoes and random dictatorship can be combined in many ways and are, in a precise sense, dual of one another. The veto guarantee is natural when we choose an expensive and long lasting infrastructure project or a person to hold a position for life; the random dictator approach makes more sense if we are dividing time between substitutable activities, or choosing a pair of roman consuls. The last part of the talk turns to the fair division of a single homogenous private commodity when preferences are not necessarily monotonic: say when coworkers share a workload or investors distribute shares in a project. In this simple model the versatile concept of ex ante guarantee suggests new ways to organize the division, and also opens challenging new mathematical questions.

Conference Plenary Lectures

Tuesday, August 15, 8:30-9:30, in Room LH1001

René Vidal, University of Pennsylvania

About the speaker: René Vidal is the Rachleff Penn Integrates Knowledge University Professor in the Departments of Electrical and Systems Engineering and Radiology and the inaugural Director of the Institute for Data Engineering and Science (IDEAS) at University of Pennsylvania. He is also an Amazon Scholar, a Chief Scientist at NORCE, Associate Editor in Chief of TPAMI and the director of the NSF-Simons Collaboration on the Mathematical Foundations of Deep Learning and the NSF TRIPODS Institute on the Foundations of Graph and Deep Learning. His current research focuses on the foundations of deep learning and its applications in computer vision and biomedical data science. He is an ACM Fellow, AIMBE Fellow, IEEE Fellow, IAPR Fellow and Sloan Fellow, and has received numerous awards for his work, including the IEEE Edward J. McCluskey Technical Achievement Award, D'Alembert Faculty Award, J.K. Aggarwal Prize, ONR Young Investigator Award, NSF CAREER Award as well as best paper awards in machine learning, computer vision, controls, and medical robotics.

Explainable AI via Semantic Information Pursuit

There is a significant interest in developing ML algorithms whose final predictions can be explained in terms understandable to a human. Providing such an "explanation" of the reasoning process in domain-specific terms can be crucial for the adoption of ML algorithms in risk-sensitive domains such as healthcare. This has motivated a number of approaches that seek to provide explanations for existing ML algorithms in a post-hoc manner. However, many of these approaches have been widely criticized for a variety of reasons and no clear methodology exists in the field for developing ML algorithms whose predictions are readily understandable by humans. To address this challenge, we develop a method for constructing high performance ML algorithms which are "explainable by design". Namely, our method makes its prediction by asking a sequence of domain- and task-specific yes/no queries about the data (akin to the game "20 questions"), each having a clear interpretation to the end-user. We then minimize the expected number of queries needed for accurate prediction on any given input. This allows for human interpretable understanding of the prediction process by construction, as the questions which form the basis for the prediction are specified by the user as interpretable concepts about the data. Experiments on vision and NLP tasks demonstrate the efficacy of our approach and its superiority over post-hoc explanations. Joint work with Aditya Chattopadhyay, Stewart Slocum, Benjamin Haeffele and Donald Geman.

Conference Plenary Lectures

Tuesday, August 15, 13:30-14:30, in Room LH1001

Yacine Ait-Sahalia, Princeton University

About the speaker: Yacine Ait-Sahalia is the Otto A. Hack 1903 Professor of Finance and Economics at Princeton University where he served as the inaugural Director of the Bendheim Center for Finance from 1998 until 2014. He was previously an Assistant Professor (1993-96), Associate Professor (1996-98) and Professor of Finance (1998) at the University of Chicago's Graduate School of Business, where he received the Emory Williams Award for Excellence in Teaching in 1995. His research contributions in financial econometrics include various methods to estimate and test continuous-time models that are sampled at discrete time intervals, including nonparametric methods, closed-form expansions for the transition density of continuous-time models and various methods to analyze high frequency data with a particular emphasis on the presence of jumps. He recently authored High Frequency Financial Econometrics with Jean Jacod, served as the editor of the Review of Financial Studies, the managing editor of the Journal of Econometrics and an associate editor for Econometrica, the Journal of Finance and the Annals of Statistics. Professor Ait-Sahalia is an elected Fellow of the Econometric Society, the Institute of Mathematical Statistics, the American Statistical Association and the Society for Financial Econometrics. He is also an Alfred P. Sloan Foundation Research Fellow, a Fellow of the Guggenheim Foundation and a Research Associate for the National Bureau of Economic Research. He received his Ph.D. in Economics from the Massachusetts Institute of Technology in 1993 and is a graduate of Ecole Polytechnique in France.

Saddlepoint Approximations for Hawkes Jump-Diffusion Processes with an Application to Risk Management

We propose a statistical model based on Hawkes processes in which large financial losses can arise in close succession serially as well as cross-sectionally. We derive in closed-form saddlepoint approximations to the tails of profit and loss distributions, both marginal and joint, and use them to construct explicit risk measure formulae that account for the fact that a given bank's losses make it more likely that that bank will experience further losses, and that other banks will experience losses as well. These closed-form risk measures can be used for comparative statics, parameter calibration, and setting capital requirements and potential systemic risk charges. (joint work with Roger J.A. Laeven)

Conference Plenary Lectures

Wednesday, August 16, 8:30-9:30, in Room LH1001

Kathryn Leonard, Occidental College, Los Angeles

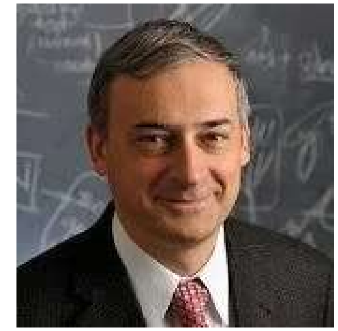
About the speaker: Kathryn Leonard is Associate Dean for Curricular Affairs, and Professor and Founding Chair of Computer Science, at Occidental College. She completed a postdoctoral fellowship in Applied and Computational Mathematics at Caltech after finishing her PhD in Mathematics at Brown University. She is the director of the National Science Foundation-funded Center for Undergraduate Research in Mathematics, and is Past President of the Association for Women in Mathematics (AWM). She has received a Henry L. Alder Award for Excellence in Teaching from the Mathematical Association of America and a service award from AWM. Her research interests are in geometric modeling for data science, computer vision, and computer graphics applications, with an emphasis on explainable AI. Her research has been recognized with an NSF CAREER award and other research grants, and she is founding co-Editor-in-Chief of the mathematics research journal, La Matematica.

Skeletal models for two- and three-dimensional shape understanding

Shape understanding - looking at a shape and intuitively understanding which parts are, e.g., body, arms, legs, toes, and ears - is almost effortless for humans. Training a computer to understand shapes in a similar way, however, presents substantial challenges. This talk will describe a useful mathematical shape model, the Blum medial axis (BMA), and methodologies based on the BMA for automatically decomposing a shape into a hierarchy of parts and determining the similarity between those parts. In 2D, we compare our automated results to human perception data gathered from a massive user study, and also provide some useful applications. Unfortunately, the BMA is notoriously sensitive to noise, which is unavoidable in applications. To address this, we propose geometrically coherent approaches to denoising that provide approximation guarantees for the shape boundary. Finally, because the BMA also provides an interesting example of a Whitney stratified set, we will explore some of the resulting elegant mathematical constructions.

Wednesday, August 16, 13:30-14:30, in Room LH1001

Mark Alber, University of California Riverside



About the speaker: Professor Mark Alber earned his Ph.D. in mathematics at the University of Pennsylvania under the direction of J. E. Marsden (UC Berkeley and Caltech). He held several positions at the University of Notre Dame including most recently Vincent J. Duncan Family Chair in Applied Mathematics. He is currently Distinguished Professor in the Department of Mathematics and Director of the Center for Quantitative Modeling in Biology, University of California, Riverside. Dr. Alber was elected in 2011 Fellow of the American Association for the Advancement of Science (AAAS) and was recently selected for the 2023-24 Fulbright Scholar Award. He is currently a section editor in systems biology of PLoS Computational Biology and member of editorial boards of Bulletin of Mathematical Biology and Biophysical Journal. His research interests include mathematical and computational multiscale modeling of plants and epithelial tissue development as well as blood clot formation and contraction.

Combined multiscale modeling and experimental study of regulation mechanisms of shape and structure formation during tissue development

The regulation and maintenance of an organ's shape and structure is a major outstanding question in developmental biology. The Drosophila wing imaginal disc serves as a powerful system for elucidating design principles of the shape formation in epithelial morphogenesis. Yet, even simple epithelial systems such as the wing disc are extremely complex. A tissue's shape and structure emerge from the integration of many biochemical and biophysical interactions between proteins, subcellular components, and cell-cell and cell-ECM interactions. How cellular mechanical properties affect tissue size and patterning of cell identities on the apical surface of the wing disc pouch has been intensively investigated. However, less effort has focused on studying the mechanisms governing the shape of the wing disc in the cross-section. Both the significance and difficulty of such studies are due in part to the need to consider the composite nature of the material consisting of multiple cell layers and cell-ECM interactions as well as the elongated shape of columnar cells. Results obtained using iterative approach combining multiscale computational modelling and quantitative experimental approach will be used in this talk to discuss direct and indirect roles of subcellular mechanical forces, nuclear positioning, and extracellular matrix in shaping the major axis of the wing pouch during the larval stage in fruit flies, which serves as a prototypical system for investigating epithelial morphogenesis. The research findings demonstrate that subcellular mechanical forces can effectively generate the curved tissue profile, while extracellular matrix is necessary for preserving the bent shape even in the absence of subcellular mechanical forces once the shape is generated. The developed integrated multiscale modelling environment can be readily extended to generate and test hypothesized novel mechanisms of developmental dynamics of other systems, including organoids that consist of several cellular and extracellular matrix layers.

Conference Plenary Lectures

Thursday, August 17, 8:30-9:30, in Room LH1001

Clayton Scott, University of Michigan, Ann Arbor

About the speaker: Clay Scott received his PhD and MS in Electrical Engineering from Rice University in 2004 and 2000, and his AB in Mathematics from Harvard in 1998. He is currently Professor of Electrical Engineering and Computer Science, and of Statistics, at the University of Michigan. His research interests include statistical machine learning theory and algorithms, with an emphasis on nonparametric methods for supervised and unsupervised learning. He has also worked on a number of applications including brain imaging, nuclear threat detection, environmental monitoring, and computational biology. In 2010, he received the Career Award from the National Science Foundation.

Theories of Deep Learning

Over the past decade, deep neural networks have brought about major advances in computer vision, natural language modeling, protein structure prediction, and several other applications. These neural networks succeed despite having far more model parameters than training data. Classical machine learning theory suggests that overparametrized models will overfit, and cannot explain deep networks' low generalization error. In this talk I will survey recent theoretical developments that seek to better explain the performance of deep learning models, and present new results on the generalization ability of quantized neural networks and interpolating predictors.

Conference Plenary Lectures

Thursday, August 17, 13:30-14:30, in Room LH1001

Peter Mucha, Dartmouth College

About the speaker: Peter Mucha is the Jack Byrne Distinguished Professor in Mathematics at Dartmouth College, where he arrived in 2021 as part of The Jack Byrne Academic Cluster in Mathematics and Decision Science. Previously, he was faculty at UNC-Chapel Hill, where he served as chair of the Department of Mathematics, the founding chair of the Department of Applied Physical Sciences, and the Director of the Chairs Leadership Program at the Institute for the Arts & Humanities. His awards include a DOE Early Career PI award, an NSF CAREER award, and recognition as an HHMI Gilliam Advisor. Mucha's research includes a variety of topics in the mathematics of networks and data science, including network representations of data, community detection, and modeling dynamics on and of networks. His group's activities are fundamentally interdisciplinary, applying tools of network analysis and data science in collaborations across the mathematical, physical, life, and social sciences.

Clustering and Classification in Networks

Real-world networks are neither completely random nor fully regular, frequently containing essential structural features whose identification can help better understand the nature and purpose of a network. One common task is to seek out clusters in the data, sometimes described as "community detection". In other settings, one aims to identify key network features in the data that might be used to classify whole networks, label nodes, or predict missing edges. But many of these tasks require selecting features or parameters that are not always obvious to experts in possible application domains. For example, the best use of modularity-based methods includes setting a parameter to control the resolution scale. In this talk, we demonstrate a variety of approaches for such tasks, with emphasis on best practices with readily available software packages.

Conference Plenary Lectures

Friday, August 18, 8:30-9:30, in Room LH1001

M. Angeles Serrano, Universitat de Barcelona

About the speaker: M. Angeles Serrano is an ICREA Research Professor at the Dept. of Condensed Matter Physics of the University of Barcelona (UB), where she leads the Mapping Complexity Lab. She also holds an appointment as an External Faculty at the Complexity Science Hub CSH in Vienna. A native of Barcelona, M.A.S. received a Ph.D. in theoretical physics from UB in 1999 and, a year later, a master in mathematics for finance from the Centre de Recerca Matematica CRM. She spent several years in the private sector and returned to academia in 2004 to work in network science. She conducted postdoctoral research at Indiana University (USA), the ecole Polytechnique Federale de Lausanne (Switzerland), and IFISC Institute (Spain), and was awarded a Ramon y Cajal Fellowship in 2009. M.A.S. has published in major peer reviewed international scientific journals including Nature Reviews Physics, Nature Physics, Nature Communications, PNAS, Phys Rev Letters, and more. She obtained the Outstanding Referee Award of the American Physical Society (APS) and a James McDonnell Foundation Scholar Award for the Study of Complex Systems. She serves as a Board member of the Statistical and Nonlinear Physics Division of the European Physical Society, and belongs to the Editorial Board of the APS journal Physical Review Research. She is a founding member of Complexitat, the Catalan network for the study of complex systems, and a promoter and Scientific Board member of UBICS, the Universitat de Barcelona Institute of Complex Systems. M.A.S. is astonished by the amazing features that emerge in the structure, function, and evolution of complex systems, and she is using networks to model and to predict them.

Network geometry: from multiscale to ultra low dimensional representations of complex systems

Recent advances in network science include the discovery that hyperbolic geometry captures the complex connectivity of real networks. Within this paradigm, we have been developing model-based methods for exploring their multiscale nature and their intrinsic dimensionality. More specifically, we produced a renormalization group technique that progressively coarse-grains and rescales networks, revealing a hierarchy of layers at different resolutions. We found that the multiscale shells of real networks, such as connectomes of the human brain, exhibit self-similarity across multiple scales. This symmetry is also evident in the growth of some real networks, suggesting that evolution can be modeled by a reverse renormalization process. In addition, geometric renormalization has practical applications, allowing us to produce scaled down and scaled up replicas of real networks. Our results were obtained by embedding real networks in two-dimensional hyperbolic space, but we have also developed a method to infer their intrinsic dimensionality since there is not fundamental reason to believe that it must be two. Our analysis has revealed ultra low dimensionality and unexpected regularities across different domains, such as extremely low dimensionality in tissue-specific biomolecular networks, close-to-three-dimensional brain connectomes, and slightly higher dimensionality in social networks and the Internet.

Conference Plenary Lectures

Friday, August 18, 13:30-14:30, in Room LH1001

Genevera Allen, Rice University

About the speaker: Genevera Allen is an Associate Professor of Electrical and Computer Engineering, Statistics, and Computer Science at Rice University and an investigator at the Jan and Dan Duncan Neurological Research Institute at Texas Children's Hospital and Baylor College of Medicine. She is also the Founding Director of the Rice Center for Transforming Data to Knowledge, informally called the Rice D2K Lab. Dr. Allen's research develops new statistical machine learning tools to help people make reproducible data-driven discoveries. She is known for her work in the areas of interpretable machine learning, data integration, modern multivariate analysis, and graphical models with applications in neuroscience and bioinformatics. Dr. Allen is also a leader in data science education. In 2018, she founded the Rice D2K Lab, a campus hub for experiential learning and data science education. Through her leadership of the D2K Lab, Dr. Allen developed new interdisciplinary data science degree programs, established a novel capstone program in data science and machine learning, and led Rice's engagement with corporate and community partners in data science. Dr. Allen is the recipient of several honors for both her research and educational efforts including a National Science Foundation Career Award, Rice University's Duncan Achievement Award for Outstanding Faculty, the Curriculum Innovation Award, and the School of Engineering's Research and Teaching Excellence Award. In 2014, she was named to the "Forbes '30 under 30': Science and Healthcare" list. She is also an elected member of the International Statistics Institute and an elected fellow of the American Statistical Association. Dr. Allen currently serves as an Action Editor for the Journal of Machine Learning Research, an Associated Editor for the Journal of the American Statistical association, and a Series Editor for Springer Texts in Statistics. Dr. Allen received her Ph.D. in statistics from Stanford University, under the mentorship of Prof. Robert Tibshirani, and her bachelors, also in statistics, from Rice University.

Fast and Powerful Minipatch Ensemble Learning for Discovery and Inference

Enormous quantities of data are collected in many industries and disciplines; this data holds the key to solving critical societal and scientific problems. Yet, fitting models to make discoveries from this huge data often poses both computational and statistical challenges. In this talk, we propose a new ensemble learning strategy primed for fast, distributed, and memory-efficient computation that also has many statistical advantages. Inspired by random forests, stability selection, and stochastic optimization, we propose to build ensembles based on tiny subsamples of both observations and features that we term minipatches. While minipatch learning can easily be applied to prediction tasks similarly to random forests, this talk focuses on using minipatch ensemble approaches in unconventional ways: making data-driven discoveries and for statistical inference. Specifically, we will discuss using this ensemble strategy for feature selection, clustering, and graph learning as well as for distribution-free and model-agnostic inference for both predictions and important features. Through huge real data examples from neuroscience, genomics and biomedicine, we illustrate the computational and statistical advantages of our minipatch ensemble learning approaches.

8. Conference Semi-Plenary Lectures

Monday, August 14, 10:30-11:30, in Room LH1011

Israel Michael Sigal, University of Toronto

About the speaker: Israel Michael Sigal is a University Professor at the University of Toronto where he also holds the Norman Stuart Robertson Chair in Applied Mathematics. He has made significant contributions to mathematical physics and applied mathematics. These include a proof, together with A. Soffer, of the asymptotic completeness of scattering for quantum many-body short-range systems; the development, with V. Bach and J. Fr ohlich, of the mathematical theory of quantum radiation in the non-relativistic regime (non-relativistic QED); the introduction, with V. Bach and J. Fr ohlich, of the operator renormalization group; and determination, jointly with S. Gustafson, Z. Gang, L. Jonsson, J. Fr ohlich and T. Tzaneteas, of dynamics of solitons, quantum vortices and vortex lattices. More recently, Sigal has been addressing mathematical questions of quantum information science, proving, jointly with J. Faupin and M. Lemm, the long-standing conjecture on existence of an effective light cone in the lattice Bose gases, and deriving, with Jingxuan Zhan, a large class of general constraints on the flow of quantum information in general lattice quantum many-body systems.
Sigal has published over 250 peer-reviewed papers and is co-author of books on spectral theory and on quantum mechanics. He is a Fellow of the AMS and a Fellow of the Royal Society of Canada. His research achievements have been recognized with numerous awards and lectureships, including the Killam Fellowship, the CRM/Fields Institute Prize, invited talks at the ICM and ICMP, and addresses at the AMS and CMS.

Partial Differential Equations of Quantum Mechanics

In this talk I will describe key partial differential equations of quantum mechanics and condensed matter physics. I will review briefly the origins of the equations, their properties and some of the recent results. I will also touch upon some open problems. No preliminary knowledge of quantum mechanics is required. All needed concepts will be introduced in the talk.

Tuesday, August 15, 10:00-11:00, in Room LH3094

Hiroki Sayama, Binghamton University, State University of New York

About the speaker: Hiroki Sayama is a Professor in the Department of Systems Science and Industrial Engineering, and the Director of the Center for Collective Dynamics of Complex Systems (CoCo), at Binghamton University, State University of New York, USA. He also serves as a non-tenure-track Professor in the School of Commerce at Waseda University, Japan, as well as an External Faculty member of the Vermont Complex Systems Center at the University of Vermont, USA. He received his B.Sc., M.Sc. and D.Sc. in Information Science, all from the University of Tokyo, Japan. He did his postdoctoral work at the New England Complex Systems Institute in Cambridge, Massachusetts. His research interests include complex dynamical networks, human and social dynamics, collective behaviors, artificial life/chemistry, interactive systems, and complex systems education, among others. He is an expert on mathematical/computational modeling and analysis of various complex systems. He has published more than 220 peer-reviewed journal articles and conference proceedings papers and has written or edited 14 books and conference proceedings about complex systems related topics. His open-access textbook on complex systems modeling and analysis has been downloaded more than 70,000 times globally and has become one of the standard textbooks on this subject. He currently serves as a Board member of the Network Science Society (NetSci) and the International Society for Artificial Life (ISAL), the Chief Editor of Complexity (Wiley/Hindawi), the Founding Co-Editor-in-Chief of Northeast Journal of Complex Systems (NEJCS), an Associate Editor of Artificial Life (MIT Press), and as an editorial board member for several other journals.

Mechanistic Modeling of Complex Social Systems

Discovering patterns in experimental and observational data is an essential step in any scientific endeavor and has been dramatically accelerated by recent advances in data science, machine learning, and AI. However, pattern discovery alone cannot complete the full cycle of scientific research. Mechanistic modeling complements pattern discovery and plays a critical role in generating deeper understanding of and insight into the hidden mechanisms that may have produced the observed patterns. While current trends of data science/ML/AI research and applications focus primarily on the pattern discovery side (e.g., classification, clustering, prediction), there is also a growing demand for knowledge, skills, capabilities, and tools for mechanistic modeling. This is because many of our complex societal problems arise with high uncertainty yet with very limited data available, and often require the exploration and testing of numerous hypothetical scenarios, not for prediction, but for preparation. In this talk, I will illustrate the importance of mechanistic modeling, especially when dealing with complex societal problems, using examples from our recent work on (1) pandemic response planning in early 2020 when COVID-19 hit our daily lives but no one knew much about the disease, and (2) socio-political opinion dynamics modeling to explore alternative pathways for society other than the currently dominant divide and polarization. I will also argue that there is an urgent need for education and training in mechanistic modeling, in which systems thinking and creativity play a key role.

Wednesday, August 15, 15:00-16:00, in Room LH1011

Katherine Stange, University of Colorado, Boulder

About the speaker: Katherine E. Stange is a number theorist and cryptographer at the University of Colorado, Boulder. She is in love with the rich structure and variation of number theory, with its potential to interact with geometry and illustration, and is fascinated by its relationship to human affairs through cryptography. She is happiest simply wandering around taking field notes on the behaviour of mathematical flora and fauna. Over the years, she has happily trailed elliptic curves and isogenies, quadratic forms, Kleinian groups, Apollonian circle packings, and continued fractions, to name a few. In real life, she trails her two children, often on two wheels. She can be found on the web at https://math.katestange.net/.

Supersingular isogeny graphs and orientations

A supersingular isogeny graph is a graph whose vertices are supersingular elliptic curves over $\overline{\mathbb{F}}_p$ (where p is typically a large prime in our context), and whose edges represent isogenies of degree ℓ (typically a small prime). Hard problems concerning pathfinding in supersingular isogeny graphs form a basis for post-quantum isogeny-based cryptography. In this talk, I will describe the structure of isogeny graphs of CM curves, and of oriented supersingular curves, and their relationship to the structure of supersingular isogeny graphs. In particular, the endomorphism ring of a supersingular elliptic curve is an order in a quaternion algebra. Embeddings of imaginary quadratic orders into this quaternion order are called *orientations*. Explicit knowledge of this endomorphism ring leads to well-known pathfinding algorithms. In joint work, we develop classical and quantum algorithms for path-finding under the assumption that *only one* endomorphism from this order is known (equivalently, one orientation). In related work, we demonstrate a bijection between the cycles in a fixed isogeny graph and the cycles in the union of all CM graphs which cover it. As a result, we count the cycles in the isogeny graph in terms of certain class numbers of imaginary quadratic orders.

9. AMMCS Prize-Winning Lecture

Kolmogorov-Wiener Prize for Young Researchers

Wednesday, August 16, 17:00-18:00, in Room LH1001

Siran Li, Shanghai Jiao Tong & New York University

About the speaker: Siran Li grew up in Beijing, studied mathematics from 2009 to 2013 at Columbia University, New York, and obtained the D.Phil. degree in 2017 from the University of Oxford, under the supervision of Gui-Qiang Chen. He did postdoctoral researches with Bob Hardt from 2017 to 2020 at Rice University, Houston, and spent the year 2018 - 2019 at McGill and Concordia Universities in Montreal as a CRM-ISM postdoctoral fellow. Siran moved back to China in 2020, first working at New York University-Shanghai. He joined Shanghai Jiao Tong University as an associate professor in September 2021. Siran's main research interests include analysis of partial differential equations, geometric measure theory, and applied mathematics. One of the main themes of his mathematical work is the analysis of singularities, or structures of weak regularities, which arise naturally from problems in differential geometry and fluid dynamics. His recent research projects concern with isometric immersions of manifolds, the theory of compensated compactness, and the Navier-Stokes equations.

The isometric immersions problem: from perspectives of PDE, geometry, and physics

We report our recent work on a classical problem in differential geometry: isometric immersions and/or embeddings of Riemannian and semi-Riemannian manifolds. The underlying PDE is the system of Gauss-Codazzi-Ricci equations. Existence of isometric immersions is studied under various curvature conditions, via elliptic and hyperbolic PDE techniques. Weak continuity of isometric immersions is investigated with the help of the theory of compensated compactness. Connections to other problems in mathematical physics, including fluid dynamics, harmonic maps, and Coloumb gauges, will be discussed. Our talk contains joint work with Gui-Qiang Chen, Reza Pakzad, Armin Schikorra, and Marshall Slemrod.

10. Special Sessions & Organizers

Session ID	Session Name	Session Organizers	Session Blocks
SS-AIIPMM	Artificial Intelligence, Inverse Problems, and Mathematical Modelling	Leopoldo Bertossi (SKEMA Business School Canada, Montreal) Herb Kunze (University of Guelph) Davide La Torre (SKEMA Business School & Université Côte d'Azur)	SS-AIIPMM #1 Thursday A.M. SS-AIIPMM #2 Thursday P.M.
SS-ASDEDS	Algebraic Structure of Discrete-Event Dynamical Systems, and Applications	Chrystopher L. Nehaniv (University of Waterloo) Attila Egri-Nagy (Akita International University, Japan)	SS-ASDEDS #1 Wednesday A.M. SS-ASDEDS #2 Wednesday P.M.
SS-CCSMS	Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	Sundeep Singh (UPEI) Rosa Fallahpour (University of Toronto) Hassan Askari (General Motors)	SS-CCSMS #1 Tuesday A.M. SS-CCSMS #2 Tuesday P.M. SS-CCSMS #3 Wednesday A.M. SS-CCSMS #4 Wednesday P.M. SS-CCSMS #5 Thursday A.M.
SS-CNT	Computational Number Theory	Chester Weatherby (Wilfrid Laurier University) Michael Jacobson (University of Calgary)	SS-CNT #1 Wednesday A.M. SS-CNT #2 Wednesday P.M. SS-CNT #3 Thursday A.M. SS-CNT #4 Thursday P.M.
SS-DF	Decisions and Fairness	Marc Kilgour (Wilfrid Laurier University) Bill Zwicker (Union College, New York)	SS-DF #1 Monday A.M. SS-DF #2 Monday P.M. SS-DF #3 Tuesday A.M. SS-DF #4 Tuesday P.M.
SS-DSBEA	Dynamical Systems in Biological and Engineering Applications	Maggie Han (Auburn University) Xingfu Zou (Western University) Yuming Chen (Wilfrid Laurier University)	SS-DSBEA #1 Friday A.M. SS-DSBEA #2 Friday P.M.
SS-MAAC	Modeling and Analysis in Analytical Chemistry	Arun Moorthy (National Institute of Standards & Technology) Wesley Burr (Trent University)	SS-MAAC Monday A.M.

Session ID	Session Name	Session Organizers	Session Blocks
SS-MBM	Mathematics in Biology and Medicine	Kathleen Wilkie (Toronto Metropolitan University) Corina Drapaca (Pennsylvania State University)	SS-MBM #1 Wednesday A.M. SS-MBM #2 Wednesday P.M.
SS-MCSLS	Modeling Complex Systems in Life Sciences	Blessing Emerenini (Rochester Institute of Technology) Lucia Carichino (Rochester Institute of Technology) Ephraim Agyingi (Rochester Institute of Technology)	SS-MCSLS #1 Monday A.M. SS-MCSLS #2 Monday P.M.
SS-MF	Mathematical Finance	Joe Campolieti (Wilfrid Laurier University) Nick Costanzino (Claremont Graduate School) Dan Pirjol (Stevens Institute of Technology)	SS-MF #1 Tuesday A.M. SS-MF #2 Tuesday P.M.
SS-MMNN	Mathematical Models for Nanoscience and Nanotechnology	Zoran Miskovic (University of Waterloo) Kamran Akbari (Queen's University)	SS-MMNN #1 Friday A.M. SS-MMNN #2 Friday P.M.
SS-MNAPA	Modeling and Numerical Analysis for PDE Applications	Faranak Pahlevani (Pennsylvania State University) Lisa Davis (Montana State University)	SS-MNAPA #1 Tuesday A.M. SS-MNAPA #2 Tuesday P.M.
SS-MNPE	Modelling NPI and PI in Epidemics/Pandemics	Jeta Molla (York University) Iain Moyles (York University) Jane Heffernan (York University)	SS-MNPE Thursday A.M.
SS-MSD	Mathematics of Systems with Delay	Elena Braverman (University of Calgary) Anatoli Ivanov (Pennsylvania State University) Erik Verriest (Georgia Institute of Technology)	SS-MSD #1 Monday A.M. SS-MSD #2 Monday P.M.
SS-OCDGA	Optimal Control, Differential Games, and Applications	Alberto Bressan (Pennsylvania State University) Khai T. Nguyen (North Carolina State University)	SS-OCDGA Wednesday A.M.
SS-QCQPQM	Quantum computation, and Other Quantum Processes in Quantum Matter	Lianao Wu (IKERBASQUE, Basque Foundation of Science and University of the Basque Country, Spain)	SS-QCQPQM #1 Friday A.M. SS-QCQPQM #2 Friday P.M.

Session ID	Session Name	Session Organizers	Session Blocks
SS-RANMSC	Recent Advances in Numerical Methods and Scientific Computing	Christina C. Christara (University of Toronto) Dong Liang (York University) Shaun Lui (University of Manitoba) Justin Wan (University of Waterloo)	SS-RANMSC #1 Tuesday A.M. SS-RANMSC #2 Tuesday P.M. SS-RANMSC #3 Wednesday A.M. SS-RANMSC #4 Wednesday P.M.
SS-RATAWP	Recent Advances in the Theory and Applications of Wave Propagation	Eduard Kirr (University of Illinois, Urbana-Champaign) Daniel Onofrei (University of Houston) Nicolae Tarfulea (Purdue University Northwest)	SS-RATAWP #1 Monday A.M. SS-RATAWP #2 Monday P.M. SS-RATAWP #3 Tuesday A.M.
SS-RPCDSA	Recent Pogress in Complex Dynamical Systems and Applications	Mohamad Alwan (University of Saskatchewan) Xinzhi Liu (University of Waterloo) Yuan Shen (University of Waterloo)	SS-RPCDSA #1 Thursday A.M. SS-RPCDSA #2 Thursday P.M.
SS-SDMICN	Spatial data and Modelling Including the Canadian North	Steven Roberts (Wilfrid Laurier University)	SS-SDMICN #1 Friday A.M.
SS-TSMDA	Topics in Spatiotemporal Modelling and Data Analysis	Devan Becker (Wilfrid Laurier University) Sukhjit Singh Sera (Wilfrid Laurier University) Sunny Wang (Wilfrid Laurier University)	SS-TSMDA Tuesday P.M.

11. Contributed Sessions

Session ID	Session Name	Session Blocks
CS-APMRE	Applied Problems and Methods in Research & Education	CS-GEN #1 Thursday A.M.
CS-BSM	Mathematics and Computation in Biological Sciences and Medicine	CS-BSM Thursday P.M.
CS-CACO	Computational Algebra, Combinatorics and Optimization	CS-GEN #2 Thursday P.M.
CS-CPC	Computational Physics and Chemistry	CS-CPC Monday P.M.
CS-DSDE	Applications of Dynamical Systems and Differential Equations	CS-DSDE #1 Friday A.M. CS-DSDE #2 Friday P.M.
CS-ENV	Mathematical Modelling in Environmental Sciences and Models for Complex Media	CS-GEN #2 Monday P.M.
CS-GSRS	Graduate Student Research Symposium	CS-GSRS #1 Monday A.M. CS-GSRS #2 Monday P.M.
CS-MECHE	Computational Mechanics and Engineering	CS-GEN #1 Thursday A.M.
CS-MODELING	Partial Differential and Integral Equations in Mathematical Modeling	CS-GEN #2 Thursday P.M.
CS-POST	Poster Session	CS-POST Wednesday

merged to CS-GEN #1

merged to CS-GEN #2

12. High-Level Conference Schedule

Mon: A.M.=10:30-12:30; P.M.=3:30-5:30
Tues-Fri: A.M.=10:00-12:00; P.M.=3:00-5:00

Room		LH1001	LH1009	LH1010	LH1011	LH2066	LH3094	LH3098
August 14	A.M.	PLENARY T. Sandholm	SS-MSD Mathematics of Systems with Delay	SS-DF Decisions and Fairness	SS-RATAWP Recent Advances in the Theory and Applications of Wave Propagation	SS-MAAC Modeling and Analysis in Analytical Chemistry	SS-MCSLS Modeling Complex Systems in Life Sciences	CS-GSRS Graduate Student Research Symposium
	P.M.	H. Moulin				CS-CPC Computational Physics and Chemistry		
August 15	A.M.	R. Vidal	SS-RANMSC Recent Advances in Numerical Methods and Scientific Computing			SS-MNAPA Mathematical Models for Nanoscience and Nanotechnology	SS-CCSMS Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	SS-MF Mathematical Finance
	P.M.	Y. Ait-Sahalia			SS-TSMDA Topics in Spatiotemporal Modelling and Data Analysis			
August 16	A.M.	K. Leonard		SS-MBM Mathematics in Biology and Medicine	SS-CNT Computational Number Theory	SS-ASDEDS Algebraic Structure of Discrete-Event Dynamical Systems, and Applications		SS-OCDGA Optimal Control Differential Games, and Applications
	P.M.	M. Alber						CS-GEN #1 APMRE MECHE Applied Problems +Computational Mechanics
August 17	A.M.	C. Scott	SS-RPCDSA Recent Progress in Complex Dynamical Systems and Applications	SS-MNPE Modelling NPI and PI in Epidemics/Pandemics		SS-AIIPMM Artificial Intelligence, Inverse Problems, and Mathematical Modelling		
	P.M.	P. Mucha		CS-BSM Mathematics and Computation in Biological Sciences and Medicine				CS-GEN #2 CACO.ENV MODEL Computational Algebra +Environmental Science +PDEs, Integral Eqns
August 18	A.M.	M.A. Serrano	CS-DSDE Modeling and Numerical Analysis for PDE Applications		SS-SDMICN Spatial Data and Modelling Including the Canadian North	SS-QCQPQM Quantum Computation, and Other Quantum Processes in Quantum Matter	SS-MMNN Applications of Dynamical Systems and Differential Equations	SS-DSBEA Dynamical Systems in Biological and Engineering Applications
	P.M.	G. Allen						

Monday, August 14

Time	Room			
8:30-9:00	LH1001	**AMMCS Conference Opening** **Marc Kilgour**, Department of Mathematics, Wilfrid Laurier University **Charity Parr-Vasquez**, Vice-President Research Office, Wilfrid Laurier University **Dorothy McCabe**, Mayor, City of Waterloo		
9:00-10:00	LH1001	**Conference Plenary Lecture** *The State of Representing and Solving Games* **Tuomas Sandholm**, Carnegie Mellon University, Abstract & Biography on p. 10 (Chair: M. Kilgour, Wilfrid Laurier University)		
10:00-10:30	LH Halls	**Coffee Break**		
10:30-12:30	**Parallel Sessions**	LH1009 SS-MSD #1 Mathematics of Systems with Delays	LH1010 SS-DF #1 Decisions and Fairness	LH1011 SS-RATAWP #1 Recent Advances in the Theory and Application of Wave Propagation Semi-plenary: I.M. Sigal Abstract & Biography on p. 20
		LH2066 SS-MAAC Modeling and Analysis in Analytic Chemistry	LH3094 SS-MCSLS #1 Modeling Complex Systems in Life Sciences	LH3098 CS-GSRS #1 Graduate Student Research Symposium
12:30-14:00	**Lunch**			
14:00-15:00	LH1001	**Conference Plenary Lecture** *Ex Ante Fairness and Worst Case Analysis* **Hervé Moulin**, University of Glasgow, Abstract & Biography on p. 11 (Chair: M. Kilgour, Wilfrid Laurier University)		
15:00-15:30	LH Halls	**Coffee Break**		
15:30-17:30	**Parallel Sessions**	LH1009 SS-MSD #2 Mathematics of Systems with Delays	LH1010 SS-DF #2 Decisions and Fairness	LH1011 SS-RATAWP #2 Recent Advances in the Theory and Application of Wave Propagation
		LH2066 CS-CPC Computational Physics and Chemistry	LH3094 SS-MCSLS #2 Modeling Complex Systems in Life Sciences	LH3098 CS-GSRS #2 Graduate Student Research Symposium

Tuesday, August 15

Time	Room	
8:30-9:30	LH1001	**Conference Plenary Lecture** *Explainable AI via Semantic Information Pursuit* **René Vidal**, Johns Hopkins University, Abstract & Biography on p. 12 (Chair: R. Makarov, Wilfrid Laurier University)
9:30-10:00	LH Halls	**Coffee Break**
10:00-12:00	Parallel Sessions	see below
12:00-13:00		**Lunch**
13:00-13:30	LH1001	**Maplesoft Session** Applications of Maple
13:30-14:30	LH1001	**Conference Plenary Lecture** *Saddlepoint Approximations for Hawkes Jump-Diffusion Processes with an Application to Risk Management* **Yacine Ait-Sahalia**, Princeton University, Abstract & Biography on p. 13 (Chair: J. Campolieti, Wilfrid Laurier University)
15:00-15:30	LH Halls	**Coffee Break**
15:00-17:00	Parallel Sessions	see below

10:00-12:00 Parallel Sessions

LH1009	LH1010	LH1011
SS-RANMSC #1 Recent Advances in Numerical Methods and Scientific Computing	SS-DF #3 Decisions and Fairness	SS-RATAWP #3 Recent Advances in the Theory and Application of Wave Propagation

LH2066	LH3094	LH3098
SS-MNAPA #1 Modelling and Numerical Analysis for PDE Applications	SS-CCSMS #1 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Semi-plenary: H. Sayama Abstract & Biography on p. 21	SS-MF #1 Mathematical Finance

15:00-17:00 Parallel Sessions

LH1009	LH1010	LH1011
SS-RANMSC #2 Recent Advances in Numerical Methods and Scientific Computing	SS-DF #4 Decisions and Fairness	SS-TSMDA Topics in Spatiotemporal Modelling and Data Analysis

LH2066	LH3094	LH3098
SS-MNAPA #2 Modelling and Numerical Analysis for PDE Applications	SS-CCSMS #2 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	SS-MF #2 Mathematical Finance

Wednesday, August 16

Time	Room			
8:30-9:30	LH1001	**Conference Plenary Lecture** *Skeletal models for two- and three-dimensional shape understanding* **Kathryn Leonard**, Occidental College, Los Angeles, Abstract & Biography on p. 14 (Chair: X. Wang, Wilfrid Laurier University)		
9:30-10:00	LH Halls	**Coffee Break & Poster Session**		
10:00-12:00	Parallel Sessions	LH1009 SS-RANMSC #3 Recent Advances in Numerical Methods and Scientific Computing	LH1010 SS-MBM #1 Mathematics in Biology and Medicine	LH1011 SS-CNT #1 Computational Number Theory
		LH2066 SS-ASDEDS #1 Algebraic Structures of Discrete-Event Dynamical Systems and Applications	LH3094 SS-CCSMS #3 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	LH3098 SS-OCDGA Optimal Control, Differential Games, and Applications
12:00-13:30	**Lunch**			
13:30-14:30	LH1001	**Conference Plenary Lecture** *Combined multiscale modeling and experimental study of regulation mechanisms of shape and structure formation during tissue development* **Mark Alber**, University of California Riverside, Abstract & Biography on p. 15 (Chair: R. Melnik, Wilfrid Laurier University)		
14:30-15:00	LH Halls	**Coffee Break & Poster Session**		
15:00-17:00	Parallel Sessions	LH1009 SS-RANMSC #4 Recent Advances in Numerical Methods and Scientific Computing	LH1010 SS-MBM #2 Mathematics in Biology and Medicine	LH1011 SS-CNT #2 Computational Number Theory Semi-plenary: K. Stange Abstract & Biography on p. 22
		LH2066 SS-ASDEDS #2 Algebraic Structures of Discrete-Event Dynamical Systems and Applications	LH3094 SS-CCSMS #4 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	LH3098 CS-GEN #1 Applied Problems and Methods + Computational Mechanics
17:00-18:00	**Refreshments Served** LH1001	**AMMCS Prize-Winning Lecture** *The isometric immersions problem: from perspectives of PDE, geometry, and physics* **Siran Li**, Shanghai Jiao Tong & New York University, Abstract & Biography on p. 23 (Chair: R. Melnik, Wilfrid Laurier University)		

Thursday, August 17

Time	Room			
8:30-9:30	LH1001	**Conference Plenary Lecture** *Theories of Deep Learning* **Clayton Scott**, University of Michigan, Ann Arbor, Abstract & Biography on p. 16 (Chair: R. Makarov, Wilfrid Laurier University)		
9:30-10:00	LH Halls	**Coffee Break**		
10:00-12:00	**Parallel Sessions**	LH1009 SS-RPCDSA #1 Recent Progress in Complex Dynamical Systems and Applications	LH1010 SS-MNPE Modelling NPI and PI in Epidemics/Pandemics	LH1011 SS-CNT #3 Computational Number Theory
		LH2066 SS-AIIPMM #1 Artificial Intelligence, Inverse Problems, and Mathematical Modelling	LH3094 SS-CCSMS #5 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications	LH3098
12:00-13:30	**Conference Photo Shoot at 12:00 & Lunch**			
13:30-14:30	LH1001	**Conference Plenary Lecture** *Clustering and Classification in Networks* **Peter Mucha**, Dartmouth College, Abstract & Biography on p. 17 (Chair: H. Kunze, University of Guelph)		
14:30-15:00	LH Halls	**Coffee Break**		
15:00-17:00	**Parallel Sessions**	LH1009 SS-RPCDSA #2 Recent Progress in Complex Dynamical Systems and Applications	LH1010 CS-BSM Mathematics and Computation in Biological Sciences and Medicine	LH1011 SS-CNT #4 Computational Number Theory
		LH2066 SS-AIIPMM#2 Artificial Intelligence, Inverse Problems, and Mathematical Modelling	LH3094	LH3098 CS-GEN #2 Computational Algebra + Environmental Science + PDEs, Integral Equations
18:30-22:00	Waterloo Delta Hotel	**Conference Banquet Dinner**		

Friday, August 18

Time	Room			
8:30-9:30	LH1001	**Conference Plenary Lecture** *Network geometry: from multiscale to ultra low dimensional representations of complex systems* **M. Angeles Serrano**, Universitat de Barcelona, Abstract & Biography on p. 18 (Chair: R. Melnik, Wilfrid Laurier University)		
9:30-10:00	LH Halls	**Coffee Break**		
10:00-12:00	Parallel Sessions	LH1009 CS-DSDE #1 Applications of Dynamical Systems and Differential Equations	LH1010	LH1011 SS-SDMICN Spatial Data and Modelling Including the Canadian North
		LH2066 SS-QCQPQM #1 Quantum Computation, and Other Quantum Processes in Quantum Matter	LH3094 SS-MMNN #1 Mathematical Models for Nanoscience and Nanotechnology	LH3098 SS-DSBEA #1 Dynamical Systems in Biological and Engineering Applications
12:00-13:30	Lunch			
13:30-14:30	LH1001	**Conference Plenary Lecture** *Fast and Powerful Minipatch Ensemble Learning for Discovery and Inference* **Genevera Allen**, Rice University, Abstract & Biography on p. 19 (Chair: X. Wang, Wilfrid Laurier University)		
14:30-15:00	LH Halls	**Coffee Break**		
15:00-17:00	Parallel Sessions	LH1009 CS-DSDE #2 Applications of Dynamical Systems and Differential Equations	LH1010	LH1011
		LH2066 SS-QCQPQM #2 Quantum Computation, and Other Quantum Processes in Quantum Matter	LH3094 SS-MMNN #2 Mathematical Models for Nanoscience and Nanotechnology	LH3098 SS-DSBEA #2 Dynamical Systems in Biological and Engineering Applications
17:00-17:30	LH1009	**Conference Prize Announcements & Closing**		

13. Parallel Sessions Schedule

The following pages give the detailed speaker list for the morning and afternoon parallel session each day of the Conference.

Monday, August 14

Time	LH1009	LH1010	LH1011
Room	SS-MSD #1 Mathematics of Systems with Delay Chair: E. Braverman University of Calgary	SS-DF #1 Decisions and Fairness: Models Chair: S. Horan Université de Montréal	SS-RATAWP #1 Recent Advances in the Theory and Application of Wave Propagation Chair: E. Kirr University of Illinois at Urbana-Champaign
10:30 -10:50	*Exponentially decaying solutions for models with delayed and advanced arguments: nonlinear effects in linear differential equations* E. Braverman University of Calgary	*Fairer Penalty Shootouts in Soccer: The m-n Rule* S.J. Brams New York University	**Semi-plenary Lecture** *Partial Differential Equations of Quantum Mechanics* I.M. Sigal University of Toronto Abstract & Biography on p. 20
10:50 -11:10	*The Impact of Time Delays on Synchrony in a Neural Field Model* S.A. Campbell University of Waterloo	*The pipeline externalities game* C. Trudeau University of Windsor	
11:10 -11:30	*Some Stability Results on Impulsive Systems with Time Delay* X. Liu University of Waterloo	*Countering Partisan Gerrymandering with Multimember Electoral Districts* D. Cooper Morehouse College	
11:30 -11:50	*Event-Triggered Stabilization for Linear Time-Delay Systems* K. Zhang Queen's University	*Order Symmetry: A New Fairness Criterion for Assignment Mechanisms* M. Wilson University of Massachusetts Amherst	*Recent results on the stability of solitons and kinks* F. Pusateri University of Toronto
11:50 -12:10	*Macroscopic Dynamics of a Neural Network with Synaptic Delay* L. (Liang) Chen University of Waterloo	*Patterns of Substitution in Discrete Choice* S. Horan Université de Montréal	*A Hamiltonian Dysthe equation for deep-water gravity waves with constant vorticity* A. Kairzhan University of Toronto
12:10 -12:30	*Gravitational Models with State- Dependent Delay: Gravitating Binaries* E. Verriest Georgia Institute of Technology		*A new approach to Scattering: On the Asymptotic states of Nonlinear Dispersive and Hyperbolic equations with General Data* A. Soffer Rutgers University
12:30 -12:50			*Limiting absorption principle and virtual levels of operators in Banach spaces* A. Comech Texas A&M University

Time	LH2066	LH3094	LH3098
Room	SS-MAAC Modelling and Analysis in Analytic Chemistry Chair: A. Moorthy National Institute of Standards & Technology	SS-MCSLS #1 Modeling Complex Systems in Life Sciences Chair: L. Carichino Rochester Institute of Technology	CS-GSRS #1 Graduate Student Research Symposium Chair: D. Soave Wilfrid Laurier University
10:30 -10:50	*Optimization and Math Modelling in COVID19 Data Analysis* A. Kearsley National Institute of Standards and Technology	*Mathematical Modeling of Wound Angiogenesis: Understanding the Dynamics of Cellular Interactions and Signaling Pathways* E. Agyingi Rochester Institute of Technology	*Reconfiguration of vertex colouring and forbidden induced subgraphs* M. Belavadi Wilfrid Laurier University
10:50 -11:10	*New insights into estimating the time since deposition of bloodstained evidence* T. Stotesbury Ontario Tech University	*Optimal Bandwith Selection in Bio-FET Measurements* L. Melara Shippensburg University	*Retirement Risks with Glide Paths* A. Iu Wilfrid Laurier University
11:10 -11:30	*Open Source Workflows for Mass Spectrometry Analysis* W. Burr Trent University	*Understanding Phage-Antibiotic Treatment of Biofilms in Mathematical Framework* B. Emerenini Rochester Institute of Technology	*Spectral Expansions for Credit Risk Modelling with Occupation Times* H. Kato Wilfrid Laurier University
11:30 -11:50	*Machine Learning for Molecular Sensing in the Lab and in Nature* J. Wei Google Deepmind	*Diverse myelination patterns impact action potential conduction timing* A. Talidou University of Ottawa	*Dynamic Optimization of Covered Call Strategies Under Alternative Models* M. Perryman Wilfrid Laurier University
11:50 -12:10		*Impact of feedforward and feedback controls on potassium homeostasis: A mathematical modeling analysis* M. Stadt University of Waterloo	*Last Passage Time in Option Pricing: Spectral Expansions for Solvable Diffusions* Y. Sui Wilfrid Laurier University
12:10 -12:30			

Monday, August 14: Afternoon

Time	LH1009	LH1010	LH1011
Room	SS-MSD #2 Mathematics of Systems with Delay Chair: E. Verriest Georgia Institute of Technology	SS-DF #2 Decisions and Fairness: Voting Procedures Chair: N. Shah University of Toronto	SS-RATAWP #2 Recent Advances in the Theory and Application of Wave Propagation Chair: N. Tarfulea Purdue University Northwest
15:30 -15:50	*On effects of delay in SEIR systems with a quarantine stage modeling COVID-19 spread* A. Raza National College of Business Administration and Economics	*An Examination of Ranked-Choice Voting in the United States, 2004-2022* D. McCune William Jewell College	*Bifurcations in Nonlinear Schr odinger Equations with Multi-Well Potentials: Insights from the Infinite Eigenvalue Case* E. Kirr University of Illinois at Urbana-Champaign
15:50 -16:10	*Analytical Solutions to Delay Fractional Differential Equations by Using Sumudu Iterative Method* M. Aibinu Durban University of Technology	*Predicting Ranked Choice Voting Winners on Sampled Votes* M. Iceland University of Rochester	*Decay rates for the damped wave equation with time dependent damping* P. Kleinhenz Michigan State University
16:10 -16:30	*Between 1 and $\frac{1}{e}$: History and Methods of an Oscillation Criterion for First-Order Delay Differential Equations* J. Stavroulakis Ariel University	*Some Further Results on Ordinal Bayesian Incentive Compatible Probabilistic Voting Rules* D. Majumdar Concordia University	*Convolution Quadrature solutions of 3D scattering problems in the time domain* C. Turc New Jersey Institute of Technology
16:30 -16:50	*Global Stability, Instability, and Periodicity in Some Differential Delay Physiological Models* A. Ivanov Pennsylvania State University	*p-Norm Approval Voting* M. Orrison Harvey Mudd College	*Asymptotic expansion of the scattering amplitude using local approximations of the Dirichlet to Neumann operator* Y. Boubendir New Jersey Institute of Technology
16:50 -17:10		*Optimized Distortion and Proportional Fairness in Voting* N. Shah University of Toronto	*A Sinc function-based numerical solution of a nonlinear Schr odinger type equation* M. Usman University of Dayton
17:10 -17:30			*A discrete-kinetic entropy conserving and discontinuity capturing scheme for hyperbolic partial differential equations* M. Anandan Indian Institute of Science

Monday, August 14: Afternoon

Time	LH2066	LH3094	LH3098
Room	CS-CPC Computational Physics and Chemistry Chair: R. Meyer Laurentian University	SS-MCSLS #2 Modeling Complex Systems in Life Sciences Chair: B. Emerenini Rochester Institute of Technology	CS-GSRS #2 Graduate Student Research Symposium Chair: C. Weatherby Wilfrid Laurier University
15:30 -15:50	*Computational modelling of heat transport in kinked nanowires* A. Robillard Laurentian University	*Mathematical Models of Novel Ocular Drug Delivery Systems* L. Carichino Rochester Institute of Technology	*Financial News Headlines Sentiment Analysis Enhances Stock Market Prediction* W. Fan Wilfrid Laurier University
15:50 -16:10	*A Numerical Study of the Dynamics of Particles at Fluid Interface* S. Alavi Western University	*Statistically Augmented Finite Element Models to Study Knee Biomechanics* A. Lerner University of Rochester	*A Poisson-Tweedie Framework for Joint Mean and Dispersion Regression Modeling* S. Chen Wilfrid Laurier University
16:10 -16:30	*Temperature Profile in Thin Nanowires* R. Meyer Laurentian University	*A modified error in constitutive equations formulation for elastodynamics inverse problems in the elastography field* O. Babaniyi Rochester Institute of Technology	*An Analysis of Statistical Machine Learning Performance in Bankruptcy Prediction* W. Shen Wilfrid Laurier University
16:30 -16:50	*Droplet dynamics driven by electrowetting* C.-X. Wu Xiamen University	*Balancing statistical power and accuracy through multi-objective optimization of rhythm detection experiments* T. Silverthorne University of Toronto	*Mathematical Models of Exercise-Induced Metabolic Alterations in Men and Women* S. Abo University of Waterloo
16:50 -17:10		*Probability distributions in proteomics data analysis: current status and next steps* N. Mdziniso Rochester Institute of Technology	
17:10 -17:30		*Superposition of two excitation types for gonadotropin-releasing hormone neuron forms two types of exocytosis* M. Chugunova University of Waterloo	

Tuesday, August 15

Tuesday, August 15: Morning

Time	LH1009	LH1010	LH1011
	SS-RANMSC #1	SS-DF #3	SS-RATAWP #3
	Recent Advances in Numerical Methods and Scientific Computing Chair: D. Liang York University	Decisions and Fairness: Appointments and Voting Chair: W.H. Holliday University of California Berkeley	Recent Advances in the Theory and Application of Wave Propagation Chair: E. Kirr University of Illinois at Urbana-Champaign
10:00 -10:20	*Advanced discretization schemes for phase-field fracture* B. Bourdin McMaster University	*A Ramsey-Like Conjecture for Dividing a Circle* W. Stromquist Bryn Mawr College	*Adhesion of Polymer Membranes* K. Promislow Michigan State University
10:20 -10:40	*The preconditioned closest point method for surface PDEs* R. Haynes Memorial University of Newfoundland	*Proportional Consistency in Apportionment Methods* J. Wilson The New School	*Viscous Flow Between Oscillating Concentric Torii* M. Haslam York University
10:40 -11:00	*New analysis of FEMs for miscible displacement in porous media* W. Sun Beijing Normal University at Zhuhai	*Delegate Apportionment Methods: the Quota Condition, Bias, and Thresholds* M.A. Jones American Mathematical Society	*L^2 theory for compressible Euler equations* G. Chen University of Kansas
11:00 -11:20	*A Parallel Spectral Solver for the Incompressible Navier-Stokes Equations in Simple Toroidal Coordinates* M. Haslam York University	*Does the Rule Matter? A Comparison of Preference Elicitation Methods and Voting Rules Based on Data from an Austrian Regional Parliamentary Election in 2019* C. Klamler University of Graz	*Shocks interaction for the Burgers-Hilbert Equation* K.T. Nguyen North Carolina State University
11:20 -11:40	*Deep Reinforcement Learning of Viscous Incompressible Flow* A. Stinchcombe University of Toronto	*An extension of May's Theorem to three alternatives: axiomatizing Minimax voting* W.H. Holliday University of California Berkeley	*On the effects of suitably designed space microstructures in the propagation of waves in time modulated composites* O. Mattei San Francisco State University
11:40 -12:00	*Sparse Random Feature Models and Applications in Signal Processing and Epidemiologic Data* G. Tran University of Waterloo		*Stochastic perturbations of El Nino Southern Oscillations (ENSO): a Wiener chaos approach* Y. Aydogdu University of Waterloo

Tuesday, August 15: Morning

Time	Room LH2066	LH3094	LH3098
	SS-MNAPA #1 Modelling and Numerical Analysis for PDE Applications Chair: L. Davis & F. Pahlevani Montana State University & Pennsylvania State University	SS-CCSMS #1 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Chair: S. Singh University of Prince Edward Island	SS-MF #1 Mathematical Finance Chair: J. Campolieti Wilfrid Laurier University
10:00 -10:20	*Modeling, Digital Twins and Numerical Methods for Model Based Design* J. Burns Virginia Tech	**Semi-plenary Lecture** *Mechanistic Modeling of Complex Social Systems* H. Sayama Binghamton University Abstract & Biography on p. 21	*Portfolio Time Consistency and Utility Weighted Discount Rates* T. Pirvu McMaster University
10:20 -10:40	*Modelling Tools for Mine Water and Environmental Management* H. Gaebler Ecometrix Incorporated		*Portfolio optimization in the family of 4/2 stochastic volatility models* M. Escobar-Anel Western University
10:40 -11:00	*Evaluating and Improving Flow Models for Low Permeability Media* S. Schrader Montana Technological University		*Portfolio Management and Option Pricing under a Multi-Asset Jump Diffusion Model with Systemic Risk* R. Makarov Wilfrid Laurier University
11:00 -11:20	*Ensemble Monte Carlo Penalty Finite Element Method for Navier-Stokes Equations with Random Forcing and Initial Conditions* R. Fang University of Pittsburgh	*Neural Network Method for Solving Parabolic Two-temperature Micro/nanoscale Heat Conduction in Double-layered Thin Films Exposed to Ultrashort-Pulsed Lasers* W. Dai Louisiana Tech University	*Deep Learning method for the complex system of American options* C. Nwankwo University of Calgary
11:20 -11:40	*Fractional Order Transient Free-Convection Flow in a Channel* S. Sarwar King Fahd University of Petroleum and Minerals	*Modeling and Analysis of Mass-Spring systems with Friction - Detachment Waves* M. Shillor Oakland University	*Boundary error control for numerical solution of BSDEs by the convolution method* C. Hyndman Concordia University
11:40 -12:00	*Impact of Chemical Reactions on the Unsteady Flow of Viscoelastic Fluids using Fractional Calculus Approach* A. Rasheed Lahore University of Management Sciences	*Relaxation of Heavy Hole Spins in Wurtzite Semiconductor Quantum Dots* S. Prabhakar Northwest Missouri State University	

Tuesday, August 15: Afternoon

Time	LH1009	LH1010	LH1011
	SS-RANMSC #2	SS-DF #4	SS-TSMDA
	Recent Advances in Numerical Methods and Scientific Computing Chair: M. Haslam York University	Decisions and Fairness: Voting and Fair Division Chair: M.A. Jones American Mathematical Society	Topics in Spatiotemporal Modelling and Data Analysis Chair: D. Becker Wilfrid Laurier University
15:00 -15:20	*Reactive Multiparticle Collision Dynamics (RMPC) as stochastic simulations of reaction-diffusion systems* K. Rohlf Toronto Metropolitan University	*Cutsets and EF1 Fair Division of Graphs* W. Zwicker William Jewell College	*Modelling Terror Attack Data Cluster Phenomena with Self-Exciting Point Process and Forecasting Future Terror Events with Statistical Learning Methods* X. (Sunny) Wang Wilfrid Laurier University
15:20 -15:40	*A posteriori Error Estimates for Numerical Solutions to Hyperbolic Conservation Laws* M.T. Chiri Queen's University	*Modelling the influence of campaign contributions and advertising on Presidential elections* M. Gallego Wilfrid Laurier University	*Quantifying Dependence Between Spatio-Temporal Point Processes and their Mark Distributions with Application to Wildland Fires* D. Becker Wilfrid Laurier University
15:40 -16:00	*VIX Option pricing for non-parameter Heston stochastic local volatility model* W. Xu Toronto Metropolitan University	*The Impact of Brexit in the 2015 UK General Election* M.W. Mak Wilfrid Laurier University	*A new BART prior for flexible modeling of areal spatial data* S. Deshpande University of Wisconsin Madison
16:00 -16:20	*Fast solvers for centrosymmetric linear systems, applications to spectral methods* S. Nataj Simon Fraser University	*Comparing Algorithms for Fair Allocation of Indivisible Items with Limited Information* F. Ziaei Wilfrid Laurier University	*Spatio-Temporal Point Processes: A Novel Approach to Modeling Real Estate Transaction Dynamics* I. Fraser Wilfrid Laurier University
16:20 -16:40	*High-order state redistribution methods on cut cell grids* A. Giuliani Flatiron Institute, Simons Foundation	*Two-person fair division with additive cardinal valuations* D.M. Kilgour Wilfrid Laurier University	*Ensemble-Based Deep Learning Approach for Road Updates Extraction from High-Resolution Satellite Imagery* S.S. Sehra Wilfrid Laurier University
16:40 -17:00	*PETSC-PIC: A Structure Preserving Full Geometry Toolkit for Kinetic Particle-in-Cell Plasma Simulation* J. Pusztay University of Buffalo		*Leveraging cellphone-derived mobility networks in spatiotemporal infectious disease models* J. Slater University of Guelph

Tuesday, August 15: Afternoon

Time	LH2066	LH3094	LH3098
Room	SS-MNAPA #2 Modelling and Numerical Analysis for PDE Applications Chair: L. Davis & F. Pahlevani Montana State University & Pennsylvania State University	SS-CCSMS #2 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Chair: H. Askari & R. Fallahpour University of Waterloo & University of Toronto	SS-MF #2 Mathematical Finance Chair: N. Costanzino Claremont Graduate School
15:00 -15:20	*Multiple solutions to the 2-dimensional Euler equations* A. Bressan Pennsylvania State University	*Stabilization of a Parabolic-Elliptic System via Backstepping* A. Alalabi University of Waterloo	*Sensitivity analysis of climate-economic models* M. Grasselli McMaster University
15:20 -15:40	*Multiscale modeling of biofilm communities with flux balance analysis* T. Zhang Montana State University	*Non-Fourier Bioheat Transfer Analysis of Interstitial Laser Ablation for Treating Brain Tumors* S. Singh University of Prince Edward Island	*Model invariants and functional regularization* H. Stein Columbia University
15:40 -16:00	*A Numerical Study of Time Filtered Schemes for Hyperbolic Equations* F. Pahlevani Pennsylvania State University	*Interplay between Amyloid-beta and Calcium Dynamics in Alzheimer's Disease: A Physics-Informed Bayesian Approach* H. Shaheen Wilfrid Laurier University	*Event-Driven Finance: Trading Biotech Event at Intermediate Timescales* M. Lipkin New York University Tandon
16:00 -16:20	*Vreman Stabilization for Nonlinear Greenshield's Model* J. Reyes University of Nevada Las Vegas	*Effect of Environmental Fluctuations on Patterns in an Ecosystem* S. Pal Wilfrid Laurier University	*The New Regulatory Capital Regime and its Impact on Trading Businesses in Banking* K. Wouterloot Scotiabank
16:20 -16:40	*Analysis of a Model for Ribosome Abundance Regulation Mechanisms in Prokaryotes* L. Davis Montana State University	*A Mathematical Model Coupled with an Agent-Based Model for Studying the Intra-Host Phenomenon of Malaria Taking into Account Treatment and Vaccination* P.N.T. Tandong Cheikh Anta Diop University	
16:40 -17:00		*Predator-prey Dynamics Influenced by Fear, Refuge and their Velocities* Q. Khan Sultan Qaboos University	
17:00 -17:20		*EHD Stability of an Oscillating Streaming Fluid Cylinder* A. Hasan Arab Academy for Science, Technology and Maritime Transport	

Wednesday, August 16

Wednesday, August 16: Posters

Time	Room		
	LH Atrium		
	CS-POST		
	Poster Session		
9:30-10:00 & 14:30-15:00	*Bioeconomic modeling of Sardina pilchardus, Engraulis encrasicolus, and Xiphias gladius populations in the Atlantic Moroccan Zone: Incorporating the effects of tides* N. Baba Hassan II University of Casablanca	*Using the High Dimensional Consensus Mass Spectral similarity algorithm for improved identification of isomers* D. McGlynn National Institute of Standards and Technology	*Climate Change Modelling and Forecasting with Fourier Autoregressive Mov-ing Average Processes* A. Taiwo Olabisi Onabanjo University

Wednesday, August 16: Morning

Time	LH1009	LH1010	LH1011
	SS-RANMSC #3 Recent Advances in Numerical Methods and Scientific Computing Chair: W. Sun Beijing Normal Univ at Zhuhai	SS-MBM #1 Mathematics in Biology and Medicine Chair: K.P. Wilkie Toronto Metropolitan University	SS-CNT #1 Computational Number Theory Chair: C. Weatherby Wilfrid Laurier University
10:00 -10:20	*tost.II: A temporal operator-splitting template library in deal.II* R. Spiteri University of Saskatchewan	*ODE and FDE Models for Cancer Radiotherapy with a Death-Rate Term* K.P. Wilkie Toronto Metropolitan University	*An Algorithm to Generate Random Factored Smooth Integers* J. Sorenson Butler University
10:20 -10:40	*Energy-conserved numerical methods for Electromagnetic Propagations in Nonlinear Metamaterials and with Stochastic Noises* D. Liang York University	*The Mutation Spectrum May Promote Cancer Development in Most Cancer Types* M.Z. Tuffaha Western University	*Ideal solutions in the Prouhet–Tarry–Escott problem* M. Mossinghoff Center for Communications Research
10:40 -11:00	*Space-time HDG for advection-diffusion on deforming domains in the advection-dominated limit* S. Rhebergen University of Waterloo	*Application of Symbolic Differential Operator Discovery in Biological Sciences* L. Podina University of Waterloo	*Fibonacci Primes, Primes of the form $2^n - k$ and Beyond* J. Grantham Center for Computing Sciences, Institute for Defense Analyses
11:00 -11:20	*Data-driven modelling of two-dimensional chaotic fluid flows* J. Alam Memorial University of Newfoundland	*Mathematical modelling of the adaptive immune response: B-lymphocytes and SARS-CoV-2 neutralizing antibodies* S. Farhang-Sardroodi University of Manitoba	*The 0–1 Conjecture for polynomials* K. Hare University of Waterloo
11:20 -11:40	*The Combination Method for Multidimensional Black-Scholes Partial Differential Equations* R. Wu University of Toronto	*The impact of endoplasmic reticulum morphology on IRE1 protein clustering* A. Brown Toronto Metropolitan University	*On Totally Real PCF Parameters* C. Noytaptim University of Waterloo
11:40 -12:00	*Numerical approximation of two dimensional Variable order fractional differential equations* S. Sarwar King Fahd University of Petroleum and Minerals	*Biophysical Modelling of the Mammalian Circadian Clock Suggests Mechanisms for Altered Behaviour of PER2::LUC Mices* A. Stinchcombe University of Toronto	*Advances in Tabulating Carmichael Numbers* J. Webster Butler University

Time	LH2066	LH3094	LH3098
Room	SS-ASDEDS #1 Algebraic Structures of Discrete-Event Dynamical Systems and Applications Chair: C.L. Nehaniv University of Waterloo	SS-CCSMS #3 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Chair: S. Singh University of Prince Edward Island	SS-OCDGA Optimal Control, Differential Games, and Applications Chair: T.K. Nguyen North Carolina State University
10:00 -10:20	*Compact Notation for Finite Transformations* A. Egri-Nagy Akita International University	*A Multiscale Model of Protein Allostery: Side Chain Concerted Motions Initiated by Brownian Kicks* F.J. Burkowski University of Waterloo	*Generic Properties of Mean Field Games* A. Bressan Pennsylvania State University
10:20 -10:40	*Algebraic Structure and Complexity of Games* Z. Gao University of Waterloo	*Efficient Method to Estimate Second-order Sensitivities for Stochastic Discrete Biochemical Systems* F. Jabeen University of Waterloo	*On mean field games and master equations through the lens of conservation laws* J. Graber Baylor University
10:40 -11:00	*State Complexity Relations in Evolved Players of the Iterated Prisoner's Dilemma* J. Lu University of Waterloo	*Mathematical Analysis of Avian Influenza* R. Fallahpour University of Toronto	*On Optimization of Conservation laws with space discontinuous flux* F. Ancona University of Padova
11:00 -11:20	*Algebraic Applications in Investigation of Musical Symmetry* O. Ibragimova University of Waterloo	*Heterogeneous Blood Perfusion Redistribution for Magnetic Nanoparticle Assisted Thermal Ablation: A Coupled Complex System Under Imaging Guidance* M. Singh University of Maryland Baltimore County	*Controlling the spread of invasive biological species* M.T. Chiri Queen's University
11:20 -11:40	*On Constructing Finite Automata by Relational Programming* A. Egri-Nagy Akita International University	*Semi-Analytical Solutions for SIHR Rumor Spreading Model in Social Networks* H. Askari General Motors	*Turnpike phenomena in optimal control* R. Guglielmi University of Waterloo
11:40 -12:00			

Wednesday, August 16: Afternoon

Time	LH1009	LH1010	LH1011
	SS-RANMSC #4 Recent Advances in Numerical Methods and Scientific Computing Chair: R. Spiteri University of Saskatchewan	**SS-MBM #2** Mathematics in Biology and Medicine Chair: C.S. Drapaca Pennsylvania State University	**SS-CNT #2** Computational Number Theory Chair: M. Jacobson University of Calgary
15:00 -15:20	*Efficient Pricing and Hedging of High-Dimensional American Options using Deep Recurrent Neural Networks* A. Na University of Waterloo	*Modeling Sex-Differences in Alzheimer's Disease* C.S. Drapaca Pennsylvania State University	**Semi-plenary Lecture** *Supersingular Isogeny Graphs and Orientations* K. Stange University of Colorado Boulder Abstract & Biography on p. 22
15:20 -15:40	*Study of high-order time-stepping schemes with non-smooth initial conditions* D. Wang University of Toronto	*Magnesium transport in the kidneys: effect of sodium transport inhibition* P. Dutta University of Waterloo	
15:40 -16:00	*Developing optimal control of multicomponent contamination flows in porous media* K.E. Hossain York University	*A Biologically-Detailed, Multi-Scale Simulation of Retinal Physiology* B. Abuelnasr University of Toronto	
16:00 -16:20	*Space-Time Spectral Methods for Partial Differential Equations* C.P.W. Liyange University of Manitoba	*Noise-induced Synchrony Near a Hopf Bifurcation with Asymmetric Noise and Uneven Coupling* G. Jagdev Toronto Metropolitan University	*Markoff mod p Graphs and Maximal Divisors* D. Martin University of California Davis
16:20 -16:40	*Analytical and Numerical Study of Eigenvalues Problem of Beam Dynamics with Consistent and Lumped Mass Matrices* M. Alkinidri King Abdulaziz University	*Agent-based models of interacting microbial populations: model calibration* B. Ingalls University of Waterloo	*Vanishing of twisted L-functions of elliptic curves over function fields* M. Lalin Université de Montréal
16:40 -17:00	*A Synthetic Machine Learning Approach to Estimate Febrile-Episode Survival Period Post-Acute Lymphoblastic Leukemia Diagnosis* N. Shahid Forman Christian College	*Real-time pest management* R. Guglielmi University of Waterloo	*Orienteering with One Endomorphism* M. Chen University of Birmingham
17:00 -17:20		*Simulation based exploration of the effect of ultrasound-induced mechanical stress on biofilm response to antibiotics* M. Ghasemi University of Waterloo	

Time	LH2066	LH3094	LH3098
Room	SS-ASDEDS #2 Algebraic Structures of Discrete-Event Dynamical Systems and Applications Chair: A. Egri-Nagy Akita International University	SS-CCSMS #4 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Chair: H. Askari & R. Fallahpour University of Waterloo & University of Toronto	CS-GEN #1 Applied Problems and Methods + Computational Mechanics Chair: S. Léger Université de Moncton
15:00 -15:20	*Green's J-classes and Subduction Classes in Finite Transformation Semigroups* C.L. Nehaniv University of Waterloo	*Integrating Emotion-specific Factors into the Dynamics of Bio-social and Ecological Systems: An Example of Predator-Prey Models Accounting for Psychological Effects* S. Saha Wilfrid Laurier University	*A continuum space is the infinitely great* Q. Li Shijiazhuang Traditional Chinese Hospital
15:20 -15:40	*Analysis of the Semigroup Related to the Petri Net of a Traffic Roundabout* M. Zheplinska University of Waterloo	*The Influence of Coupled Electromechanical Effects on the Behavior of Active Biological Materials* A. Venkateshwarlu Wilfrid Laurier University	*Efficacy of model selection criteria in var model order selection under different pattern covariance structures* J. Salim American University of Beirut
15:40 -16:00	*The study of the transformation semigroup of the Abelian and directed non-Abelian sandpiles* H. Derets University of Waterloo	*Numerical Modeling and Simulation of Acupuncture-like Physical Therapy to Promote Healthy Aging* S. Singh University of Prince Edward Island	*Privacy-Preserving Cryptocurrency Transactions in a Regulated Decentralized Environment (PPCT-RDE)* I.A.E. Elfadul University of Electronic Science and Technology of China
16:00 -16:20	*Algebraic structure of computation with a focus on causality* U. Bajaj University of Waterloo	*Effect of Thermo-electromechanical Coupling on the Performance of Lead-free Piezoelectric Materials* A. Akshayveer Wilfrid Laurier University	*Robust continuation method for tracing solution curves with critical points* S. Léger Université de Moncton
16:20 -16:40		*A Tire Side Slip Model with Dynamic Friction Distribution over the Contact Patch* S. Zhap Jinlin University	*Dynamical Analysis of Axially Loaded Beam Supported by One Parametric Foundation: A Numerical Study* H. Alahmadi Jouf University
16:40 -17:00		*Stability Analysis of Nonlinear Singularly Perturbed Fisher-KPP Equation using an Element-free Galerkin Algorithm* J. (Jagbir) Kaur Thapar Institute of Engineering and Technology	*Computational Fluid Dynamics of Solar Collector Efficiency Enhancement with Al2O3-Water Nanofluid using Non-Newtonian Model* M. Khalili Najafabadi University of Miskolc

Thursday, August 17

Thursday, August 17: Morning

Time	Room LH1009	LH1010	LH1011
	SS-RPCDSA #1 Recent Progress in Complex Dynamical Systems and Applications Chair: M.S. Alwan University of Saskatchewan	SS-MNPE Modelling NPI and PI in Epidemics/Pandemics Chair: J. Heffernan York University	SS-CNT #3 Computational Number Theory Chair: C. Weatherby Wilfrid Laurier University
10:00 -10:20	*Optimal Control of Nonsmooth Dynamical Systems via Direct Methods* P. Stechlinski University of Maine	*Rotating waves of multi-strain virus with cross immunity* B. Majeed York University	*Bounds on Codes from Fiber Products of Curves with Many Points* M. West University of Wisconsin Eau Claire
10:20 -10:40	*Recent advances in generating convex relaxations for parametric dynamical systems* K.A. Khan McMaster University	*Heterogeneity in Disease-Free Social Influenza Affects Disease Dynamics* C. Tovissode University of Idaho	*Large rank specializations of Shioda's curve and a conjecture of Erdos on powerful numbers* G. Walsh University of Ottawa
10:40 -11:00	*Event-Triggered Impulsive Stabilization for Nonlinear Systems* K. Zhang Queen's University	*Risk heterogeneity, in-groups, and epidemic waves* B. Baumgaertner University of Idaho	*Surfaces with maximal Picard number* A. Logan Tutte Institute for Mathematics and Computation
11:00 -11:20	*Fractional-order sliding-mode-based adaptive robust predictive control of saturated input network connected systems with singular control gain* L. Khoshnevisan University of Waterloo	*Noise-induced Synchrony Near a Hopf Bifurcation with Asymmetric Noise and Uneven Coupling* Y. Tan York University	*What can theta functions tell us about Abelian threefolds?* C. Vincent University of Vermont
11:20 -11:40	*Pinning impulsive control for synchronization of multi-layer delayed complex-valued dynamical networks* Y. Shen University of Waterloo	*Multiplex network modeling for the impact of the opinion and behavior of mask-wearing on the spreading and control of COVID-19* S. Gholizadeh York University	*Hyperelliptic curves in Abelian surfaces* J. Love McGill University
11:40 -12:00	*Stability and Qualitative Analysis of a Switched SQEAIR-Based Epidemic Model* Z. Abbasi University of Waterloo	*Modeling Variable Compliance to Non-Pharmaceutical Interventions in Controlling Outbreaks* J. Bélair Université de Montréal	*Twists of the Burkhardt Quartic Threefold* N. Bruin Simon Fraser University
12:00 -12:20	*Deciphering the stochastic spatiotemporal dynamics of calcium transients using the flux-balance model* A. Khadra McGill University	*Investigating the Impact of Novel Transmission-Blocking Anti-malarial Drugs: A Mathematical Modelling Approach* W.A. Woldegerima York University	

Thursday, August 17: Morning

Time	LH2066	LH3094	LH3098
	SS-AIIPMM #1 Artificial Intelligence, Inverse Problems, and Mathematical Modelling Chair: H. Kunze University of Guelph	SS-CCSMS #5 Coupled Complex Systems and Multiple Scales, Their Modelling, and Applications Chair: S. Singh University of Prince Edward Island	
10:00 -10:20	*Annealing a Genetic Algorithm for Constrained Optimization* F. Mendivil Acadia University	*Modeling the Compaction of Bacterial Chromosomes by Biomolecular Crowding and the Cross-linking Protein H-NS* B.-Y. Ha University of Waterloo	
10:20 -10:40	*Sparse Bayesian Neural Networks: Tackling Overfitting, Uncertainty Quantification and Computational Challenges* N. Dabiran Carleton University	*Mathematical Modeling of Two-Channel Disordered Intracellular Transport* I. Dhiman Kwantlen Polytechnic University	
10:40 -11:00	*From Interval-valued Neurons to Convex-set-valued Neurons* B. Boreland Deloitte	*Modified Pennes Bioheat Equation with Heterogeneous Blood Perfusion* M. Singh University of Maryland Baltimore County	
11:00 -11:20	*Computational Considerations for Implementation of the Collage Method for ODE Inverse Problems* K. Levere University of Guelph	*Self-similar Heat Transfer in a Turbulent Particle-laden Free Flow* H.R. Zandi Pour Politecnico di Torino	
11:20 -11:40	*Model-free Inverse Problems for Ordinary Differential Equations* H. Kunze University of Guelph	*An Improved Model for the Degradation of Bioresorbable Polymer for Medical Devices* N. Nansak Atlantic Technological University	
11:40 -12:00	*Telling Oil Temperature for Frying from Audio and Video Signals based on Multimodal Learning* M. Veremchuk University of Waterloo	*Analysis Of Blood Flow Through Multiple Stenoses in A Narrow Artery* S. Kumar Dr. Bhimrao Ambedkar University	

Time	Room LH1009	LH1010	LH1011
	SS-RPCDSA #2 Recent Progress in Complex Dynamical Systems and Applications Chair: Y. Shen University of Waterloo	CS-BSM Mathematics and Computation in Biological Sciences and Medicine Chair: W.A. Woldegerima York University	SS-CNT #4 Computational Number Theory Chair: M. Jacobson University of Calgary
15:00 -15:20	*Stability-Type Properties for Cascade Impulsive Systems with Input Disturbance* M.S. Alwan University of Saskatchewan	*Machine Learning Models to Classify and Predict Subclinical Atherosclerosesis* W.A. Woldegerima York University	*Computing Class Groups of Quartic Number Fields* D. Marquis University of Calgary
15:20 -15:40	*Neural network-based hybrid impulsive control of vehicle platoons* Z.L. Liang University of Waterloo	*Modelling the Effect of Sex Steroid Hormones on the Resolution of Absence Seizures* M. Ahmed University of Waterloo	*Unconditional Computation of Fundamental Units in Number Fields* R. Yee University of Calgary
15:40 -16:00	*Dynamic event-triggered stability of delayed stochastic systems* P.L. Yu South China University of Technology	*Inferring Bacterial Conjugation Events with Integer Programming* N. Kendal-Freedman University of Waterloo	*A Lower Bound for the Area of the Fundamental Region of a Binary Form* A. Mosunov University of Waterloo
16:00 -16:20	*Observer and Command Filter-Based Prescribed Performance Control for a Class of Nonlinear System with Mismatched Disturbances* M. Wang Nanjing University of Science and Technology	*Chemical Rate Laws and Mean First Assembly times for aggregating systems* P. Kunwar Toronto Metropolitan University	
16:20 -16:40	*Dynamic behaviors of a stochastic genetic regulatory networks with switching parameters and impulsive effects* Y. Song Northwestern Polytechnical University	*Benchmarking computational peritoneal dialysis models: A comparative study* S. Swapnasrita Maastricht University	
16:40 -17:00	*Quasi-synchronization of fractional-order multiplex networks with parameter mismatch via intermittent control* Y. Xu Harbin Institute of Technology	*Intra-subject Respiratory Motion Modeling Based on 4D CT Images via Diffeomorphic Approach* Y. Zeng Sichuan University-Pittsburgh Institute	
17:00 -17:20	*Convergence Analysis of the Hogwild! Algorithm* M. Zhang University of Waterloo	*Modelling of Cure in Population Based Cancer Study across Age Groups* P. Koleoso Nile University of Nigeria	

Thursday, August 17: Afternoon

Time	LH2066	LH3094	LH3098
	SS-AIIPMM #2 Artificial Intelligence, Inverse Problems, and Mathematical Modelling Chair: F. Mendivil Acadia University		CS-GEN #2 Computational Algebra + Environmental Science + PDEs, Integral Equations Chair: H. Gaebler Ecometrix Incorporated
15:00 -15:20	*An Optimization-based Approach to Image Fusion using Structural Similarity* M. Ebrahimi Ontario Tech University		*Domain Decomposition-based Scalable Solvers for Time Dependent and Nonlinear Stochastic Systems* S. Sharma Carleton University
15:20 -15:40	*Exploring the use of gradients in the Structural Similarity image quality measure* A. Kunze University of Waterloo		*The Discrete Convolution and Convolution Equations for Fractional Cosine-Sine Series* Q. Feng Yanan University
15:40 -16:00	*Anomaly Detection of Time-series Data with Gaussian Process with Application to Wind Turbine Blade* A. Omar Carleton University		*Modelling delay propagation within a network of the outbound flights at a hub airport* A. Seifi Amirkabir University of Technology, University of Waterloo
16:00 -16:20	*Bayesian Inference of Geo-spatial COVID-19 Spread using Scalable Solvers* S. Sharma Carleton University		
16:20 -16:40	*A hybrid method for forecasting COVID-19 cases using artificial neural networks and inverse problem* P. Subhendu University of Guelph		
16:40 -17:00	*Investigations on the Impact of Loss Function Normalization Methods in Physics Informed Neural Networks for Infectious Disease Modeling* M. Pantano Carleton University		

Friday, August 18

Friday, August 18: Morning

Time	LH1009	LH1010	LH1011
	CS-DSDE #1 Applications of Dynamical Systems and Differential Equations Chair: N. Doyon Université Laval		SS-SDMICN Spatial Data and Modelling Including the Canadian North Chair: S. Roberts Wilfrid Laurier University
10:00 -10:20	*Comparison of extended Kalman filter and recurrent neural networks for state estimation* A. Kaur University of Waterloo		*A high-resolution, continental scale, and modular flood risk estimation framework* C. Chaudhuri Geosapiens Inc.
10:20 -10:40	*Modelling transmission dynamics of Lassa fever transmission with environmental transmissions* C.E. Madubeuze York University, University of Agriculture Makurdi		*DSTree: A spatio-temporal indexing data structure for distributed networks* M. Hojati Wilfrid Laurier University
10:40 -11:00	*Existence theory and Ulams stabilities for switched coupled system of implicit impulsive fractional order Langevin equations* R. Rizwan Renmin University of China		*Mapping Regional Change in Snow Water Equivalent using Deep UNET - Siamese Convolutional Neural Networks* K. Malik University of Toronto
11:00 -11:20	*Dynamics of a Plant Virus Propagation Model with Vector Preference and Latent Periods* J. Collera University of the Philippines Baguio		*Spatially distributed modelling of ice thickness and phenology on Northern Lakes* G. Attiah Wilfrid Laurier University
11:20 -11:40	*New variance related dynamics in the Wilson-Cowan model* N. Doyon Université Laval		*Slave River Delta Ice Cover and Water Classification Using Machine Learning Techniques* I. Moalemi Wilfrid Laurier University
11:40 -12:00			*Machine-Learning-based Spatial Route Planning in Polar Regions* C. Robertson GSTS
12:00 -12:20			*Towards Exact DGGS representation using Hierarchical Goldberg Polyhedron base solids* S. Roberts Wilfrid Laurier University

Friday, August 18: Morning

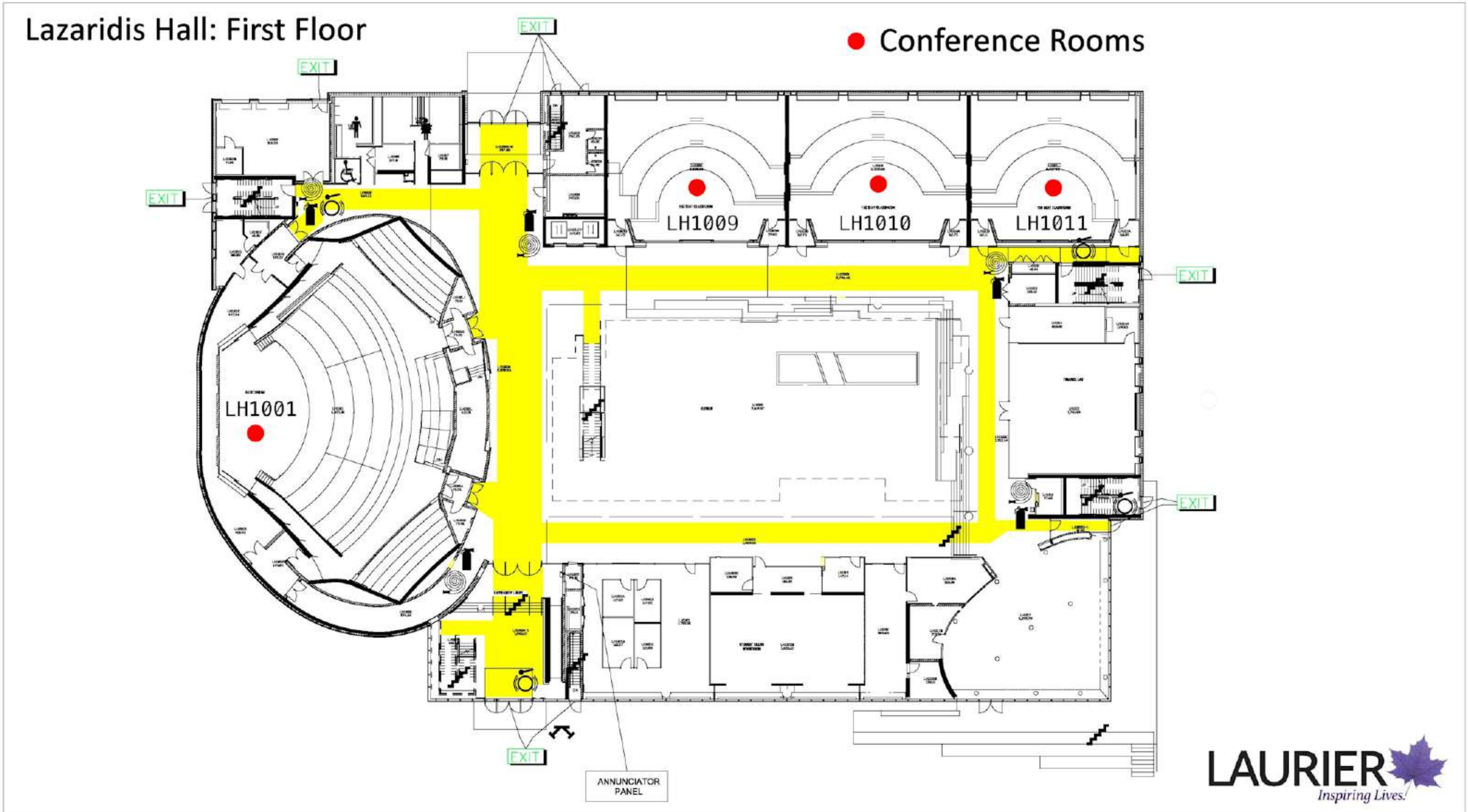
Time	LH2066	LH3094	LH3098
Room	SS-QCQPQM #1 Quantum Computation, and Other Quantum Process in Quantum Matter Chair: L. Wu University of the Basque Country UPV/EHU and Ikerbasque, Basque Foundation for Science	SS-MMNN1 #1 Mathematical Models for Nanoscience and Nanotechnology Chair: K. Akbari Queen's University	SS-DSBEA #1 Dynamical Systems in Biological and Engineering Applications Chair: M. Han Auburn University
10:00 -10:20	*Speed limits for two-qubit gates with weakly anharmonic qubits* S. Ashhab National Institute of Information and Communications Technology, Japan	*Simulation of Hubbard Model in Realistic Voltage-Controlled Quantum Dot Devices* Z. Merino University of Waterloo	*Complex oscillatory patterns in a predator-prey model featuring three time scales* S. Sadhu Georgia College & State University
10:20 -10:40	*Correcting the Coherence of a Quantum State in a Noisy Environment* M. Byrd Southern Illinois University	*Modeling of Charging Dynamics in Electrochemical Systems with a Graphene Electrode* M. Yavarian University of Waterloo	*A pressure-Based Model of IV Fluid Therapy Induced Volume Kinetics in Cats* A. Willms University of Guelph
10:40 -11:00	*Unveiling out-of-time-order correlators from stochastic operator variance* A. Chenu University of Luxembourg	*Modeling quantum photonic neural networks with experimental imperfections* J. Ewaniuk Queen's University	*The effects of nonlinearity on the dynamics of a flexible spinning blade undergoing pitching* D. Clarabut Carleton University
11:00 -11:20	*Shortcuts to Adiabaticity in Krylov Space* A. del Campo University of Luxembourg	*Calculation of carriers mobility in single-layer supported Phosphorene using the energy loss method* M. Moshayedi University of Waterloo	*Optimal Experimental Design for Systems and Synthetic Biology* B. Ingalls University of Waterloo
11:20 -11:40	*Many-body State Preparation in a Jaynes-Cummings Lattice* L. Tian University of California Merced	*Design and Optimization of InP Grating for Efficient Light Coupling in Quantum Photonic Circuit* K. Shadkami Queen's University	*Parameter Estimation of Hodgkin-Huxley Model: A Comparative Study of Metaheuristics and Neural Network Approaches* P. Yue University of Guelph
11:40 -12:00	*Emulating some exotic topological quantum effects with ultracold atoms* Z. Wang The University of Hong Kong		*A Bayesian Framework for the concurrent estimation of time-varying and time-invariant parameters in stochastic compartment models* B. Robinson Carleton University

Time	Room LH1009	LH1010	LH1011
	CS-DSDE #2 Applications of Dynamical Systems and Differential Equations Chair: L. Butler University of Manitoba		
15:00 -15:20	*Strictly Uniform Exponential Decay of the Mixed-FEM Discretization for the Wave Equation* L.A. Mora University of Waterloo		
15:20 -15:40	*On the existence of global weak solutions to the 3D electrically conductive Rosensweig system and their convergence towards quasi-equilibrium* A. Ndongmo Ngana North West University		
15:40 -16:00	*Non-ergodicity of the Kusnezov-Bulgac-Bauer thermostatted harmonic oscillator* L. Butler University of Manitoba		
16:00 -16:20			
16:20 -16:40			
16:40 -17:00			

Friday, August 18: Afternoon

Time	Room: LH2066	LH3094	LH3098
	SS-QCQPQM #2 Quantum Computation, and Other Quantum Process in Quantum Matter Chair: L. Wu University of the Basque Country UPV/EHU and Ikerbasque, Basque Foundation for Science	SS-MMNN #2 Mathematical Models for Nanoscience and Nanotechnology Chair: K. Akbari Queen's University	SS-DSBEA #2 Dynamical Systems in Biological and Engineering Applications Chair: Z. Zou Western University
15:00 -15:20	*Switching spinless and spinful topological phases of quantum matter by modulating gauge fluxes* Y.-X. Zhao Nanjing University	*Wavelet Operational Matrices and Lagrange Interpolation Differential Quadrature-Based Numerical Algorithms for Simulation of Nanofluid in Porous Channel* A. Alqahtani Princess Nourah Bint Abdulrahman University	*Behaviour quantification vis-à-vis adoption of public policy – NPI measures during COVID-19 in Ontatio* M. Cojocaru University of Guelph
15:20 -15:40	*Simulating spin qubit control in realistic semiconductor quantum dot devices* B. Kromets University of Waterloo	*Shapelet-based orientation and defect identification method for nanostructured surface imaging* M.P. Tino University of Waterloo	*Modeling the cytotoxicity of Romidepsin reveals the ineffectiveness of this drug in the "shock and kill" strategy* Q. Deng Nanjing University of Science and Technology Wilfrid Laurier University
15:40 -16:00	*Mimicking of states with limited resources: passing quantum exam via global control* E. Sherman University of the Basque Country UPV/EHU and Ikerbasque, Basque Foundation for Science	*Convective Analysis for Flow of Oldroyd-B Nanofluid Saturated Permeable Medium under the Effect of Magnetic Field for Biomedical Applications* J. (Jeevanpreet) Kaur Panjab University	*A mathematical model between keystone species: bears, salmon and vegetation* X. Wang Trent University
16:00 -16:20	*Strong coupling quantum thermodynamics* W.-M. Zhang National Cheng Kung University	*Energy losses and transition radiation in particle/anisotropic 2D-material interaction* K. Akbari Queen's University	
16:20 -16:40			
16:40 -17:00			

14. Maps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Conference Rooms
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LH1009
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LH1001
ANNUNCIATOR PANEL
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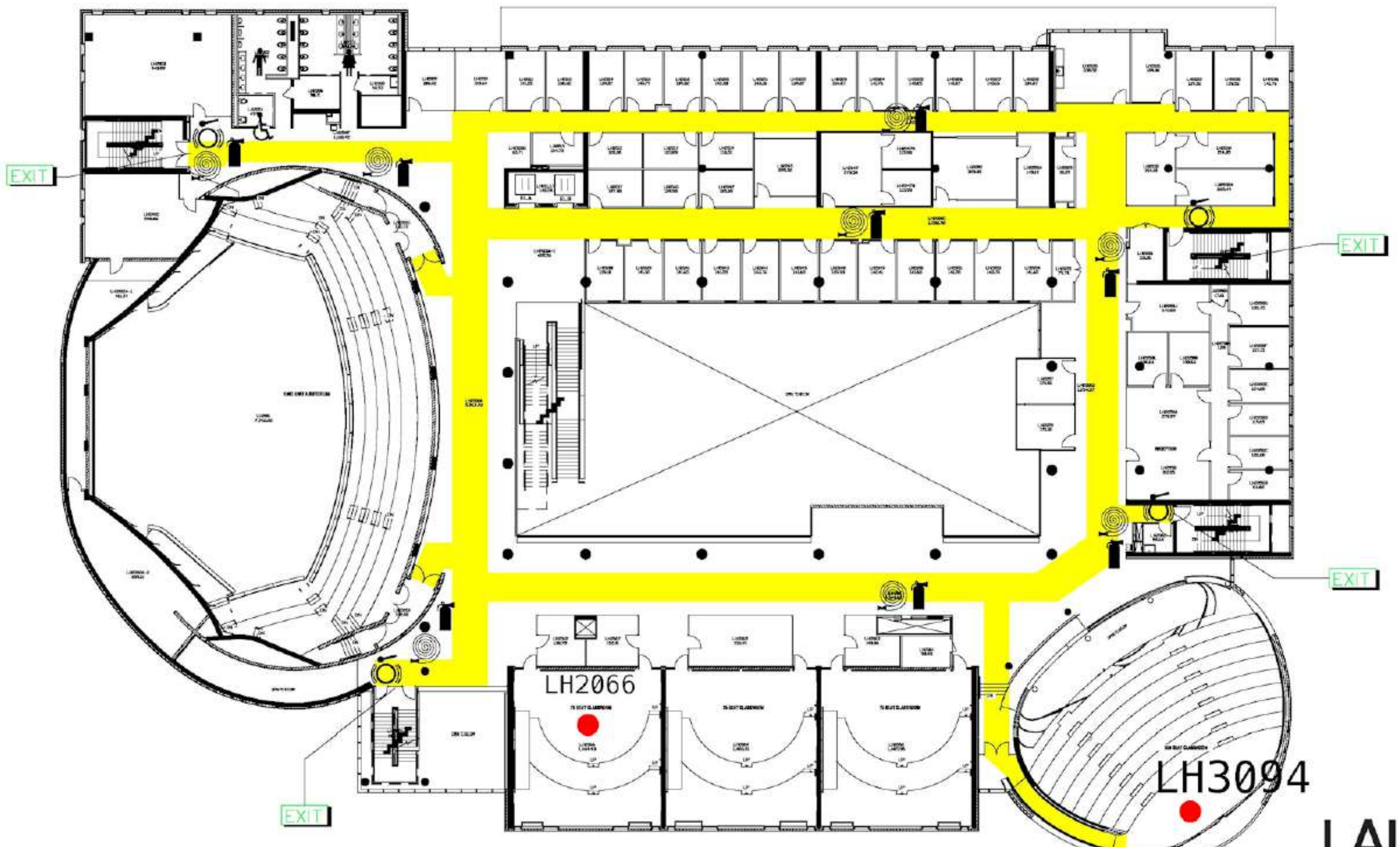
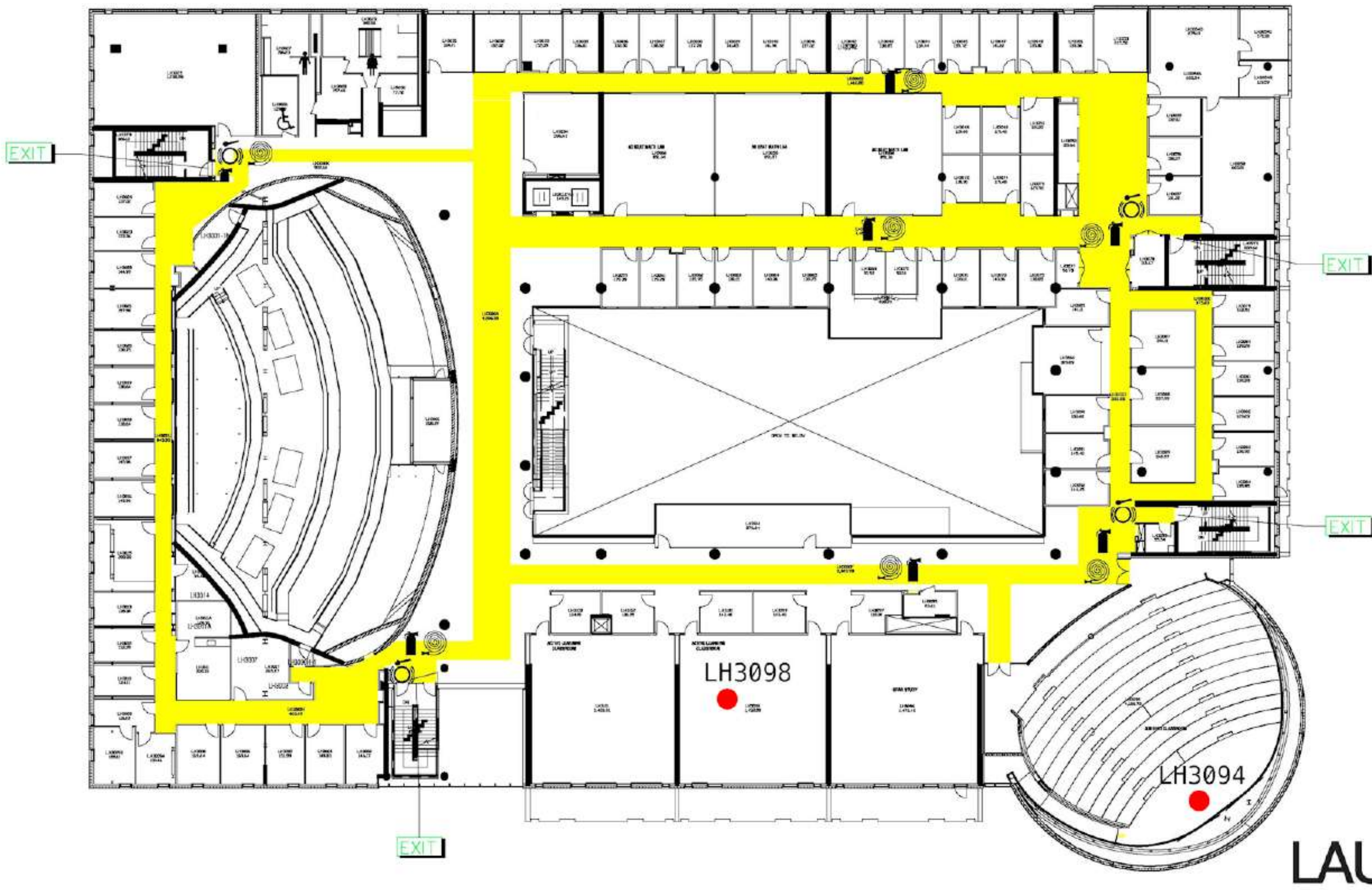
Lazaridis Hall: Second Floor

● Conference Rooms



Lazaridis Hall: Third Floor

● Conference Rooms



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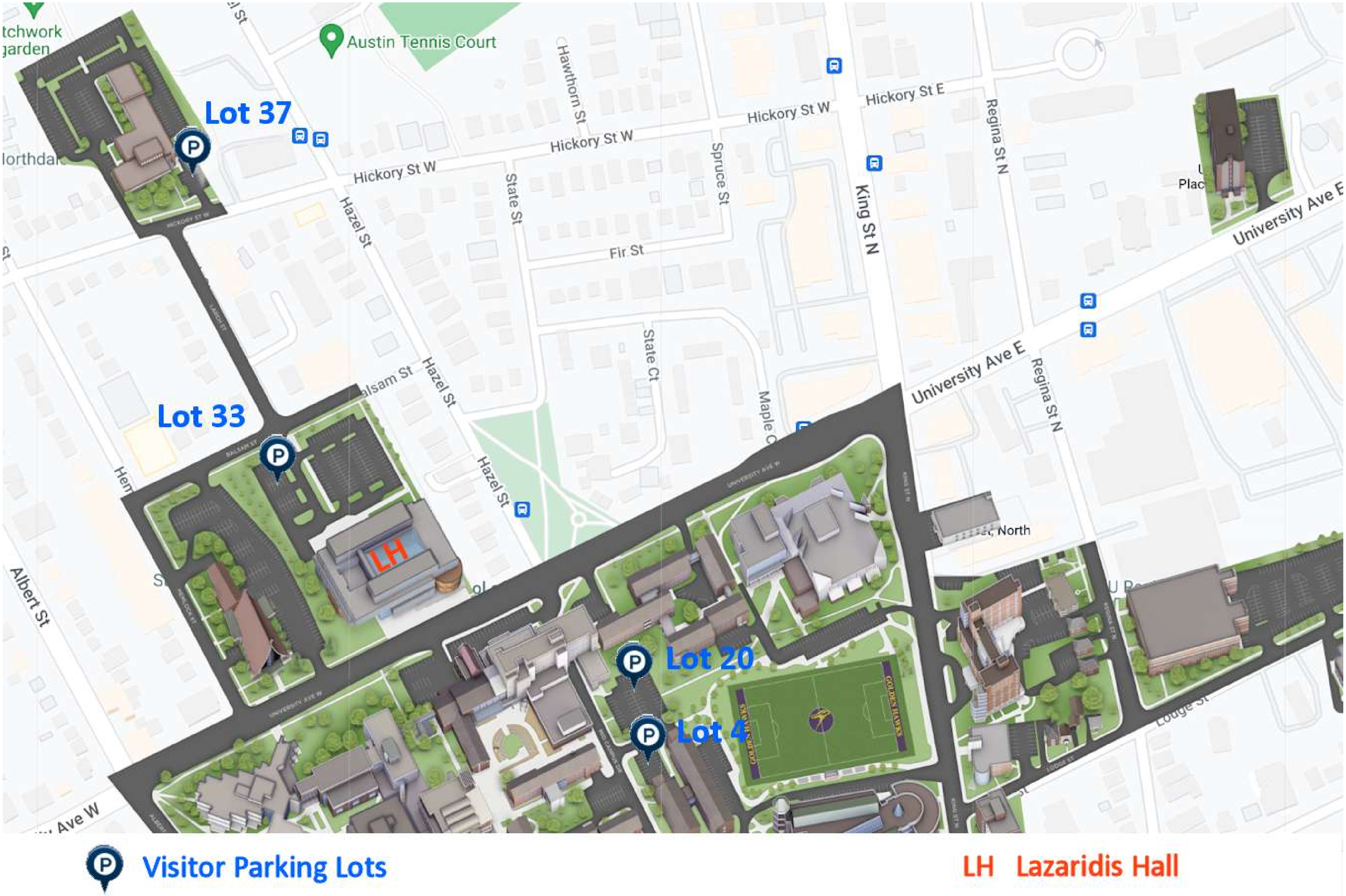

15. Hyperlinked Index of Speakers

16. Index of Participants with Book of Abstracts Page Numbers

(Note: Coloured page links may open the Book of Abstracts at the given page number; this feature appears to be browser-dependent.)

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