VIIth AMMCS 2026
INTERNATIONAL CONFERENCE

AUGUST 17–21

WATERLOO, ONTARIO, CANADA

Mathematics and Computation in Biological Sciences and
Partial Differential and Integral Equations in Materials
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 to the VIIth AMMCS International Conference

On behalf of the Organizing, Scientific, and Technical Committees of the AMMCS International Conference, welcome to this exciting event! We are glad that you are here.

The AMMCS Conference Series endeavours to promote interdisciplinary research and collaborations involving advances in Applied Mathematics, Modeling and Computational Science. This year, the AMMCS conference will be held in conjunction with ALIFE, the world's premier Artificial Life Conference.

AMMCS-2026 will take place from August 17 through 21, 2026 on the Waterloo Campus of Wilfrid Laurier University in Waterloo, Ontario, Canada. This is the seventh meeting of our international and interdisciplinary conference, which began in 2011. All AMMCS meetings have been held at Wilfrid Laurier University.

The AMMCS Conference has always aimed to highlight recent advances in Applied Mathematics, Modeling and Computational Science. This year our ambitious scientific program features

- 5 one-hour plenary presentations
- 6 semi-plenary and award speakers
- 13 special sessions, plus contributed, arranged in 40 parallel sessions
- up to 5 parallel tracks
- 6 ALIFE plenary presentations
- an array of ALIFE special sessions, tutorials, workshops, and an art exhibition

Moreover, as the Conference ends, 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 17 August there will be one AMMCS plenary every day, in either the morning or the afternoon (alternating with the ALIFE plenary). Our distinguished plenary speakers will set the tone for our scientific programs, over both morning and afternoon sessions, continuing through the entire week.

The AMMCS-2026 scientific program was designed to provide not only for in-depth technical discussions, but also for the exchange of ideas in Applied Mathematics, Modeling and Computational Science. One of our primary objectives is to promote interdisciplinary research, and we are keenly aware that our namesake disciplines are widely and fruitfully applied to the natural and social sciences, engineering and technology, industry, finance, economics, and management. The promotion of interdisciplinary research is a proud tradition of AMMCS.

The Conference venue is the Waterloo campus of Wilfrid Laurier University, the oldest university in the Cambridge-Kitchener-Waterloo-Guelph area. It lies in a beautiful part of Southwestern Ontario, 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.

The Organizing, Scientific, and Technical Committees express their gratitude to everyone helping in the development and management of AMMCS-2026. We are especially appreciative of the organizers of the Special Sessions and of the authors who submitted their work; they are the basis for the Conference. The contributions of many volunteers, and the support of our sponsors, enabled us to produce what we believe to be an outstanding program.

We are confident that AMMCS-2026 will be a dynamic, exciting, and professionally fulfilling event. We hope that every attendee will have an opportunity to enjoy this beautiful part of the world. We hope not only that you enjoy your experience at AMMCS-2026 but also that you will be inspired by it. Our ideal is for everyone to take home new ideas and new insights, as well as good memories.

Marc Kilgour, Roderick Melnik, and Sunny Wang, General Chairs
The VIIth 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 16	16:00-18:00 19:00-21:00	Lazaridis Hall Atrium
Monday, August 17	7:30-11:30 13:30-15:30	Lazaridis Hall Atrium
Tuesday, August 18	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Wednesday, August 19	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Thursday, August 20	8:00-11:00 13:30-15:30	Lazaridis Hall Atrium
Friday, August 21	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.	
For more details on Visitor Parking Options, please visit the WLU Parking page the parking map and/or the WLU Interactive Map/Parking page	**On-campus parking** is available, seven days a week, in Lots 4, 12, 20, & 33. Additional **HONK visitor parking** spaces are available in Lots 2, 3A, 14, 24, and 37.	Please refer to a campus map for some key Lot locations. All payments are made using HonkMobile at $3.75 per hour or $15 flat rate (from 7:00-23:00). Payment is made digitally at time of parking.
	After 16:30, there is **free parking** in white permit areas in Lots 18 and 48.	
	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 16	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 18	13:00-13:30	Maplesoft Session	LH1001	See next page.
Wednesday August 19	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 20	12:00-12:15	Joint AMMCS & ALIFE Conference Photoshoot	Lazaridis Hall Atrium	Meet in Lazaridis Hall atrium the photo shoot
Friday August 21	12:00-13:30	Complimentary Lunch	Lazaridis Hall Atrium	Meet in Lazaridis Hall atrium
Friday August 21	17:00-17:30	Conference Prizes, Closing	LH1009	Announcement and awarding of the Conference Prizes, and the closing of the Conference.

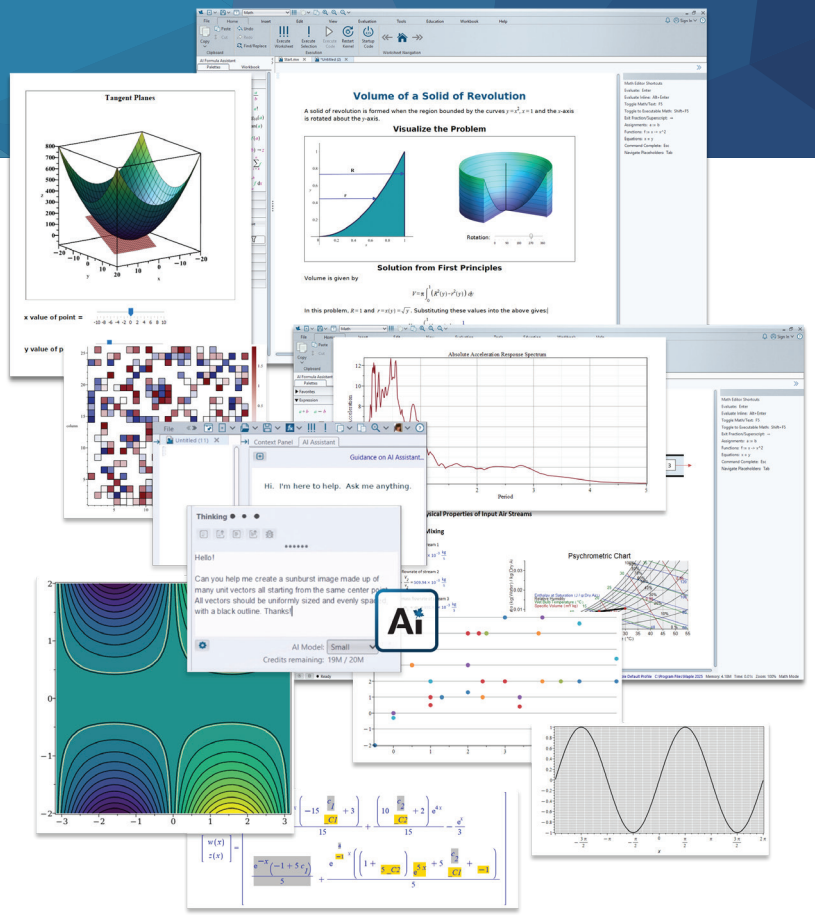
JOIN OUR PRESENTATION

Maple: Math Software for Computation, Research and Teaching

Tuesday, August 18 | 1:00 - 1:30pm

Location: Lazaridis Hall, LH1001

with Paulina Chin, Senior Architect, Maplesoft



Maple is a mathematical software environment for symbolic and numeric computation, visualization, programming, and technical document creation. Built around a powerful mathematics engine, Maple supports a wide range of work in mathematics, science, and engineering, from solving differential equations and exploring dynamical systems to optimization, data analysis, application development, and the creation of interactive teaching materials. It also has a full-featured programming language and tools allowing connectivity to other products.

In this talk, we will demonstrate how Maple can support modelling, research, and teaching workflows. The session will include examples of Maple's core capabilities as well as notable new features in Maple 2026, including the AI Assistant and Document Import, which allows users to bring research papers, handwritten notes, slides, and course notes directly into Maple as editable mathematical content.

All attendees will be offered a limited-term license of Maple. Please join us and see what Maple 2026 can do for you.

Can't make the session?

Visit **www.maplesoft.com/maple** or use the QR code to find out more and try Maple free.

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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 21, 17:00-17:30, in LH1009.

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

AMMCS 2026 Prize	Description: To be eligible,
Best Student 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 2026 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 17, 9:00-10:00, in Room LH1001

Anita Layton, University of Waterloo

About the speaker: Anita Layton is the distinguished University Professor and Professor of Applied Mathematics, Computer Science, Pharmacy and Biology at the University of Waterloo. Her research focuses on the development and application of mathematical models to gain insights into human and mammalian physiology and pathophysiology. In particular, she is interested in the effect of sex and circadian clock in kidney function, kidney disease, diabetes, and cardiovascular disease. She is the Editor of SIAM Review Book Section, a section editor of the SIAM journal on Life Sciences, an associate editor of SIAM Journal on Applied Dynamical Systems, Mathematical Medicine and Biology, Frontier in Physiology, Maple Transactions, and an AI/Machine Learning Section Editor for Hypertension. She is a Fellow of the Royal Society of Canada, the American Physiological Society, the Canada Mathematical Society, and the Association of Women in Mathematics. She is also the 2021 winner of the Krieger–Nelson Prize of the Canadian Mathematical Society, a 2021 winner of the Top 100 Most Powerful Women in Canada by the Women's Executive Network, the 2023 winner of the Award of Merit by the Federation of Chinese Canadian Professionals, the 2023 winner of the John L. Synge Award by the Royal Society of Canada, the 2025 winner of the CAIMS Research Prize, and the 2026 winner of the Ernest H. Starling Distinguished Lecture Award, American Physiological Society Water & Electrolyte Homeostasis Section.

Math as a New Microscope

The invention of the microscope transformed biology by revealing structures and processes that were previously beyond the reach of observation. Mathematical modeling offers a different but equally powerful way of seeing: it allows us to probe mechanisms, test hypotheses, and explore scenarios that cannot be directly examined experimentally. This talk will discuss how mathematics can serve as a tool for discovery in the life sciences. By combining physical principles, biological knowledge, and quantitative data, mechanistic models provide a framework for connecting processes that span multiple spatial and temporal scales, from molecular interactions to whole-organ and organism-level function. Like a microscope with adjustable magnification, mathematical models allow us to focus on different levels of organization while maintaining a coherent view of the underlying system. Using examples from computational physiology, I will illustrate how mathematical models can be used to uncover emergent behavior, quantify the contributions of interacting mechanisms, identify critical knowledge gaps, and generate experimentally testable predictions. These examples highlight the increasingly important role of mathematics not merely as a language for describing biological systems, but as an instrument for investigating them. In this sense, mathematical models can reveal aspects of physiology that would otherwise remain hidden, much as the microscope once revealed an unseen biological world.

Conference Plenary Lectures

Monday, August 17, 14:00-15:00, in Room LH1009

Wesley Holliday, University of California Berkeley

About the speaker: Wesley H. Holliday is Professor of Philosophy and Chair of the Group in Logic and the Methodology of Science at the University of California, Berkeley. He received his PhD from Stanford University for a dissertation in logic that won the E.W. Beth Dissertation Prize from the Association for Logic, Language, and Information. Since then, he has worked mainly in logic and social choice theory. In logic, his research has ranged over modal and nonclassical logic, logic and the formal semantics of natural language, and logic and probability. He has been an editor of several logic journals, including The Review of Symbolic Logic, Journal of Philosophical Logic, and the new Philosophical Logic. In social choice theory, he has focused on voting theory, computational social choice, and applications of social choice to AI safety. He is an affiliate of the Institute for Mathematics and Democracy, a co-developer of the Stable Voting website, and a co-developer of the Preferential Voting Tools library.

Axioms and Impossibilities in the Theory of Voting

The axiomatic method familiar to mathematicians has inspired axiomatic approaches to other domains, including economic and political domains. I will discuss the axiomatic approach to the theory of voting, a topic that is both practically relevant for the design of elections and of interest to theorists in several fields. Although there are differences in how "axioms" are viewed across domains, there are also common types of questions. Given a set of axioms for geometry, set theory, etc., we may ask: does there exist a model that satisfies all of the axioms? Which axioms are independent of others? Can we find axioms that uniquely characterize a given model? Parallel questions arise in the theory of voting. After reviewing the classic axiomatic impossibility theorems of Arrow and Gibbard-Satterthwaite, I will discuss a new impossibility theorem for preferential voting, wherein voters submit rankings of the candidates. Roughly speaking, no voting rule satisfies the following four principles: a candidate who beats all other candidates in head-to-head majority comparisons must win the election; a candidate who loses to all others in head-to-head majority comparisons must lose; adding voters who rank a candidate first should not turn that candidate from a winner into a loser; and ties for winning can be broken by adding a bounded number of voters. Any three of these axioms is satisfied by some voting rule actually in use, whereas the classic impossibilities include axioms violated by almost all voting rules in use. Thus, the new theorem presents a genuine four-way fork in the road for choosing a voting rule. It exemplifies how axiomatic results can be useful in designing a voting rule for a particular application, by making salient the tradeoffs one must make.

Conference Plenary Lectures

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

Leopoldo Bertossi, Carleton University

About the speaker: Professor Leopoldo Bertossi is an Emeritus Professor of Computer Science at Carleton University, Canada; and an Adjunct Professor at Western University, London, Canada. He is a Senior Researcher at the Millennium Institute of Foundational Research on Data (IMFD, Chile). He has a PhD in Mathematics from the Catholic University of Chile (PUC, Chile). His areas of research are Explainable AI, Knowledge Representation, Data Management, and Computational Logic. Web page: https://people.scs.carleton.ca/ bertossi/.

Computing Attribution Scores for Classification in Explainable AI

Attribution scores are used in XAI to quantitatively measure the strength of explanations for results from Machine Learning models. Several scores have been proposed and investigated. In addition to describing a few of them, including the popular SHAP-score, we will concentrate on the computational challenges they offer. Depending on the classifiers, some hardness and tractability results will be presented, so as an application with neural networks as classifiers.

Conference Plenary Lectures

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

Jeff Clune, University of British Columbia

About the speaker: Jeff Clune is a Professor of Computer Science at the University of British Columbia, a Canada CIFAR AI Chair at the Vector Institute, and a co-founder of Recursive. Jeff focuses on deep learning, including deep reinforcement learning. Previously he was a Senior Research Advisor to DeepMind, a research manager at OpenAI, a Senior Research Manager and founding member of Uber AI Labs (formed after Uber acquired a startup he helped lead), the Harris Associate Professor in Computer Science at the University of Wyoming, and a Research Scientist at Cornell University. He received degrees from Michigan State University (PhD, master's) and the University of Michigan (bachelor's). More on Jeff's research can be found at JeffClune.com or on Twitter (@jeffclune).

Since 2015, he won the Presidential Early Career Award for Scientists and Engineers from the White House, had two papers in Nature, one in Science, and one in PNAS, won an NSF CAREER award, received Outstanding Paper of the Decade and Distinguished Young Investigator awards, received two Test of Time awards, and had best paper awards, oral presentations, and invited talks at the top machine learning conferences (NeurIPS, CVPR, ICLR, and ICML). His research is regularly covered in the press, including the New York Times, NPR, the New Yorker, CNN, NBC, Wired, the BBC, the Economist, Science, Nature, National Geographic, the Atlantic, and the New Scientist.

The AI Scientific Revolution will be Driven by Open-Ended and AI-Generating Alorithms

Foundation models (e.g. large language models) create exciting new opportunities in our longstanding quests to produce open-ended and AI-generating algorithms, wherein agents can truly keep innovating and learning forever. In this talk, I will introduce quality diversity, open-ended, and AI-generating algorithms and share some of our recent work harnessing the power of foundation models to unleash the potential of these algorithms to advance AI, including the creation of recursively self-improving AI. I will cover our recent work including POET, OMNI (Open-endedness via Models of human Notions of Interestingness), Video Pre-Training (VPT), Genie, Automatically Designing Agentic Systems (ADAS), the Darwin Gödel Machine, HyperAgents, and The AI Scientist.

Conference Plenary Lectures

Wednesday, August 19, 8:30-9:30, in Room LH1001

Lee Cronin, University of Glasgow

About the speaker: Lee Cronin is a Chemist. He is the Regius Professor of Chemistry at the University of Glasgow and the Founder & CEO of Chemify. He is known for his approach to the digitization of chemistry and developing digital-to-chemical transformation known as Chemputing which can turn code into reactions and molecules. He has also developed a new theory for evolution and selection called assembly theory which aims to quantify and explain how selection can occur in chemistry before biology and help understand the transition to life. Lee is also exploring how chemical systems can compute, and what is needed for the evolution of artificial life and intelligence, as well as designing a new type of computational system that uses information encoded in chemical reactions and molecules.

Assembly Theory, Evolution and Artificial Life

The origin of life has remained one of the most enigmatic open problems in science because we have lacked a formal language with which to describe life's key properties. Assembly theory (AT) (see [1) is an explanatory framework recently proposed to address a number of unsolved questions related to the origin of evolution and selection, with the stated goal to allow unambiguous detection of the signatures of any evolutionary process. By providing a formal theoretical and experimental approach to determine whether or not observed objects are necessarily the product of evolution, AT opens new avenues of research for life detection, the design of synthetic life, the design of experiments to probe the de novo origin of life in the laboratory, and ways to look deeper into the history of life on Earth (e.g., predating the evolution of the genome). In this talk I will explain the theory, the experimental validation and how we are building selection engines for the emergence of evolution aiming for a bottom-up artificial life-form in the laboratory using inorganic chemicals, see Figure.

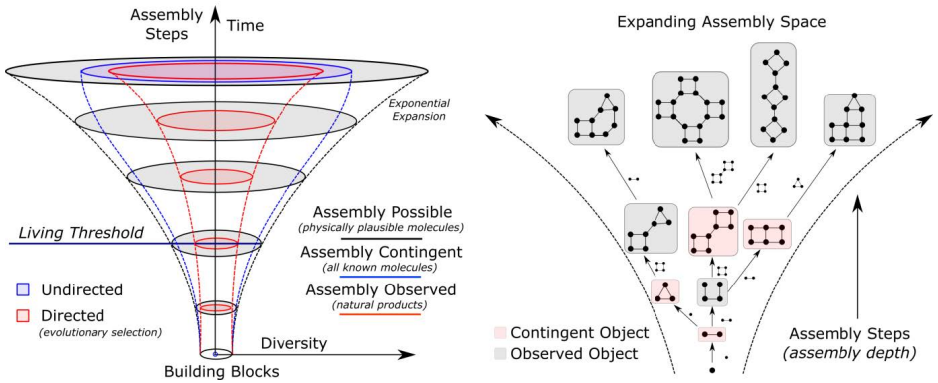


Figure: The figure shows the expansion of assembly spaces where Assembly Possible (A_P, shown in black) represents all physically plausible objects, Assembly Contingent (A_C, shown in blue) represents all known objects, and Assembly Observed (A_O, Assembly Observed, shown in red). The living threshold represents the complexity threshold over which the observed molecule in high abundance signifies the presence of life. (b) Example of an expanding assembly space of an ensemble where at each assembly depth, observed and contingent objects exist.

Conference Plenary Lectures

Wednesday, August 19, 13:30-14:30, in Room LH1009

Pascal François, HEC Montréal

About the speaker: Pascal François is a professor of Finance at HEC Montréal. He is the founding director of the Canadian Derivatives Institute, which he ran for 9 years. A former co-editor of Finance, the academic journal of the French Finance association, his latest textbook is a professional reference guide to portfolio performance (Wiley editions). Since 2024 he has been acting as the COO of Delta Vega, a financial services start-up producing an independent risk scoring metric for structured products. He holds a PhD from ESSEC and Sorbonne University.

Package Restructuring and the Pricing of Sovereign Debt

Sovereign debt renegotiation agreements have generalized the practice of package restructuring – a form of debt relief combining rescheduling and write-off. The paper provides a contingent claims model with an expression for sovereign debt value and a bargaining game that rationalizes package restructurings as optimal renegotiation deals. It further shows how the parameters of the restructuring deal can be inferred from market information. A maximum likelihood inference from EMBI spread series is applied to four countries yielding realistic renegotiation outcomes. This is joint work with Amavi Hounlete, PhD student at HEC Montreal.

Conference Plenary Lectures

Thursday, August 20, 8:30-9:30, in Room LH1001

Sanjeena Dang, Carleton University

About the speaker: Dr. Sanjeena Dang (Subedi) is an Associate Professor and Canada Research Chair in Data Science and Analytics at the School of Mathematics and Statistics at Carleton University. She has developed an innovative interdisciplinary research program that has coalesced around developing highly efficient and scalable statistical models for clustering various types of biological datasets. Dr. Dang has also taken active leadership roles in the statistics and bioinformatics communities. She is currently the President of the Classification Society, Treasurer for the International Federation of Classification Societies, and Associate Editor for several statistics and bioinformatics journals. Her past notable roles include the President of the Business and Industrial section of the Statistical Society of Canada (SSC), member of the Board of Directors of the Classification Society, guest editor for the Fields Institute Communications Series on Data Science and Optimization, and the chair of the organizing committee for the Canadian Statistical Sciences Institute (CANSSI)'s Distinguished Lecture Series in Statistical Sciences.

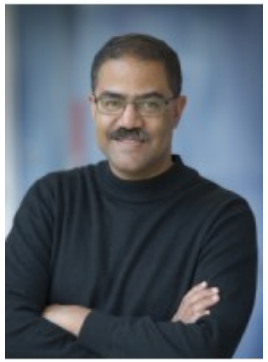
Recent Advances in Clustering Microbiome Data

The human microbiome plays a crucial role in health and disease. Advances in next-generation sequencing technologies have made it possible to quantify microbiome composition with high resolution. Clustering microbiome data can uncover meaningful patterns across samples, offering insights into biological variability and disease mechanisms. However, this task presents several challenges. Microbiome data are typically high-dimensional, over-dispersed, and compositional, the latter meaning they reflect relative, not absolute, abundances. As such, analyzing such compositional data presents many challenges because they are restricted to a simplex, which complicates standard statistical analysis. Various mixture model-based approaches have been proposed previously. These models assume that the population is a finite mixture of subpopulations (or clusters), each characterized by a probability distribution. My research team has focused on developing and refining such models to improve clustering accuracy and interpretability. We will present recent contributions from our group, emphasizing the strengths and limitations of different component-specific distributions used within mixture models. For example, Dirichlet-multinomial (DM) mixture models are computationally efficient but often fail to capture the complex correlation structures present in microbiome data. In contrast, models based on the logistic normal multinomial (LNM) distribution provide greater flexibility in capturing correlations but are computationally intensive. To overcome these limitations, we have developed a computationally efficient framework for parameter estimation in LNM-based models using variational Gaussian approximations. This approach significantly reduces the computational burden and enables application to large-scale datasets. Some other recent and ongoing developments using extensions of the LNM distribution and others to cluster microbiome data will be discussed.

Conference Plenary Lectures

Thursday, August 20, 13:30-14:30, in Room LH1001

Trevor Charles, University of Waterloo



About the speaker: Trevor C. Charles, Ph.D. is Professor of Biology at the University of Waterloo. Trained as a microbiologist and bacterial geneticist, he holds a B.Sc. in Microbiology from the University of British Columbia, a Ph.D. in Molecular Biology from McMaster University, and completed postdoctoral training at the University of Washington. He held a faculty position at McGill University before joining the University of Waterloo, where his research group works at the intersection of microbial genomics, plant-microbe interactions, and environmental surveillance. Current research activity spans beneficial bacteria in field and controlled environment agriculture, functional metagenomics and novel gene discovery, bacterial genome engineering for the conversion of food waste to bioplastics, and wastewater-based pathogen surveillance, all situated within a circular bioeconomy framework. Trevor has been actively involved in translating research from his lab into commercial products and services, and as Founder and Executive Director of the Lanterna Black Innovation Hub, is deeply committed to increasing the participation of Black youth in STEM, innovation, and entrepreneurship.

Redesigning Bacterial Genomes for Fun and Profit: Streamlining Evolved Complexity

Bacterial genomes are the product of billions of years of evolutionary tinkering. This results in sprawling, context-dependent archives of solutions to problems the organism has encountered across diverse and fluctuating environments. The result is a wonderfully messy architecture: redundant pathways, cryptic regulatory networks, horizontally acquired elements, and hundreds to thousands of genes of unknown function. For the microbiologist, this complexity is a source of endless fascination. For the metabolic engineer, it can be an obstacle.

Industrial biotechnology increasingly asks microbes to perform highly specified tasks such as converting defined substrates into target products with maximal efficiency and minimal metabolic overhead. Yet the organisms that are recruited for these purposes carry genomes shaped by entirely different selection pressures such as nutritional variation, environmental stressors, and heterogeneous and changing habitats. Some microbes have been domesticated over millennia through artificial selection, with yeast and lactic acid bacteria as canonical examples. But for many industrial applications, we need organisms to perform tasks for which no evolutionary precedent exists. We pluck them from soil, screen for the best performers, and deploy them, without addressing the fundamental mismatch between their evolutionary legacy and the objectives of our application.

We are exploring an alternative approach that involves prediction of essential / non-essential genes in the genome, and systematically removes those determined to be non-essential. Rather than accepting the genome as given, we ask which components are necessary, which are expendable, and how we can systematically distinguish between them. The key challenge is functional uncertainty. A substantial fraction of genes in even the best-studied bacterial genomes remain of unknown function. Deletion-based phenotypic screening, combined with large-scale genome engineering via homologous recombination methods, offers a path forward: remove candidate elements, assess fitness and metabolic function, and iteratively build toward a streamlined chassis. Artificial Laboratory Evolution (ALE) experiments, coupled with rapid whole-genome sequencing, reveal which genomic regions can be further refined.

As a case study, we will examine the engineering of the bacterium Pseudomonas putida KT2440 for conversion of dairy waste lactose into polyhydroxyalkanoate (PHA) bioplastic. P. putida is an attractive chassis. It is genetically tractable, metabolically versatile, and naturally tolerant of industrial stressors. But its genome encodes the capacity to transport and catabolize many carbon sources, none of which are relevant when lactose is the sole feedstock. This excess metabolic capacity consumes biosynthetic resources such as ATP, ribosomes, and membrane transporters, that could otherwise be directed toward product formation. Furthermore, it lacks the ability to metabolize both lactose and its breakdown product galactose. We discuss strategies for introducing lactose utilization capacity, redirecting central carbon flux toward PHA precursors, eliminating competing sinks, and reducing the genomic overhead that evolution has layered onto this organism over time.

Conference Plenary Lectures

Thursday, August 20, 17:30-18:30, in Room LH1001

Luis M. Rocha, State University of New York at Binghamton

About the speaker: Luis M. Rocha is the George J. Klir Professor of Systems Science at the Thomas J. Watson College of Engineering and Applied Science (School of Systems Science and Industrial Engineering), Binghamton University (State University of New York), where he leads the Complex Adaptive Systems and Computational Intelligence (CASCI) lab. He is also Visiting Professor at the Catolica Biomedical Research Center of the Catolica Medical School, where he is the Era Chair of the CBeRa project "Strategic Integration of Complex Networks and Systems for Advancing Biomedical Research". He was the director of the NSF-NRT Interdisciplinary Training Program in Complex Networks and Systems and Professor of Informatics in the Luddy School of Informatics, Computing, and Engineering at Indiana University, where he was a member of the advisory council of the Indiana University Network Science Institute, and core faculty of the Cognitive Science Program. Dr. Rocha is a founding partner of the international Center for Excellence in Mental Health Sciences, a Fulbright Scholar and was a Principal Investigator and Senior Fellow at the Instituto Gulbenkian da Ciencia between 2002 and 2024. His research is on complex networks & systems, computational & systems biology, and computational intelligence. He received his Ph.D in Systems Science in 1997 from the State University of New York at Binghamton. From 1998 to 2004 he was a permanent staff scientist at the Los Alamos National Laboratory, where he founded and led a Complex Systems Modeling Team during 1998-2002, and was part of the Santa Fe Institute research community. He has organized major conferences in the field such as the Tenth International Conference on the Simulation and Synthesis of Living Systems (Alife X), the Ninth European Conference on Artificial Life (ECAL 2007), and Complex Networks 2019-2023. He has published many articles in scientific and technology journals, and has been the recipient of several scholarships and awards. He received the Lois B. DeFleur Prize for Academic Achievement in 2025 at Binghamton University, and the Trustees Award for Teaching Excellence in 2006 and 2015 at Indiana University, after developing the complex systems training program and syllabi for several courses.

Canalizing dynamics as a network mechanism for collective decision, control, modularity, and abstraction in living systems

In biomolecular regulation, canalization (a term coined by Conrad Waddington to refer to the buffering of genetic, epigenetic, and environmental fluctuations) plays a key role in establishing a robust mapping from genotype to phenotype in noisy environments. Robustness of sensors to fluctuations, requires collective canalization realized with at least two types of dynamical redundancy: 1) heterogenous, nonlinear effective connectivity, whereby most regulatory inputs have little or no effect on downstream signaling and regulation, and 2) symmetry, whereby groups of inputs are causally equivalent. Biologically, this manifests in several ways, including: multiple signaling pathways, multiple combinations of transcription factors that bind a gene's promoter region, and threshold behaviors that allow depletion of one signal to be overcome by overabundance of another. We measure effective connectivity and symmetry in experimentally-validated automata network models of biochemical pathways, and demonstrate that these forms of dynamical redundancy are ubiquitous in regulation and signaling. Indeed, the redundancy found in biological models is much more pronounced than what is expected from random networks, and, as we demonstrate, a major reason for them being much more ordered than what the current criticality hypothesis, or "edge-of-chaos" theory, predicts. The observed redundancy is furthermore shown to shape the controllability and dynamical modularity of biochemical regulation and signaling networks. We also summarize recent computational evolution experiments showing that the necessity of collective decision in noisy environments—e.g. quorum sensing in bacteria or collective intelligence in societies—leads to the evolution of both types of redundancy. As a practical benefit of these results, we show that the observed widespread redundancy in biochemical regulation facilitates the construction of causal models, such as large-scale digital twins for precision medicine. Finally, we discuss how the observed evolution of redundancy constitutes a "selective loss of detail", which Howard Pattee argues to be required for emergence of new functions in living systems and abstraction in intelligence, and which, we argue, facilitates explanation and prediction in scientific models.

Conference Plenary Lectures

Friday, August 21, 8:30-9:30, in Room LH1001

Courtney Howard, University of Calgary

Dr Courtney Howard is an Emergency Physician in Yellowknives Dene Territory in the Canadian subarctic, a Clinical Associate Professor at the University of Calgary and the founder of POWER—PlanetaryHealth rganizations for Wellbeing, Equity and Regeneration. The Chair of the Global Climate and Health Alliance and President-Elect of the Canadian Medical Association, Dr Howard works from the bedside to global oardrooms to center the health of people and the planet in practice and policy.

Dr. Howard has researched menstrual cups and the health impacts of wildfires, and was the first woman president of the Canadian Association of Physicians for the Environment. She has led policy and advocacy ork regarding climate-resilient health systems, social tipping points and the health sector, ecoanxiety, vaccine equity, active transport, plant-rich diets, fossil fuel divestment, carbon pricing, coal power hase-out, and the understudied local health impacts of fossil fuel extraction.

The 2018 International Policy Director for the Lancet Countdown on Health and Climate Change and longtime policy brief author for Canada, she is on the Editorial Advisory Boards of the Lancet Planetary ealth and the Journal of Climate Change and Health. She recently completed a Master of Public Policy Degree at the Blavatnik School at Oxford University where she focused on transitions to an economy centered around wellbeing, and is writing a book on that topic. In 2024 she led the Roadmap for Planetary Health and Sustainable Healthcare that was passed unanimously by Canada's medical school deans. She has two daughters and loves to dance.

The North Star Imperative: Aligning Artificial Intelligence, Planetary Health and Human Flourishing

Artificial intelligence is rapidly transforming humanity's ability to understand, predict, and optimize complex adaptive systems. But as these capabilities accelerate, a profound new question is emerging: if we can optimize almost anything, what should we optimize for?

In this keynote, Dr. Courtney Howard explores how AI is creating not only unprecedented technological capability, but also an unprecedented need for societal clarity. As increasingly powerful optimization systems become embedded within our economies, governments, health systems, and communities, the limiting factor is no longer computational power—it is our ability to define the future we are trying to create.

Drawing on emergency medicine, planetary health, complexity science, and wellbeing economics, Dr. Howard introduces The North Star Imperative: the idea that as humanity's power grows, so too must our clarity of purpose. She proposes that long-term wellbeing for all people and the planet provides a compelling North Star for societies operating within planetary boundaries.

The keynote will explore how wellbeing emerges from the interactions among ecological, social, governance, economic, and healthcare systems, and why this systems perspective fundamentally changes how we think about resilience, prosperity, and societal success. It will examine how multidimensional wellbeing frameworks can help governments, organizations, and communities align around shared goals while reducing silos and enabling more integrated decision-making.

The session will also explore how AI and complexity science may help societies identify "multisolving" opportunities—interventions that improve health, strengthen communities, reduce emissions, enhance resilience, and generate positive feedback across interconnected systems.

Rather than asking only how intelligent our technologies can become, this keynote asks a more fundamental question: How do we use increasingly powerful tools to build a future in which both people and the planet can flourish?

Conference Plenary Lectures

Friday, August 21, 13:30-14:30, in Room LH1009

Nathan Kutz, University of Washington

About the speaker: Nathan Kutz is the director of physics informed AI at Autodesk Research in London UK. He is on-leave of absence from the University of Washington where he is the Boeing Professor of Applied Mathematics and Electrical and Computer Engineering and former Director of the AI Institute in Dynamic Systems, having served as chair of applied mathematics from 2007-2015. He received the BS degree in physics and mathematics from the University of Washington in 1990 and the Phd in applied mathematics from Northwestern University in 1994. He was a postdoc in the applied and computational mathematics program at Princeton University before taking his faculty position. He has a wide range of interests, including neuroscience to fluid dynamics where he integrates machine learning with dynamical systems and control.

Closing the Gap Between Physical Reality and the World of Simulation

Science and engineering is being revolutionized by computational advancements in machine learning and AI algorithms. Leveraging sensor measurements, often in combination with scientific computation proxies, such algorithms aim to learn effective models for a diversity of downstream tasks, including reconstruction, forecasting, design and control in challenging environments that include noisy measurements and or parametric variability. A grand challenge in the deployment of such algorithms is the fact that many physical systems are not amenable to full state measurements, but rather only discrete point sensor measurements at prescribed and limited locations. In fact, the only knowledge of the full state space is typically acquired by simulations of the approximating governing equations through a diversity of low- or high-fidelity models. This work aims to integrate scientific computing, data assimilation and physics informed AI in order to demonstrate tractable pathways forward for closing the SIM2REAL (simulation to reality) gap in science and engineering, thus enabling AI models that are accurate in reality, produce models that respect the fundamental laws nature, and are trustworthy in practice.

8. Conference Semi-Plenary Lectures

Thursday, August 20, 10:00-11:00, in Room LH2062

Mohamad S. Alwan, University of Saskatchewan SS-ACDS

About the speaker: Mohamad S. Alwan is a lecturer and faculty member in the Department of Mathematics and Statistics at the University of Saskatchewan. He obtained his PhD and Master's degrees from the University of Waterloo, following an earlier Master's degree from the University of Al-Nahrain. Dr. Alwan's research areas include the theory and application of stochastic and deterministic hybrid systems, including switched, impulsive, and singularly perturbed control systems with time delay. He investigates system properties such as stability, input-to-state stability (ISS), synchronization, and robust reliable H1 control. Dr. Alwan has co-authored a number of papers in leading academic journals and conference proceedings, as well as the research monograph Theory of Hybrid Systems: Deterministic and Stochastic, published by Springer in 2018.

Robust Synchronization of Cascaded Pendulum Systems Under Markovian Switching

This presentation outlines the systematic development of adaptive synchronization frameworks for leader– follower oscillator and pendulum systems, tracing a path from deterministic hybrid regimes to stochastic switching environments. We first establish a fundamental architecture for tracking under deterministic disruptions, including impulsive velocity resets and switched leader frequencies under a common external forcing environment. Using a first-order adaptive law to adjust the follower's natural frequency, we analyze the resulting cascaded error dynamics through composite Lyapunov methods. The analysis shows that unmatched hybrid events introduce structural mismatches that require an input-to-state stability (ISS) framework, while ideal matched resets may remove these mismatch effects and recover exact exponential synchronization.

Extending this framework to stochastic switching environments, we focus on the realistic mismatched Markovian regime, where the leader's natural frequency undergoes random abrupt transitions modelled by a continuous time Markov jump process. Since the follower cannot generally detect or implement these random frequency changes instantaneously, stochastic switching naturally leads to asynchronous operation, with a finite time lag between the leader's transition and the follower's response. During these asynchronous intervals, the frequency mismatch acts as a disturbance input and may temporarily increase the Lyapunov function. Thus, ISS provides the natural stability framework, yielding practical exponential synchronization with an ultimate bound determined by the magnitude, rate, and duration of the asynchronous mismatches. Numerical simulations validate the theoretical results and demonstrate the robustness of the proposed adaptive control strategy in application benchmarks such as robotic pendulums and computer-controlled oscillatory networks.

Conference Semi-Plenary Lectures

Monday, August 17, 10:30-11:30, in Room LH2064

Giovanna Guidoboni, University of Maine SS-MMSC

About the speaker: Giovanna Guidoboni is the Inaugural Dean of Maine College of Engineering and Computing at the University of Maine, and Interim Vice President for Research at the University of Maine and the University of Maine at Machias. Her research focuses on mathematical modeling and data science in engineering and life sciences, with collaborations in ocular blood flow, urinary tract function, and noninvasive health monitoring. Her work has been supported by the National Science Foundation, National Institutes of Health, and the European Commission. Giovanna co-founded Artificial Intelligence in Vision and Ophthalmology and serves as its co-Editor-in-Chief and Managing Editor. Additionally, she is the founder of Gspace LLC, a consulting firm specializing in modeling and computational solutions, and serves as Chief Scientific Advisor of Mechanica Biosystems.

Dr. Guidoboni holds a PhD in Mathematics and MS and BS in Engineering of Materials from the University of Ferrara (Italy). Before joining the University of Maine in 2023, she held faculty positions at multiple institutions in the United States and in France. She is Professor of Electrical and Computer Engineering, and faculty in the Graduate School of Biomedical Science and Engineering at the University of Maine, and Adjunct Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai (New York, NY). She is an elected member of the European Academy of Sciences and Arts and the College of Fellows of the American Institute for Medical and Biological Engineering.

From the Blackboard to the Clinic: Digital Twinning, Mathematical Modeling, and Artificial Intelligence for Personalized Medicine

Digital twinning, mathematical modeling, and artificial intelligence combine mechanism-driven and data-driven models in a complementary and synergistic way to enable personalized medicine. Mechanism-driven models are based on the principles of physics and physiology and allow for identification of cause-to-effect relationships among interplaying factors in a complex system. While invaluable for causality, mechanism-driven models are often based on simplifying assumptions to make them tractable for analysis and simulation; however, this often brings into question their relevance beyond theoretical explorations. Data-driven models aim at extracting information and knowledge from data. These approaches are naturally interdisciplinary, as it bridges fundamental techniques of data analysis, typically developed by mathematicians, statisticians and computer scientists, with the needs of actionable insights that are specific to the particular application domain. The combination of mechanism-driven and data-driven models allows us to harness the advantages of both approaches, as mechanism-driven models excel at interpretability but suffer from a lack of scalability, while data-driven models are excellent at scale but suffer in terms of generalizability and insights for hypothesis generation. This combined, integrative approach represents the pillar of the interdisciplinary approach to data science that will be discussed in this talk, with applications spanning from glaucoma research to cardiovascular monitoring and physiology of the lower urinary tract (LUT).

Conference Semi-Plenary Lectures

Tuesday, August 18, 10:00-11:00, in Room LH2062

Eduard-Wilhelm Kirr, University of Illinois at Urbana-Champaign SS-DSW

About the speaker: Eduard-Wilhem Kirr is currently an associate professor in the Mathematics Department at University of Illinois Urbana-Champaign. He obtained his Ph.D. in Mathematics from University of Michigan in 2002 under the direction of Michael I Weinstein and Anthony Bloch and was a Dickson Instructor at University of Chicago from 2002 to 2005 under the direction of Peter Constantin. During his graduate studies he was also a summer intern at Bell Laboratories. His main research interests focus on studying wave propagation and wave interaction using both theoretical methods and numerical simulations.

Large Coherent Structures in Wave Equations via Computer Assisted Proofs

While coherent structures play an essential role in the analysis and applications of wave equations it has been impossible (until now) to find all the nonlinear ones. This talk will focus on the Nonlinear Schrodinger Equations where coherent structures have the form $e^{iEt}f(x)$ with real frequency E and the profile f in the H^1 Sobolev space over R^n. We show that all coherent structures must organize themselves in smooth branches accumulating to E equal infinity. In this limit they split into peaks and an algebraic equilibrium equation between peak-potential and peak-peak interaction emerges. The equation determines the possible limit points of the coherent structures as the frequency E approaches infinity. For small number of peaks or for peaks in a collinear configuration the limiting points can be obtained by hand. However, for large number of non-collinear peaks we employ computer assisted proofs. Once the limit points are determined we adapt techniques from local bifurcation theory to show existence of actual branches of coherent states emerging from the limit points and trace them from high frequency into the range of medium and small frequency.

Conference Semi-Plenary Lectures

Tuesday, August 18, 15:00-16:00, in Room LH2066

Chloe Martindale, University of Bristol SS-CNT

About the speaker: Dr. Chloe Martindale is a Senior Lecturer in Cryptology at the University of Bristol, UK. Her research is in the mathematical aspects of post-quantum cryptography, both in constructive solutions and cryptanalysis. She also sits on the panel of experts reviewing international open-source standards for CFRG, advising the Internet Engineering Task Force (IETF). She did her PhD in algebraic number theory with Dr Marco Streng in both Leiden and Bordeaux and before moving to Bristol she was a postdoc in the group of Prof. dr. Tanja Lange at TU Eindhoven.

Hard Problems in Post-quantum Cryptography

Post-quantum cryptography is a rapidly growing area of cryptography which encompasses cryptographic algorithms that we can implement now, on current devices, but which are designed to be secure against future scalable quantum computers. In this talk, we will present some of the computational number theory problems that are at the core of post-quantum cryptography. This includes the ideal shortest vector problem, on finding small elements in ideals of orders in very high degree number fields, as well as the computational supersingular isogeny problem, on computing an isogeny between two given supersingular elliptic curves. We will also discuss some recent advances on these problems, including computational work interrogating the randomness of supersingular isogeny graphs. This includes joint work with Ross Bowden and Felix Marsh.

Conference Semi-Plenary Lectures

Friday, August 21, 15:00-16:00, in Room LH2064

Marwa Tuffaha, York University SS-MID

About the speaker: Marwa Tuffaha is a postdoctoral fellow at York University working on mathematical modelling of infectious diseases and public health interventions. She completed her PhD in Applied Mathematics at Western University, following a Master's degree from Jordan and a Bachelor's degree from Syria. Her doctoral research focused on evolutionary rescue and mutation-rate evolution, and her current work uses age-structured models of infection and immunity to evaluate the effects of vaccination, non-pharmaceutical interventions, and behavioral responses on epidemic outcomes.

Comparative Counterfactual Analysis of COVID-19 Policies and Vaccination

Understanding how public health decisions shape epidemic outcomes is essential for future outbreak preparedness. In this study, we develop and apply an age-structured model of infection and immunity to investigate how diff erent combinations of non-pharmaceutical measures and vaccination pathways influence COVID-19 dynamics across several regions. Using jurisdiction-specific calibration to observed epidemiological data, we construct hypothetical scenarios that modify intervention timing, policy intensity, primary vaccine rollout, and booster administration. The analysis reveals that epidemic severity is strongly shaped by the interplay between existing immunity levels and behavioral response to public health measures. In particular, non-school interventions have the biggest impact in reducing infections. Additionally, booster delivery has a pronounced effect on reducing hospitalizations and other severe outcomes, even when uptake is not universal. By enabling harmonized comparison across regions, this modelling approach provides a practical tool for evaluating alternative response strategies and informing future pandemic policy.

9. AMMCS Prize-Winning Lecture
Kolmogorov-Wiener Prize for Young Researchers

Wednesday, August 19, 17:00-18:00, in Room LH1001

Manpreet Singh, Advancement of Military Medicine, Inc.

About the speaker: At the VII AMMCS International Conference, Dr. Manpreet Singh, currently, a Computational Research Scientist II with the Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc. (HJF), supporting the Department of Defense Biotechnology High Performance Computing Software Applications Institute (BHSAI) is presenting his lecture as a winner of the AMMCS Kolmogorov-Wiener Prize 2023 for Young Researchers. The award was granted at the VI AMMCS meeting. More details can be found here. Dr. Singh joined BHSAI in August 2022 and is currently investigating human physiology under extreme cold environments. His research provides nuanced understanding and targeted strategies to mitigate limb amputation risks due to frostbite, ensure occupational safety, guiding decisions on rewarming protocols and provide effective medical interventions across diverse sectors in the United States and more specifically, strategies for United States Army.

Modelling Advancements in Bioheat Transfer

In the realm of bioheat transfer, Dr. Singh's research on development of human physiology-based computationally predictive models of biological systems can assist in mitigating the risks associated with cold-related injuries (frostbite, hypothermia etc.) and increase Warfighter Readiness of soldiers in extreme cold-weather operations. Dr. Singh's anatomically detailed thermoregulatory model provides accurate thermal responses including temperature predictions of the body core temperature, mean skin temperature and as well as endurance times to cold injuries of the most susceptible body peripheral regions such as digits of hands and feet in the austere environmental conditions. Therefore, Dr. Singh's research assisted in the development of militarily relevant medical products that provide early alerts of a rise and fall in core body temperature to help reduce the risk of thermal injury in the field and during training and deployment at US installations. Although the human thermoregulatory system maintains core body temperature at 37°C, humans often fail to recognize early warning signs of an impending rise or fall in this temperature and hence fail to take appropriate mitigation strategies. Therefore, a temperature alerting system from Dr. Singh's mathematical algorithms can be used during rest, exercise in the heat, cold and extreme cold environmental conditions (−40°C) to inform the soldiers mitigate such injury risks. In this talk, Dr. Singh will also discuss key modifications to the Pennes bioheat equation, with particular emphasis on incorporating spatial heterogeneity in blood perfusion derived from medical imaging. Specifically, he integrates pixel-level blood perfusion data into the model, thereby relaxing the conventional assumption of uniform blood perfusion.

10. Special Sessions & Organizers

Session ID	Session Name	Session Organizers	Session Blocks
SS-ACDS	Advances in Complex Dynan Systems and Applications	Mohamad Alwan (University of Saskatchewan) Xinzhi Liu (University of Waterloo) Peter Stechlinski (University of Maine)	SS-ACDS #1 Thursday A.M. SS-ACDS #2 Thursday P.M. SS-ACDS #3 Friday A.M.
SS-AIO	Artificial Intelligence, Inverse Problems, and Mathematical Modelling	Herb Kunze (University of Guelph) Davide La Torre (SKEMA Business School & Université Côte d'Azur) Oleg Michailovich (University of Waterloo) Roman Smirnov (Dalhousie University)	SS-AIO #1 Monday A.M. SS-AIO #2 Monday P.M. SS-AIO #3 Tuesday A.M.
SS-CNT	Computational Number Theory	Chester Weatherby (Wilfrid Laurier University) Michael Jacobson (University of Calgary) Katherine E. Stange (University of Colorado Boulder)	SS-CNT #1 Tuesday A.M. SS-CNT #2 Tuesday P.M. SS-CNT #3 Wednesday A.M. SS-CNT #4 Wednesday P.M.
SS-DF	Decisions and Fairness	Marc Kilgour (Wilfrid Laurier University) William Zwicker (Union College, New York)	SS-DF #1 Monday A.M. SS-DF #2 Monday P.M.
SS-DSW	Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives	Eduard Kirr (University of Illinois, Urbana-Champaign) Perry Kleinhenz (Illinois State University) Nicolae Tarfulea (Purdue University Northwest)	SS-DSW #1 Tuesday A.M. SS-DSW #2 Tuesday P.M. SS-DSW #3 Wednesday A.M. SS-DSW #4 Wednesday P.M.
SS-MF	Mathematical Finance	Joe Campolieti (Wilfrid Laurier University) Mark Reesor (Wilfrid Laurier University)	SS-MF #1 Tuesday P.M. SS-MF #2 Wednesday A.M. SS-MF #3 Wednesday P.M.
SS-MFRA	Mathematical Foundations, Reasoning, and Applications of Large Language Models	Sukhjit Singh Sehra (Wilfrid Laurier University) Sunny Wang (Wilfrid Laurier University)	SS-MFRA Thursday A.M.
SS-MID	Modelling Infectious Disease and Pathogen Evolution	Marwa Tuffaha (York University) Jane Heffernan (York University)	SS-MID #1 Thursday A.M. SS-MID #2 Thursday P.M. SS-MID #3 Friday A.M. SS-MID #4 Friday P.M.

Session ID	Session Name	Session Organizers	Session Blocks
SS-MMCS	Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches	Sundeep Singh (University of Prince Edward Island) Roderick Melnik (Wilfrid Laurier University)	SS-MMCS #1 Monday A.M. SS-MMCS #2 Monday P.M. SS-MMCS #3 Tuesday A.M.
SS-MPQ	Mathematical Physics of Quantum and Nanoscale Systems	Kamran Akbari (Queen's University) Hamed Majedi (University of Waterloo)	SS-MPQ #1 Friday A.M. SS-MPQ #2 Friday P.M.
SS-RPNM	Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing	Dong Liang (York University) Giang Tran (University of Waterloo) Kazem Cheshmi (McMaster University)	SS-RPNM #1 Tuesday A.M. SS-RPNM #2 Tuesday P.M. SS-RPNM #3 Wednesday A.M.
SS-TAS	Mathematics of Systems with Delay	Elena Braverman (University of Calgary) Anatoli Ivanov (Pennsylvania State University) Erik Verriest (Georgia Institute of Technology)	SS-TAS #1 Wednesday A.M. SS-TAS #2 Wednesday P.M.
SS-TPQ	Theoretical Perspectives on Quantum Computation, Quantum Control, and Quantum Dynamics	Lianao Wu (IKERBASQUE, Basque Foundation of Science and University of the Basque Country, Spain)	SS-TPQ #1 Monday A.M.

11. Contributed Sessions

Session ID	Session Name	Session Blocks
CS-TALK	Contributed Talks	CS-TALK #1 Monday A.M. CS-TALK #2 Monday P.M.
CS-GSRS	Graduate Student Research Symposium	CS-GSRS #1 Thursday A.M. CS-GSRS #2 Thursday P.M.
CS-POST	Poster Session	CS-POST Wednesday

12. High-Level Daytime 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	LH1009	LH2062	LH2064	LH2066	LH3101
August 17	A.M.	ALIFE	PLENARY: A. Layton		SS-AIO: Artificial Intelligence, Inverse Problems, and Optimization	SS-DF: Decisions and Fairness	SS-MMCS: Multiphysics and Multiscale Modelling Complex Systems: Computational and AI Approaches	SS-TPQ: Theoretical Perspectives on Quantum Computation Quantum Control, and Quantum Dynamics	CS-TALK: Contributed Talks
	P.M.	AMMCS		W. Holliday					
August 18	A.M.	AMMCS	L. Bertossi			SS-DSW: Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives		SS-CNT: Computational Number Theory	SS-RPNM: Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing
	P.M.	ALIFE	J. Clune		SS-MF: Mathematical Finance				
August 19	A.M.	ALIFE	L. Cronin				SS-TAS: Theory and Applications of Systems with Delay across the Sciences and Engineering		
	P.M.	AMMCS		P. François					
August 20	A.M.	AMMCS	S. Dang		CS-GSRS: Graduate Student Research Symposium	SS-ACDS: Advances in Complex Dynamical Systems and Applications	SS-MID: Modelling Infectious Disease and Pathogen Evolution	SS-MFRA: Mathematical Foundations, Reasoning, and Applications of Large Language Models	
	P.M.	ALIFE	T. Charles						
August 21	A.M.	ALIFE	C. Howard		SS-MPQ: Mathematical Physics of Quantum and Nanoscale Systems				
	P.M.	AMMCS		N. Kutz					

Monday, August 17

Time	Room	
8:30-9:00	LH1001	**AMMCS Conference Opening** **Marc Kilgour**, Department of Mathematics, Wilfrid Laurier University **Deborah MacLatchy**, President, Wilfrid Laurier University **Royce Bodaly**, Acting Mayor, City of Waterloo
9:00-10:00	LH1001	**Conference Plenary Lecture** *Math as a New Microscope* **Anita Layton**, University of Waterloo, Abstract & Biography on p. 10 (Chair: C. Nehaniv, University of Waterloo)
10:00-10:30	LH Halls	**Coffee Break**
10:30-12:30	Parallel Sessions	LH1009: SS-AIO #1 — Artificial Intelligence, Inverse Problems, and Optimization LH2062: SS-DF #1 — Decisions and Fairness LH2064: SS-MMCS #1 — Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches Semi-plenary: G. Guidoboni Abstract & Biography on p. 22 LH2066: SS-TPQ #1 — Theoretical Perspectives on Quantum Computation, Quantum Control, and Quantum Dynamics LH3101: CS-TALK #1 — Contributed Talks
12:30-14:00		**Lunch**
14:00-15:00	LH1009	**Conference Plenary Lecture** *Axioms and Impossibilities in the Theory of Voting* **Wesley Holliday**, University of California Berkeley, 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-AIO #2 — Artificial Intelligence, Inverse Problems, and Optimization LH2062: SS-DF #2 — Decisions and Fairness LH2064: SS-MMCS #2 — Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches LH2066 LH3101: CS-TALK #2 — Contributed Talks

Tuesday, August 18

Time	Room	
8:30-9:30	LH1001	**Conference Plenary Lecture** *Explainable AI via Semantic Information Pursuit* **Leopoldo Bertossi**, Carleton University, Abstract & Biography on p. 12 (Chair: D. La Torre, SKEMA Business School & Université Côte d'Azur)
9:30-10:00	LH Halls	**Coffee Break**
10:00-12:00	Parallel Sessions	LH1009: SS-AIO #3 — Artificial Intelligence, Inverse Problems, and Optimization LH2062: SS-DSW #1 — Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives Semi-plenary: E.-W. Kirr Abstract & Biography on p. 23 LH2064: SS-MMCS #3 — Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches LH2066: SS-CNT #1 — Computational Number Theory LH3101: SS-RPNM #1 — Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing
12:00-13:00		**Lunch**
13:00-13:30	LH1001	**Maplesoft Session** Applications of Maple
13:30-14:30	LH1001	**Conference Plenary Lecture** *The AI Scientific Revolution will be Driven by Open-Ended and AI-Generating Algorithms* **Jeff Clune**, University of British Columbia, Abstract & Biography on p. 13 (Chair: S. Nichele, Østfold University College)
14:30-15:00	LH Halls	**Coffee Break**
15:00-17:00	Parallel Sessions	LH1009: SS-MF #1 — Mathematical Finance LH2062: SS-DSW #2 — Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives LH2064: LH2066: SS-CNT #2 — Computational Number Theory Semi-plenary: C. Martindale Abstract & Biography on p. 24 LH3101: SS-RPNM #2 — Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing

Wednesday, August 19

Time	Room	
8:30-9:30	LH1001	**Conference Plenary Lecture** *Assembly Theory, Evolution and Artificial Life* **Lee Cronin**, University of Glasgow, Abstract & Biography on p. 14 (Chair: S. Rasmussen, University of Southern Denmark)
9:30-10:00	LH Halls	**Coffee Break & Poster Session**
10:00-12:00	Parallel Sessions	LH1009: SS-MF #2 — Mathematical Finance LH2062: SS-DSW #3 — Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives LH2064: SS-TAS #1 — Theory and Applications of Systems with Delay across the Sciences and Engineering LH2066: SS-CNT #3 — Computational Number Theory LH3101: SS-RPNM #3 — Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing
12:00-13:30	**Lunch**	
13:30-14:30	LH1009	**Conference Plenary Lecture** *Package Restructuring and the Pricing of Sovereign Debt* **Pascal François**, HEC Montréal, Abstract & Biography on p. 15 (Chair: R. Makarov, Wilfrid Laurier University)
14:30-15:00	LH Halls	**Coffee Break & Poster Session**
15:00-17:00	Parallel Sessions	LH1009: SS-MF #3 — Mathematical Finance LH2062: SS-DSW #4 — Dynamical Systems and Wave Propagation: Analytical and Numerical Perspectives LH2064: SS-TAS #2 — Theory and Applications of Systems with Delay across the Sciences and Engineering LH2066: SS-CNT #4 — Computational Number Theory LH3101
17:00-18:00	**Refreshments Served** LH1001	**AMMCS Prize-Winning Lecture** *Modelling Advancements in Bioheat Transfer* **Manpreet Singh**, Advancement of Military Medicine, Inc., Abstract & Biography on p. 26 (Chair: R. Melnik, Wilfrid Laurier University)

Thursday, August 20

Time	Room	
8:30-9:30	LH1001	**Conference Plenary Lecture** *Recent Advances in Clustering Microbiome Data* **Sanjeena Dang**, Carleton University, Abstract & Biography on p. 16 (Chair: X. Wang, Wilfrid Laurier University)
9:30-10:00	LH Halls	**Coffee Break**
10:00-12:00	Parallel Sessions	**LH1009**: CS-GSRS #1 — Graduate Student Research Seminar **LH2062**: SS-ACDS #1 — Advances in Complex Dynamical Systems and Applications; Semi-plenary: M.S. Alwan Abstract & Biography on p. 21 **LH2064**: SS-MID #1 — Modelling Infectious Disease and Pathogen Evolution **LH2066**: SS-MFRA — Mathematical Foundations, Reasoning, and Applications of Large Language Models **LH3101**
12:00-13:30	**AMMCS & ALIFE Joint Conference Photo Shoot at 12:00 & Lunch**	
13:30-14:30	LH1001	**Conference Plenary Lecture** *Redesigning Bacterial Genomes for Fun and Profit: Streamlining Evolved Complexity* **Trevor Charles**, University of Waterloo, Abstract & Biography on p. 17 (Chair: J. Čejková, University of Chemistry and Technology)
14:30-15:00	LH Halls	**Coffee Break**
15:00-17:00	Parallel Sessions	**LH1009**: CS-GSRS #2 — Graduate Student Research Seminar **LH2062**: SS-ACDS #2 — Advances in Complex Dynamical Systems and Applications **LH2064**: SS-MID #2 — Modelling Infectious Disease and Pathogen Evolution **LH2066** **LH3101**
17:30-18:30	**Refreshments Served** LH1001	**Early Evening Plenary Talk** *Canalizing dynamics as a network mechanism for collective decision, control, modularity, and abstraction in living systems* **Luis M. Rocha**, State University of New York, Abstract & Biography on p. 18 (Chair: H. Sayama, Binghamton University)

Friday, August 21

Time	Room	
8:30-9:30	LH1001	**Conference Plenary Lecture** *The North Star Imperative: Aligning Artificial Intelligence, Planetary Health and Human Flourishing* **Courtney Howard**, University of Calgary, Abstract & Biography on p. 19 (Chair: K. Wright, Waterloo Institute for Complexity & Innovation)
9:30-10:00	LH Halls	**Coffee Break**
10:00-12:00	Parallel Sessions	LH1009: SS-MPQ #1 — Mathematical Physics of Quantum and Nanoscale Systems LH2062: SS-ACDS #3 — Advances in Complex Dynamical Systems and Applications LH2064: SS-MID #3 — Modelling Infectious Disease and Pathogen Evolution LH2066 LH3101
12:00-13:30	LH Atrium	**Complimentary Lunch**
13:30-14:30	LH1009	**Conference Plenary Lecture** *Closing the Gap Between Physical Reality and the World of Simulation* **Nathan Kutz**, University of Washington, Abstract & Biography on p. 20 (Chair: R. Melnik, Wilfrid Laurier University)
14:30-15:00	LH Halls	**Coffee Break**
15:00-17:00	Parallel Sessions	LH1009: SS-MPQ #2 — Mathematical Physics of Quantum and Nanoscale Systems LH2062 LH2064: SS-MID #4 — Modelling Infectious Disease and Pathogen Evolution Semi-plenary: M. Tuffaha Abstract & Biography on p. 25 LH2066 LH3101
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 17

Monday, August 17: Morning

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-AIO #1	SS-DF #1	SS-MMSC #1	SS-TPQ #1	CS-TALK #1
		Artificial Intelligence, Inverse Problems, and Optimization Chair: D. La Torre SKEMA Business School & Université Côte d'Azur	Decisions and Fairness Chair: W. Zwicker Union College	Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches Chair: S. Singh & R. Melnik University of Prince Edward Island & Wilfrid Laurier University	Theoretical Perspectives on Quantum Computation, Quantum Control, and Quantum Dynamics Chair: L. Wu IKERBASQUE, Basque Foundation of Science & University of the Basque Country, Spain	Contributed Talks Chair: D. Becker Wilfrid Laurier University
10:30-10:50	*Orthogonality relations for derivatives of Discrete Fourier Transform and Discrete Cosine Transform basis functions* A. Kunze University of Insubria & Université Côte d'Azur	*A Geometric Approach to Bias and Other Properties of Sequential Apportionment* M.A. Jones American Mathematical Society	**Semi-plenary Lecture**	*The Unusual Physics and Math of Generalized Squeezing* S. Ashhab Advanced ICT Institute	*Applications of Modeling and Simulation in Wargaming* A. Ghanmi Defence Research and Development Canada
10:50-11:10	*Air Pollution and Energy Innovation: A Spatial Optimal Control Approach* L. Bargna University of Insubria	*An Axiomatization of the Geometric Median* S. Horan Université de Montréal	*From the Blackboard to the Clinic: digital twinning, mathematical modeling, and artificial intelligence for personalized medicine*	*The Chern Theorem and Topological Matter in Fast-Rotating Atomic Nuclei* M. Guidry University of Tennessee	*Evolutionary Gaslighting: The Emergence of Skepticism in Deceptive Environments* E. Haque University of Waterloo
11:10-11:30	*Sigmoidal Production Functions and Optimization Problems in Economics* R. Smirnov Dalhousie University	*A Structural Mechanics Approach to Institutional Stability: The Governance Geometry Model* S. Foster Independent Researcher	G. Guidoboni University of Maine Abstract & Biography on p. 22	*Super-Poissonian squeezed light in the deep-strong-coupling regime of the quantum Rabi model* X. Hu University at Buffalo	*A Stabilized Mixed Finite Element Method Glacier Drainage System Model* N. Betancourt University of Waterloo
11:30-11:50	*The Obtainable Limiting Distributions for a Markov Chain* F. Mendivil Acadia University	*Can We Infer the Single Transferable Vote Winner Set from Bloc Ballot Data?* D. McCune William Jewell College	*Recent Advances in Heat and Entropy Transfer in Multiphase Flows* G. Naterer University of Prince Edward Island	*Pulsed Generation of Continuous-Variable Cluster States in Optomechanical Quantum Network: Noise, Scalability, and Optimal Control* L. Tian University of California Merced	*Minimum-Energy Control of a Wave Equation with Integral Action* L. Ma University of Waterloo
11:50-12:10	*IFSM with Grey-Level Maps on $L^p(0,1)$ for $0 < p < 1$* H. Kunze University of Guelph	*Mutual Preference Distance Visualizations Bring New Perspectives to Elections with Ranked Ballots* B. Brubach Wellesley College	*Generation of Model-Based Virtual Patient Cohorts with Neural Networks* K. Wilkie Toronto Metropolitan University	*Quantum Subspace Expansion Guided by Approximate Symmetries* T. Zeng York University	*Prediction of Lassa Fever Outbreak in Nigeria using Statistical and Machine Learning Algorithms: An Outlook of the Model Performance* M.O. Adenomon Nasarawa State University
12:10-12:30	*In Search of a Collage Theorem for Iterated Function Systems on Riemannian Manifolds* M. Pham University of Toronto	*Borda Variants on Truncated Ballots* J. Wilson The New School	*Designing Solar-Responsive Neighborhoods: Linking Neighborhood Morphology, Zoning, and Energy Performance* K. Grewal University of Prince Edward Island		

Monday, August 17: Afternoon

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-AIO #2	SS-DF #2	SS-MMCS #2		CS-TALK #2
		Artificial Intelligence, Inverse Problems, and Optimization Chair: R. Smirnov Dalhousie University	Decisions and Fairness Chair: M. Kilgour Wilfrid Laurier University	Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches Chair: S. Singh University of Prince Edward Island		Contributed Talks Chair: C. Drapaca Pennsylvania State University
15:30-15:50		*Recent Advances in Multi-Objective and Set-Valued Optimization with Applications* D. La Torre SKEMA Business & Universit'e Côte d'Azur	*The Uniform Core of an Approval-Based Committee Election* W. Zwicker Union College	*Sinc Collocation Methods for Nonlinear PDEs* M. Usman University of Dayton		*A Mathematical Investigation of the Role of Intracranial Pressure in the Functional-Structural Interactions of Synchronized Neurons* C. Drapaca Pennsylvania State University
15:50-16:10		*Preconditioned Bilevel Optimization* T. Zhao University of Waterloo	*Comparing Nash, Berge, and Kantian Equilibria in Strict Ordinal 2×2 Games* S. El-Badawy Wilfrid Laurier University	*Efficient Estimation of Second-Order Sensitivities in Stiff Stochastic Discrete Biochemical Networks* S. Ilie Toronto Metropolitan University		*Synchronization properties in C. elegans: Relating behavioral circuits to structural and functional neuronal connectivity* G.K. Sar University of Calgary
16:10-16:30		*Statistical Learning Approach for Tuning the Hyperparameter in the L-BFGS Optimization Algorithm* Y. Gao University of Toronto Mississauga	*Fair-Division Auctions: Everybody Beneftis* S.J. Brams New York University	*A New Framework for Heterogeneity Measure in Numerical Health Data Using Heterogeneity Average Index* R. Fallahour University of Toronto		*Augmented Sample Size Calculation With Truncated Data* J. Zhang Thompson Rivers University
16:30-16:50		*Deep Learning Based on Train-Test Discrepancy Minimization* K. Zheng University of Waterloo	*Non-Monotonicity in Fair Division of Graphs* H. Hosseini Penn State University	*Toward Optimized Pulsed Field Ablation: A Coupled Multiphysics Model of Multi-Electrode Catheter* S. Subah University of Prince Edward Island		*Time-Symmetric and Symplectic Parallel-in-Time Gauss-Legendre and Hermite Methods for Hamiltonian Systems* A. Aguilera Stony Brook University
16:50-17:10		*Extended Cellular Automata on Spaces of Probability Measures* A. Kunze University of Insubria & Université Côte d'Azur	*Borda Measures of Balanced Allocations of Indivisible Objects to Two Persons* F. Ziaei Wilfrid Laurier University	*A Capital-Gains Tax Threshold for Housing Financialisation: A Bid-Function Analysis* D. Robinson Laurentian University		*Edge-Cloud Runtime Validation of Neural Stimulation Devices Using Timed Colored Petri Nets and Hierarchical Reinforcement Learning* N. Majma Naghshejahan Higher Education Institute
17:10-17:30		*Using Linear Inverse Methods to Study Food Web Energy Flows and Whole Community Responses to Perturbation* M. Yodzis University of Guelph	*Two-Person Fallback Allocation of Indivisible Items* M. Kilgour Wilfrid Laurier University			*Analysis of Lassa Fever Cases and Climate in Nigeria using Predictive Supervised Learning* M.O. Adenomon Oregon State University

Tuesday, August 18: Morning

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-AIO #3	SS-DSW #1	SS-MMSC #3	SS-CNT #1	SS-RPNM #1
		Artificial Intelligence, Inverse Problems, and Optimization Chair: O. Michailovich University of Waterloo	Dynamical Systems and Wave Propagation: Nonlinearities Chair: N. Tarfulea Purdue University Northwest	Multiphysics and Multiscale Modelling of Complex Systems: Computational and AI Approaches Chair: S. Singh University of Prince Edward Island	Computational Number Theory Chair: C. Weatherby Wilfrid Laurier University	Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing Chair: Dong Liang York University
10:00-10:20		*Robust Parametric Blind Deconvolution of Non-Linear Motion Blur via Spectral Analysis* A. Elwazir University of Waterloo	**Semi-plenary Lecture** *Large Coherent Structures in Wave Equations via Computer Assisted Proofs* E.-W. Kirr University of Illinois at Urbana-Champaign Abstract & Biography on p. 23	*Computational Field Intelligence for Precision Agriculture: AI-Driven Robotic Scouting for Disease Detection and Geospatial Crop Monitoring* G. Randhawa University of Guelph	*Explicit Brauer-Manin Obstructions on Plane Quartics* N. Bruin Simon Fraser University	*Parameter-robust Preconditioning for Hybridizable Discretizations* S. Rhebergen University of Waterloo
10:20-10:40		*Kolmogorov-Arnold Networks for Image Processing and Representation Learning* I. Urbaniak Cracow University of Technology		*The Influence of Crowders on a Nanopore Fluid Flow Driven Polymer* K. Grosvenor Western University	*A Survey on Exploring Elliptic Curves with Machine Learning* A. Babei Howard University	*Exascale Direct Numerical Simulation of Stratified Turbulence* M. Couchman York University
10:40-11:00		*Selective State-Space Model Prediction of Cancer Treatment Response* Y. Derbal Toronto Metropolitan University		*Influence of Anisotropic Blood Perfusion on Magnetic Nanoparticle Migration in Cancer Treatment* M. Singh University of Maryland Baltimore County	*EOType: A Magma package for p-torsion group schemes* C. Weir Tutte Institute	*High-Resolution Regional Climate Modeling and Projection over Western Canada using a Weather Research Forecasting Model with a Pseudo-Global Warming Approach* Y. Li Western University
11:00-11:20			*Bloch-Floquet Band Gaps for Water Waves Over Periodic Bottom* C. Sulem University of Toronto	*Patient-Specific Multiphysics Modeling of Microwave Ablation in Breast Cancer: Effects of Tumor Geometry and Applicator Placement* M. Ellsworth-Reid University of Prince Edward Island	*Post-critically Finite Polynomials in Positive Characteristic* P. Ingram York University	*Methods for Solving Three-Dimensional Nonlinear Flexural-Gravity Wave Problems* O. Trichchenko Western University
11:20-11:40			*Wedge Problem and Dispersive Shock Waves in the Two-dimensional Toda Lattice* M. Calabrese University of Massachusetts Amherst	*Molecular Dynamics Investigation of Thermophysical and Viscoelastic Properties in Two-Stage Thermosets* P. Bhanuse Western University	*Statistical methodology for arithmetic statistics* A. Cowan University of Waterloo	*New Frontiers in Artificial Intelligence for Large-eddy Simulation of Atmospheric Turbulence* J. Alam Memorial University of Newfoundland
11:40-12:00			*Conservation laws with flux discontinuous in the conserved quantity* M.T. Chiri Queen's University		*Solving the Isogeny Problem Using Orientations* E. Orvis University of Colorado Boulder	*Efficient Parallel Method for Contamination Convection-Diffusion Problems in Porous Media* D. Liang York University

Tuesday, August 18: Afternoon

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-MF #1	SS-DSW #2		SS-CNT #2	SS-RPNM #2
		Mathematical Finance Chair: M. Reesor Wilfrid Laurier University	Dynamical Systems and Wave Propagation: Linear Propagation Chair: P. Kleinhenz Illinois State University		Computational Number Theory Chair: K. Stange University of Colorado Boulder	Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing Chair: G. Tran University of Waterloo
15:00-15:20		*Beyond Volatility of Volatility: Decomposing the Informational Content of VVIX* J.-F. Bégin Simon Fraser University	*Local Energy Decay for Non-Stationary Damped Wave Operators* M. Tohaneanu University of Kentucky		**Semi-plenary Lecture**	*Random Feature Bayesian Lasso Takens Model for Time Series Forecasting* L. Ho Dalhousie University
15:20-15:40		*In Estimation, the Key is the Volatility Index, not the Returns* L. Stentoft Western University	*Global Behavior of Multispeed Klein-Gordon System* X. Zhu University of Michigan		*Hard problems in Post-quantum Cryptography*	*Stochastic Resonance Enhances Forecastability in a Noisy Predator-Prey System* N. Yu Toronto Metropolitan University
15:40-16:00		*Implied Volatility Expansions for VIX Options in Forward Variance Models* A. Agarwal Western University	*Exponential Local Energy Decay of Solutions to the Wave Equation with Electric and Magnetic Potentials* J. Shapiro University of Dayton		C. Martindale University of Bristol Abstract & Biography on p. 24	*An Application of Equivariant Machine Learning in Contact Detection* S. Morin Polytechnique Montréal
16:00-16:20		*Option Pricing with Recurrent Variance Risk Aversion* A. Badescu University of Calgary	*Internal Mode Dynamics for the Quartic Klein-Gordon Equation on the Line* G.Y. Diebou University of Toronto		*Isogeny Graphs of Abelian Varieties and Singular Ideals in Orders* S. Arpin Vriginia Polytechnic Institute	*Finite Data Error Bounds for Approximating the Koopman Operator* D. Fassler Concordia University
16:20-16:40		*A Dynamic Equilibrium Model of Liquidity Risk* X. Shi University of Toronto			*The Spine: A Supersingular Highway* T. Hedayat University of Calgary	*Mathematical Models for Medical Image Registration* M.C. Mojica University Health Network
16:40-17:00		*Infinite-Dimensional LQ Mean Field Games with Common Noise: Small and Arbitrary Finite Time Horizons* D. Firoozi University of Toronto				*Stable Mesh-Free Variational Radial Basis Function Approximation for Elliptic PDEs and Obstacle Problems* G. Tran University of Waterloo

Wednesday, August 19: Posters

Time	Room		
	LH Atrium CS-POST Poster Session		
9:30-10:00 & 14:30-15:00	*Improvement of Frontier-Based Exploration Using Carryover-Recovery Prioritization* Y. Miura National Institute of Technology, Tokyo College	*Glimpses of Fractal Analysis in the Navier-Stokes Regularity Problem* J. Said University of Waterloo	*Prototyping of an Omnidirectional Mobile Ball-Throwing Robot for Simulating a Tennis Opponent* N. Sawada National Institute of Technology, Tokyo College
		Physics-Informed Neural Networks for Identifying Tumor Metabolic Dynamics S. Vandvajdi University of Waterloo	

Wednesday, August 19: Morning

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-MF #2	SS-DSW #3	SS-TAS #1	SS-CNT #3	SS-RPNM #3
		Mathematical Finance Chair: J. Campolieti Wilfrid Laurier University	Dynamical Systems and Wave Propagation: Quantum Chair: E.-W. Kirr University of Illinois at Urbana-Champaign	Theory and Applications of Systems with Delay across the Sciences and Engineering Chair: E. Braverman University of Calgary	Computational Number Theory Chair: M. Jacobson University of Calgary	Recent Progress in Numerical Methods and Algorithms for Scientific and Engineering Computing Chair: K. Cheshmi McMaster University
10:00-10:20		*Optimal Option Portfolios for Skew-Elliptical t Returns* T. Pirvu McMaster University	*On the ergodic theory of some stochastic dispersive PDEs* G. Richards University of Guelph	*Global Asymptotic Stability and Periodicity in Delay Differential Biological Models* A.F. Ivanov Pennsylvania State University	*Computing Isomorphisms Between Quaternion Algebras with Indefinite LLL* T. Morrison Virginia Polytechnic Institute	*A Transformer-Based Optimization Framework for Clustering and Feature Selection* P. Jeganathan McMaster University
10:20-10:40		*Equilibrium Exploratory Optimal Stopping under Non-Exponential Discounting* D. Saunders University of Waterloo	*Observability of Schr odinger Equations in Euclidean Space* P. Kleinheinz Illinois State University	*Global Continuation of Periodic Solution to a Coupled Delayed Algebraic-Differential Equations* T. Cheng York University	*The Determination of Norm-Euclidean Cyclic Cubic Fields* K. McGown California State University Chico	*Progress in Surface Reconstruction from Signed Distance Data* C. Batty University of Waterloo
10:40-11:00		*Optimal Timing of Imbalance Announcements in Closing Auctions* C. Frei University of Alberta	*On the ETH model for quantum measurement* G. Zhou Binghamton University	*Stability Switches and Multi-Wave Dynamics in a Two-Strain Delay Model Calibrated with Wastewater* B. Pell Lawrence Technological University	*Algorithmic Computation of Cohen–Lenstra-Type Measures for p-Class Tower* M. Fakhari University of Calgary	*Automatic Hexahedral Meshing via Reinforcement Learning for Block Decomposition* S. Holdhousen University of Waterloo
11:00-11:20		*Optimal Trading in Day-ahead Power Markets with Battery Storage* T. Ware University of Calgary	*A Gutzwiller trace formula for singular potentials* Y. Zou Oakland University	*Discrete Delay Population Models* S. Streipart University of Pittsburgh	*Shape of Imaginary D_6 Sextic Log-Unit Lattices* F. Jalalvand University of Calgary	*RAS: A Riccati-Schur Active-Set QP Solver for Resource-Constrained Model Predictive Control* D. Ma McMaster University
11:20-11:40		*Real Options for Naval Platform Design and Operations* M. Davison Western University	*Magnetic Eigenfunctions, Landscapes, and Brownian Motion* H. Quan University of California Santa Cruz	*Quantifying Statistical Covariance Near Limit Cycles of Autonomous Delay Differential Equations* Z. Iklodi University of Maryland	*Apollonian Circle Packings and Rings of Integers* S. Haag University of Colorado Boulder	*A Single-Distribution Higher-Moment Lattice Boltzmann Scheme for Thermal and Complex-Fluid Flows* B. Duong Western University
11:40-12:00		*Habit Formation, Labor Supply, and the Dynamics of Retirement and Annuitization* C. Hyndman Concordia University	*On Propagation of Information in Open Quantum Systems* I.M. Sigal University of Toronto	*Infection Dynamics in the Presence of a Migratory Population* C. McCluskey Wilfrid Laurier University	*Eisenstein Circle Packings* J. Rickards Saint Mary's University	*Big Data, Small Footprint: Compressing Linear Algebra for the Modern Era* K. Cheshmi McMaster University

Wednesday, August 20: Afternoon

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-MF #3	SS-DSW #4	SS-TAS #2	SS-CNT #4	
		Mathematical Finance Chair: J. Campolieti Wilfrid Laurier University	Dynamical Systems and Wave Propagation: Numerics Chair: E.-W. Kirr University of Illinois at Urbana-Champaign	Theory and Applications of Systems with Delay across the Sciences and Engineering: Theory of Delay Equations and Engineering Applications Chair: A.F. Ivanov Pennsylvania State University	Computational Number Theory Chair: C. Weatherby Wilfrid Laurier University	
15:00-15:20		*Examining the Relationship Between Income and Longevity in Canada* K. Stankova Western University	*Sampling methods for solving electromagnetic inverse scattering problems associated with Maxwell's equations* T. Le University of Wisconsin-Madison	*Gravitational Models with State-Dependent Delay Applied to Galaxy Rotation* E.I. Verriest Georgia Institute of Technology	*Efficient resolution of Thue-Mahler equations* A. Gherga Tutte Institute	
15:20-15:40		*The Last Passage Time Before Ruin: Theory and Applications in Liquidation Risk Management* S. Li Western University	*Generalized Stress Models and Numerical Solvers for Blood Flow Problems* M. Haslam York University	*Event-Triggered Pinning Impulsive Control with Actuation Delays* E. Astri Queen's University	*Expansion, Separation, and Decomposition in the Markoff Graph Modulo p* C. Brown University of California Davis	
15:40-16:00		*Lambda Value-at-Risk under ambiguity* A. Schied University of Waterloo	*Threshold-based Wave Propagation Engineering: Physics-based Modeling and Data-driven Approach* M.R.T. Bidhendi University of Toronto	*From Numerics to Rigour: Periodic Orbits in State-dependent Delay Equations* J.-P. Lessard McGill University	*Factoring Non-Negative Integer Matrices* E. Goedhart Bryn Mawr College	
16:00-16:20			*Stability for Oscillatory Shocks of KdV-Burgers Equation* N. Eun Korea Institute for Advanced Study	*On Asymptotic Stability of Equations and Systems with Distributed, Unbounded and Infinite, Delays* E. Braverman University of Calgary	*Carmichael Numbers up to* 10^{24} J. Webster Butler University	
16:20-16:40			*On Solving Constrained Hyperbolic Differential Equations Numerically* N. Tarfulea Purdue University Northwest	*Dynamics of Cell Cycle Models with Quiescence and Time Delay Due to Interphase* S. Alsibaai Queen's University	*Gleeful Numbers* J. Sorenson Butler University	
16:40-17:00						

Thursday, August 20: Morning

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		CS-GSRS #1	SS-ACDS #1	SS-MID #1	SS-MFRA	
		Graduate Student Research Symposium Chair: D. Soave Wilfrid Laurier University	Advances in Complex Dynamical Systems and Applications Chair: X.Z. Liu University of Waterloo	Modelling Infectious Disease and Pathogen Evolution Chair: C. Arnold University of Toronto	Mathematical Foundations, Reasoning, and Applications of Large Language Models Chair: S.S. Sehra & X. Wang Wilfrid Laurier University	
10:00-10:20	*Sentiment-Augmented State-Space Models* M. Absolahi M.S. Wilfrid Laurier University	**Semi-plenary Lecture**	*Agent-Based Modeling of Epstein–Barr Virus Transmission Dynamics and Vaccine Impact* B. Amoako University of Guelph	*An Empirical Study of Large Language Models for Grading and Feedback Generation of Programming Assignments* N. Shaffir Wilfrid Laurier University	
10:20-10:40	*Likelihood inference for discrete stable count models on the Poisson-Tweedie boundary* S. Chen Wilfrid Laurier University	*Robust Synchronization of Cascaded Pendulum Systems Under Markovian Switching*	*Beyond Non-Linear Least Squares: Enhancing Epidemiological Inference with Chi-Square Fitting and Bayesian Informed Generalized Profiling* V. Tyuryaev York University	*Evaluating the Pedagogical Characteristics of LLM-Generated versus Human- Written Code Explanations* S. Talati Wilfrid Laurier University	
10:40-11:00	*Design-Aware Survival Analysis: Doubly-Robust Estimation under Complex Probability Sampling* I. Garg Wilfrid Laurier University	M.S. Alwan University of Saskatchewan Abstract & Biography on p. 21	*Analysis of a General Vector Transmission Model for Infectious Disease Spread* K. Devries Wilfrid Laurier University	*Towards Validity-Weighted Attenuation of Affective Noise in Student Evaluations of Teaching: An Interpretable ABSA Framework* B. Obeidi Wilfrid Laurier University	
11:00-11:20	*Positive Returns, Negative Outcomes: Identifying the Dominant Drivers of Retirement Ruin* A. Iu Wilfrid Laurier University	*Structural Properties of Networks Controlled by Switching* I.O. Shevchenko University of Waterloo	*Modelling the Impact of Vaccine Failure Mode on the Evolution of Escape Variants* C. Yu University of Toronto	*Mitigating Hallucination in Large Language Models through Data Normalization* Y. Shen Wilfrid Laurier University	
11:20-11:40	*Goalscoring Positioning Value: A Metric for Strikers' Off-Ball Positioning in Soccer* J. Jeffreys Wilfrid Laurier University	*On the Necessity of Effect Terms in Multi-Agent Systems* Z. Abbasi University of Waterloo	*Individual and Population Level Uncertainty Interact to Determine the Performance of Outbreak Surveillance Systems* C. Arnold University of Toronto	Context-Aware Probabilistic Map Matching and LLM-Enabled Decision Support for Intelligent Transportation Systems Kiran, K. Chitkara University,	
11:40-12:00	*Time Series Mediation Analysis with Non-Linear and Machine Learning Methods* T. Marsh Wilfrid Laurier University	*Predefined-Time Control for Second-Order Neural Networks* Y. Jin Dalian University of Technology		*Designing LLM Agents for Urban Mobility Planning and Operations: Optimizing the Agent-Simulator Interface* J. Yeo Gachon University	

Thursday, August 20: Afternoon

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		CS-GSRS #2	SS-ACDS #2	SS-MID #2		
		Graduate Student Research Symposium Chair: C. Weatherby Wilfrid Laurier University	Advances in Complex Dynamical Systems and Applications Chair: M.S. Alwan University of Saskatchewan	Modelling Infectious Disease and Pathogen Evolution Chair: T. Meadows Queen's University		
15:00-15:20		*Pricing American Option with Reinforcement Learning* S. Heydari University of Ottawa	*Sensitivity-Based Methods for Analyzing Nonsmooth Systems* P. Stechlinski University of Maine	*Modelling Within-host HIV Dynamics Incorporating CD31+ and CD31- Naive CD4+ T Cell Subsets* J. Liu Western University		
15:20-15:40		*Long-Lasting, Slowly Varying Transient Dynamics from Nonequilibrium Transient Centers* A. Pasion Queen's University	*Maximum Likelihood Identification of Bistable Structural Nonlinear Systems via Analytical Fokker-Planck Solution* S. Takata National Institute of Technlogy	*In-host Modelling with Immunity and Virus Loss Term* M. Ruma York University		
15:40-16:00		*The Summation-by-Parts Framework for Training Neural Networks* M. Yalsavar University of Waterloo	*Recent Approaches for Analyzing Convex Relaxations of Parametric Ordinary* K. Khan McMaster University	*An Age-and-Phase Structured Model of the Malaria Asexual Erythrocytic Replication Cycle* Z. Khanzad York University		
16:00-16:20		*A Modified Iteration Framework for Pricing American Options* X. Zhu Western University	*Adaptive Vibration Control of the Euler-Bernoulli Beam System with an Unknown Payload* Y. Wang Jiangnan University	*Modelling the Consequences of Drug Treatment for Malaria Parasite Evolution, Given Pre-existing Variation in Sensitivity* Y.C. Jeong University of Toronto		
16:20-16:40			*Event-Triggered Control of SIS Epidemic Models: Stability, Positivity, and Robustness to Delays* K. Zhang Queen's University	*Analysis of a Model of Bacterial Persister Cells* T. Meadows Queen's University		
16:40-17:00			*Event-Triggered Game-Based Impulsive Control for Systems with Disturbances* W. Liu University of Waterloo			

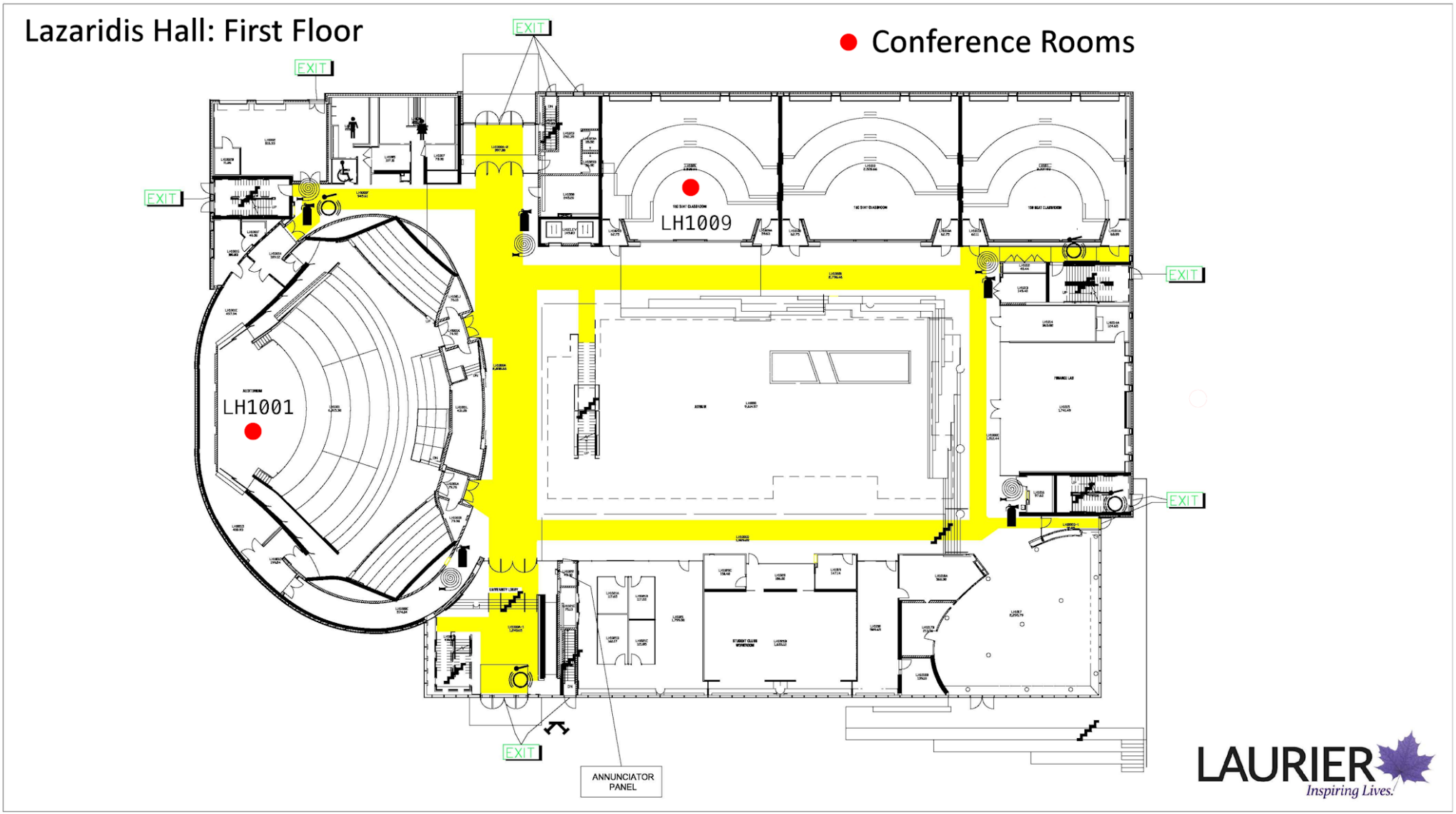
Friday, August 21: Morning

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-MPQ #1	SS-ACDS #3	SS-MID #3		
		Mathematical Physics of Quantum and Nanoscale Systems Chair: K. Akbari Queen's University	Advances in Complex Dynamical Systems and Applications Chair: P. Stechlinski University of Maine	Modelling Infectious Disease and Pathogen Evolution Chair: E. Coates McMaster University		
10:00-10:20		*What Can Quantum Entanglement Tell Us About Quantum Materials?* E.S. Sørenson McMaster University	*Stability Analysis of a Multilayer Agent-Based SIWS Epidemic Model* Z. Abbasi University of Waterloo	*Scarlet Fever Dynamics in 19th and 20th Century London* K. Zhao McMaster University		
10:20-10:40		*Anisotropic Charge Transport in Phosphorene: Effects of Screening, Impurities, and Dielectric Environment* A. Chalehchaleh University of Waterloo	*Fiscal Policy as Basin Deformation: Critical Multipliers, Timing Thresholds, and Geometric Control of a Macroeconomic Attractor* K. Wright University of Waterloo	*Familial Mutation-Aware Modelling of Amyloid-beta Propagation in Alzheimer's Disease* H. Shaheen University of Manitoba		
10:40-11:00		*Dirac Fermions, Excitons, and Trions in TMDCsand Bilayer Graphene Quantum Dots* M. Korkusinski National Research Council	*Bistability and Basin Geometry in a Nonlinear Macro-Financial Model* D. Robinson Laurentian University	*Deep Learning for Early Warning Signals of Complex Dynamical Transitions* A. Haghighatgooasiabar University of Waterloo		
11:00-11:20		*Self-consistent Two-scale Formulation of the Macroscopic Electromagnetic Boundary Conditions in the Presence of a Polarizable Sheet* A. Hansen University of Waterloo	*Near-Absorbing Boundaries in Macroeconomic Diffusions and the Mathematics of Institutional Floors* K. Wright University of Waterloo	*Noise-induced Transitions in a Coupled Stochastic Behavior–Disease System* Q. Yang University of Waterloo		
11:20-11:40			*Modelling the Interplay between IUU Fishing, Wholesaler Fraud, and Consumer Awareness in the Seafood Supply Chain* R.C. Cui University of Guelph	*Attractor and Transient Periodicities are Invariant to Seasonal Transmission Patterns in Epidemic Models* E. Coates McMaster University		
11:40-12:00						

Friday, August 21: Afternoon

Time	Room	LH1009	LH2062	LH2064	LH2066	LH3101
		SS-MPQ #2 Mathematical Physics of Quantum and Nanoscale Systems Chair: K. Akbari Queen's University		SS-MID #4 Modelling Infectious Disease and Pathogen Evolution Chair: Z.S. Yu York University		
15:00-15:20		*Classification of Metals* S.-S. Lee McMaster University		**Semi-plenary Lecture**		
15:20-15:40		*A Quantum Field-Theoretic Approach to the Quantization of Electromagnetic Fields in a Superconducting Condensate* A. Dhillon University of Waterloo		*Comparative Counterfactual Analysis of COVID-19 Policies and Vaccination*		
15:40-16:00		*Double Dressing, Quasienergy-Resolved Dissipation, and Floquet-Liouville Spectroscopy in Strongly Driven Quantum Systems* K. Akbari Queen's University		M. Tuffaha York University Abstract & Biography on p. 25		
16:00-16:20				*A Continuous-time Stochastic Model for Mutation Effects in Microbial Population* M. Ezadian Western University		
16:20-16:40				*Modelling of Post-vaccination Immunity for Influenza with PapMV Adjuvant Trivalent Vaccine* Z.S. Yu York University		
16:40-17:00						

14. Maps


Lazaridis Hall: First Floor
Conference Rooms
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LH1009
LH1001
ANNUNCIATOR PANEL
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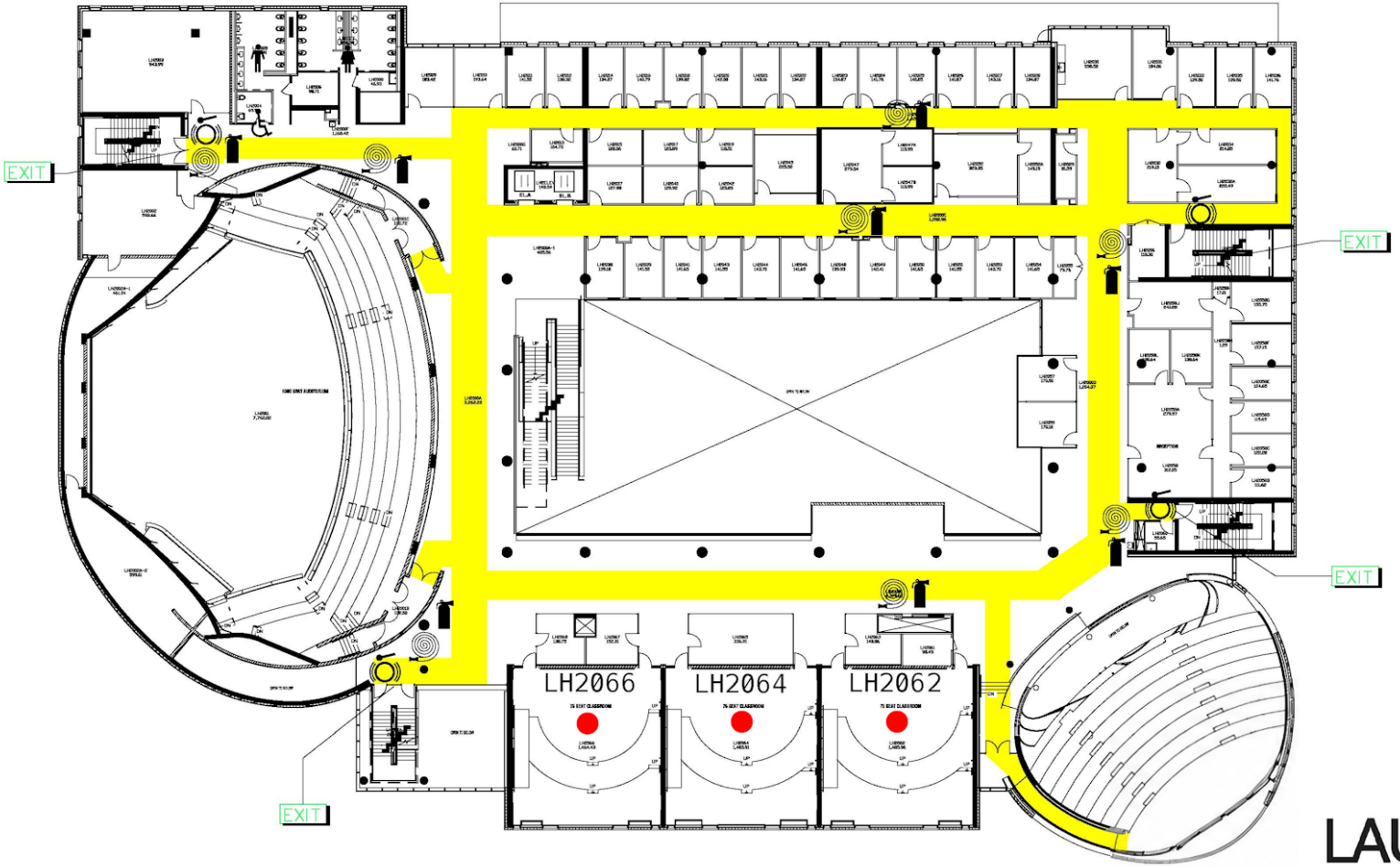
● Conference Rooms



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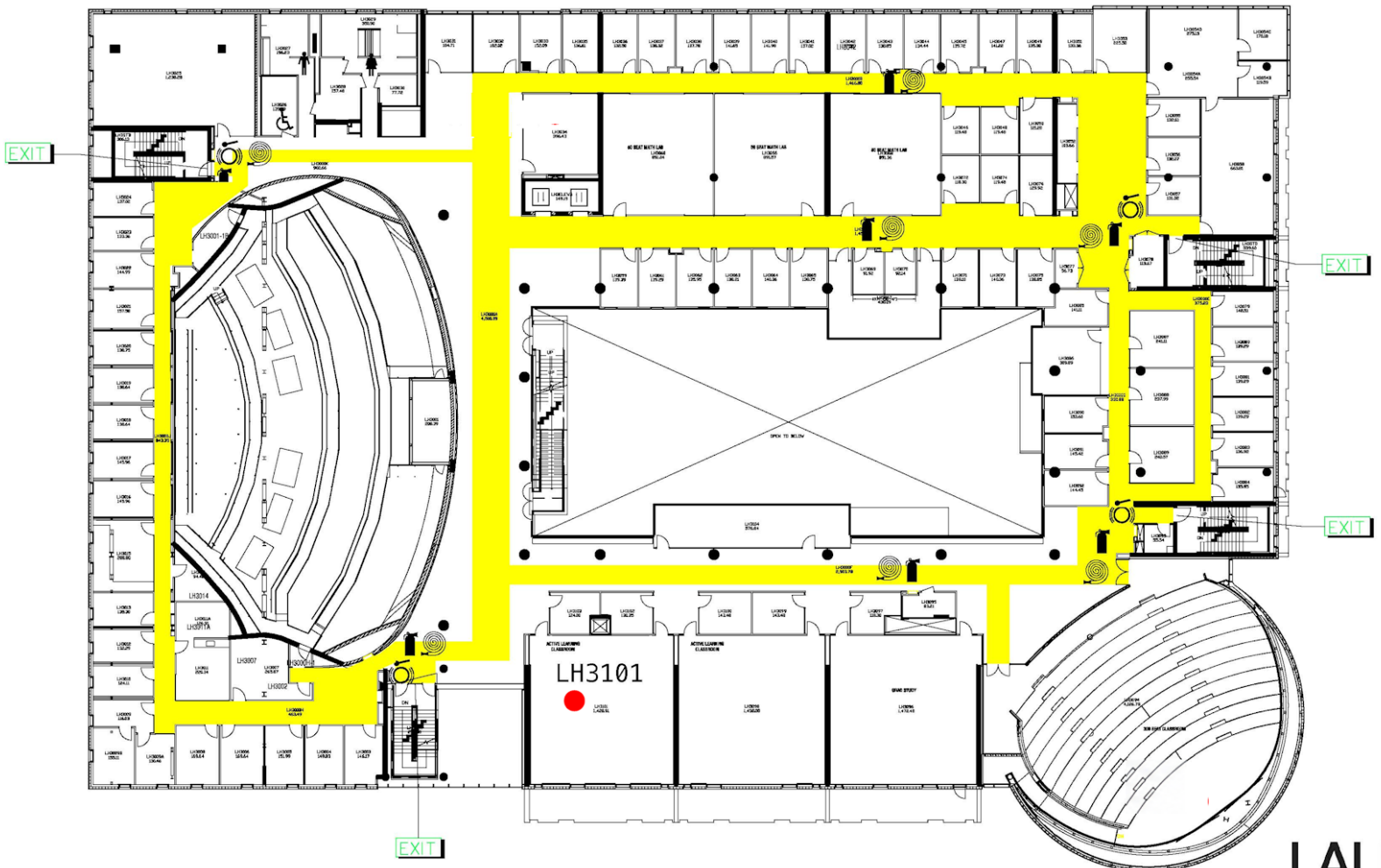

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15. Hyperlinked Index of Speakers

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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