



International Conference on Applied Mathematics & Informatics 2026 (AMI 2026)

August 22, 2026 - Hanoi, Vietnam

Programs & Information

Faculty of Mathematics and Informatics
Hanoi University of Science and Technology



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**Applied Mathematics &
Informatics 2026**
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About AMI 2026

The International Conference on Applied Mathematics and Informatics 2026 (AMI 2026) provides an international forum for researchers, educators, students, and professionals to present recent advances and exchange ideas in applied mathematics, informatics, and their applications.

The conference aims to promote collaboration between academia and industry while encouraging the development of mathematical theories, computational methods, and intelligent technologies that address challenging scientific and engineering problems. AMI 2026 welcomes contributions ranging from fundamental mathematical research to innovative applications in science, engineering, technology, and data-driven decision making.

The conference also celebrates the 70th Anniversary of the Faculty of Mathematics and Informatics, Hanoi University of Science and Technology, highlighting its long-standing commitment to excellence in education, research, and international collaboration.

Topics

- ◇ Analysis and Partial Differential Equations
- ◇ Algebra, Number Theory, and Combinatorics
- ◇ Probability and Statistics
- ◇ Optimization and Scientific Computing
- ◇ Mathematical Modeling and Numerical Analysis
- ◇ Stochastic Processes and Dynamical Systems
- ◇ Data Science, Machine Learning, and Artificial Intelligence
- ◇ Computational Mathematics
- ◇ Mathematical Methods in Engineering and Technology
- ◇ Applications in:
 - Healthcare,
 - Climate and Environmental Sciences,
 - Transportation and Logistics,
 - Robotics and Intelligent Systems,
 - Education,
 - Other Emerging Applications.

Supporting Institutions

This conference is organized by the Faculty of Mathematics and Informatics, Hanoi University of Science and Technology with special support from:

- **Computer Communication Control 3C Inc.**
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- **D.ragoon Co., Ltd.**
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- **ITSOL Joint Stock Company**
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Location

The conference takes place at Ta Quang Buu Library and C7 Building, which are located on the campus of Hanoi University of Science and Technology, No. 1 Dai Co Viet Road, Bach Mai Ward, Ha Noi, Viet Nam.

Access to the Venue: Although the main entrance of the university campus is No. 1 Dai Co Viet Road, the best way to come to the conference's location is through the side entrance of university campus near the road junction between Ta Quang Buu Street and Tran Dai Nghia Street.

Conference office: Room C9–101 – Hanoi University of Science and Technology

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Conference website: <https://fami.hust.edu.vn/hoi-nghi/international-conference-on-applied-mathematics-and-informatics-2026-ami-2026/>

Committees

Organizing Committee

- Assoc. Prof. Dr. Huynh Dang **Chinh** (HUST)
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- Assoc. Prof. Dr. Truong **Viet Anh** (HUST)
- Assoc. Prof. Dr. Nguyen Dac **Trung** (HUST)
- Dr. Nguyen Thi Thu **Huong** (HUST)
- Dr. Doan Duy **Trung** (HUST)
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- Assoc. Prof. Dr. Nguyen Thi Thu **Thuy** (HUST)
- Assoc. Prof. Dr. Duong Anh **Tuan** (HUST)

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- Dr. Ta Thi Thanh **Mai** (HUST)
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- Assoc. Prof. Dr. Le Chi **Ngoc** (HUST)
- Assoc. Prof. Dr. Nguyen Duy **Tan** (HUST)
- Assoc. Prof. Dr. Do Duc **Thuan** (HUST)
- Assoc. Prof. Dr. Nguyen Thi Thu **Thuy** (HUST)
- Assoc. Prof. Dr. Duong Anh **Tuan** (HUST)

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Conference Program

Morning					
07:45–08:15	Reception				
08:15–08:30	Opening ceremony				
Session 1	Chair: Doan Thai Son, location: 10th Floor Auditorium, Ta Quang Buu Library				
08:30–09:30	Ho Tu Bao <i>Systems thinking in the age of AI: Reflections on autonomous-intelligent systems</i>				
09:30–10:30	Dinh Nho Hao <i>Parameter estimation in surface water and groundwater quality modeling</i>				
10:30–11:00	Coffee break and photo session				
Session 2	Chair: Phan Thi Ha Duong, location: 10th Floor Auditorium, Ta Quang Buu Library				
11:00–12:00	Dao Hai Long <i>Some recent interactions between research mathematics and artificial intelligence</i>				
12:00–14:00	Lunch				
Afternoon					
Mini-symposium	Analysis <i>Room: C7-105</i>	Algebra, Number theory and Combinatorics <i>Room: C7-107</i>	Probability, Statistics and Applications <i>Room: C7-108</i>	Optimization and Scientific Computing <i>Room: C7-103</i>	Data Science <i>Room: C7-109</i>
Session 3	Chair: Le Van Tu	Chair: Nguyen Duy Tan	Chair: Tran Ngoc Khue	Chair: Do Duc Thuan	Chair: Ha Minh Hoang
14:00–14:30	Doan Thai Son <i>Spectral theory of nonautonomous dynamical systems and applications</i>	Ngo Dac Tuan <i>On the algebra of multiple zeta values</i>	Ngo Hoang Long <i>Recent advances in numerical approximation of stochastic differential equations with irregular coefficients</i>	Pham Ky Anh <i>Regularized dynamical system methods for ill-posed problems</i>	Nguyen Van Hau <i>From offline metric to instructional decision: calibration, leakage, and effect size in educational data</i>
14:30–15:00	Pham Hoang Hiep <i>Singular invariants of plurisubharmonic functions and complex spaces</i>	Nguyen Duc Manh <i>Counting representations of real quadratic orders and modular forms</i>	Can Van Hao <i>Random cluster model on random graphs</i>		Nguyen Tuan Binh <i>When AI “makes things up”: Understanding how large language models work and the challenge of controlling AI hallucinations</i>
15:00–15:30	Nguyen Thi Van Anh <i>Approximation of Allen-Cahn equations with signed-functional initial conditions to a mean curvature flow</i>	Le Quy Thuong <i>Equivariant motivic integration for formal schemes and the motivic Milnor fiber of formal functions</i>	Nguyen Tien Dung <i>Berry-Esseen bounds for the parameter estimations in SDEs</i>	Tang Quoc Bao <i>Indirect diffusion effect in reaction-diffusion systems</i>	Nguyen Thi Trang Nhung <i>Some development directions of applied mathematics in healthcare</i>
15:30–15:45	Coffee break				
Session 4	Chair: Dao Tuan Anh	Chair: Nguyen Cong Minh	Chair: Ngo Hoang Long	Chair: Pham Thi Hoai	Chair: Nguyen Van Hau
15:45–16:15	Nguyen Van Hoang <i>The L^2-Caffarelli-Kohn-Nirenberg inequalities: The sharp constants and stability estimate</i>	Phan Thi Ha Duong <i>Some deterministic and stochastic dynamical systems on graphs: A random walk perspective</i>	Trinh Thi Huong <i>Analysis of variance for density data</i>	Dao Phuong Nam <i>Q-Learning trajectory tracking control for a perturbed Three-Wheeled mobile robot with mecanum wheels</i>	Ha Minh Hoang <i>Recent advances in optimization for drone delivery scheduling</i>
16:15–16:45	Duong Anh Tuan <i>Non-existence results for fractional elliptic inequalities on lattice graphs</i>	Trieu Thu Ha <i>The many roles of Mahler measure</i>	Tran Ngoc Khue <i>Malliavin calculus for local asymptotic properties of stochastic differential equations with and without jumps</i>	Chu Thi Mai Hong <i>Time-integrated optimal transport: A robust minimax framework</i>	Nguyen Thi Ngoc Anh <i>Fisher-geometric drift statistics for cost-aware adaptive forecasting under distribution shift</i>

Plenary talks

Room: 10th Floor Auditorium, Ta Quang Buu Library

Session 1 - Chair: Doan Thai Son

08:30–09:30 Ho Tu Bao

Systems thinking in the age of AI: Reflections on autonomous-intelligent systems

09:30–10:30 Dinh Nho Hao

Parameter estimation in surface water and groundwater quality modeling

10:30–11:00 Coffee break and photo session

Session 2 - Chair: Phan Thi Ha Duong

11:00–12:00 Dao Hai Long

Some recent interactions between research mathematics and artificial intelligence

Analysis

Room: C7-105

Session 3 - Chair: Le Van Tu

14:00–14:30 Doan Thai Son

Spectral theory of nonautonomous dynamical systems and applications

14:30–15:00 Pham Hoang Hiep

Singular invariants of plurisubharmonic functions and complex spaces

15:00–15:30 Nguyen Thi Van Anh

Approximation of Allen-Cahn equations with signed-functional initial conditions to a mean curvature flow

15:30–15:45 Coffee break

Session 4 - Chair: Dao Tuan Anh

15:45–16:15 Nguyen Van Hoang

The L^2 -Caffarelli-Kohn-Nirenberg inequalities: The sharp constants and stability estimate

16:15–16:45 Duong Anh Tuan

Non-existence results for fractional elliptic inequalities on lattice graphs

Algebra, Number theory and Combinatorics

Room: C7-107

Session 3 - Chair: Nguyen Duy Tan

14:00–14:30 Ngo Dac Tuan, Nguyen Chu Gia Vuong, and Pham Lan Huong

On the algebra of multiple zeta values

14:30–15:00 Nguyen Duc Manh

Counting representations of real quadratic orders and modular forms

15:00–15:30 Nguyen Hong Duc and Le Quy Thuong

Equivariant motivic integration for formal schemes and the motivic Milnor fiber of formal functions

15:30–15:45 Coffee break

Session 4 - Chair: Nguyen Cong Minh

15:45–16:15 Phan Thi Ha Duong

Some deterministic and stochastic dynamical systems on graphs: A random walk perspective

16:15–16:45 Trieu Thu Ha

The many roles of Mahler measure

Probability, Statistics and Applications

Room: C7-108

Session 3 - Chair: Tran Ngoc Khue

14:00–14:30 Ngo Hoang Long

Recent advances in numerical approximation of stochastic differential equations with irregular coefficients

14:30–15:00 Can Van Hao and Remco van der Hofstad

Random cluster model on random graphs

15:00–15:30 Nguyen Tien Dung

Berry-Esseen bounds for the parameter estimations in SDEs

15:30–15:45 Coffee break

Session 4 - Chair: Ngo Hoang Long

15:45–16:15 Camille Mondon, Trinh Thi Huong, Josep Antoni Martin Fernandez, and Christine Thomas-Agnan

Analysis of variance for density data

16:15–16:45 Tran Ngoc Khue

Malliavin calculus for local asymptotic properties of stochastic differential equations with and without jumps

Optimization and Scientific Computing

Room: C7-103

Session 3 - Chair: Do Duc Thuan

14:00–15:00 Pham Ky Anh

Regularized dynamical system methods for ill-posed problems

15:00–15:30 Tang Quoc Bao

Indirect diffusion effect in reaction-diffusion systems

15:30–15:45 Coffee break

Session 4 - Chair: Pham Thi Hoai

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Q-Learning trajectory tracking control for a perturbed Three-Wheeled mobile robot with mecanum wheels

16:15–16:45 Nguyen Pham Duy Thai, Chu Thi Mai Hong, and Kim-Chuan Toh

Time-integrated optimal transport: A robust minimax framework

Data Science

Room: C7-109

Session 3 - Chair: Ha Minh Hoang

14:00–14:30 Nguyen Van Hau

From offline metric to instructional decision: calibration, leakage, and effect size in educational data

14:30–15:00 Nguyen Tuan Binh

When AI “makes things up”: Understanding how large language models work and the challenge of controlling AI hallucinations

15:00–15:30 Nguyen Thi Trang Nhung

Some development directions of applied mathematics in healthcare

15:30–15:45 Coffee break

Session 4 - Chair: Nguyen Van Hau

15:45–16:15 Ha Minh Hoang

Recent advances in optimization for drone delivery scheduling

16:15–16:45 Nguyen Thi Ngoc Anh

Fisher-geometric drift statistics for cost-aware adaptive forecasting under distribution shift

Abstracts

Approximation of Allen-Cahn equations with signed-functional initial conditions to a mean curvature flow

Nguyen Thi Van Anh¹

Abstract: In this talk, I will consider the Allen-Cahn equation under the initial condition that is no longer well-prepared and even discontinuous, in particular it is simply a 'signed function' of a given set. The solvability of problems, the convergence to the mean curvature flows in both classical and weak sense are discussed. This is a part of an ongoing research project with Giovanni Bellettini (ICTP & University of Udine-Italy).

Keywords: Allen-Cahn equations.

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Regularized dynamical system methods for ill-posed problems

Pham Ky Anh¹

Abstract: This talk explores the so-called Regularized Dynamical System Method (RDSM) as a unifying framework for solving ill-posed operator equations and monotone optimization problems.

We discuss the construction of continuous evolution equations whose trajectories converge strongly to specific solutions, such as the minimum-norm or bilevel variational inequality solution.

Keywords: Ill-Posed problems, dynamical system methods, Tikhonov regularization, bilevel variational inequality problems.

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Fisher-geometric drift statistics for cost-aware adaptive forecasting under distribution shift

Nguyen Thi Ngoc Anh¹

Abstract: Adaptive forecasting for nonstationary time series requires deciding when a forecasting model should be updated and which adaptation action should be taken under changing data distributions. Existing methods mainly rely on prediction-error thresholds or heuristic drift detectors, which often ignore the local statistical geometry of the underlying probabilistic model and treat all detected drifts as retraining events. This talk introduces a Fisher-geometric drift statistic for locally parametric time-series models. The statistic measures local distributional change through the Fisher information metric, providing a coordinate-invariant characterization of statistical drift under regularity conditions. Building upon this statistic, we formulate model adaptation as a sequential cost-aware decision problem in which an adaptive agent selects one of four actions—keep, recalibrate, retrain, or switch model—according to the estimated drift, forecasting loss, predictive uncertainty, and computational budget. Policy updates are stabilized using a Kullback–Leibler trust-region constraint to avoid unnecessary adaptation. The proposed framework establishes a mathematical connection between local statistical geometry and adaptive forecasting. We analyze the asymptotic properties of the proposed drift statistic under dependent observations and investigate policy stability and dynamic regret under standard regularity assumptions. This work provides a principled alternative to threshold-based retraining and offers a unified mathematical framework for cost-aware adaptive forecasting under distribution shift.

Keywords: Nonstationary time series, Fisher information, information geometry, distribution shift, adaptive forecasting, dynamic regret.

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Systems thinking in the age of AI: Reflections on autonomous-intelligent systems

Ho Tu Bao¹

Abstract: This talk summarizes the development of three fields—Cybernetics, Computer Science, and AI—along with key observations and reflections: While AI has developed as a branch of Computer Science for nearly 70 years, it is now emerging as an independent discipline. It fulfills many of the original goals of Cybernetics and serves as the core of the Science of Intelligent Autonomous Systems, which will play a pivotal role in development over the coming decade.

Keywords: AI, computer science, cybernetics.

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Indirect diffusion effect in reaction-diffusion systems

Tang Quoc Bao¹

Abstract: Convergence to equilibrium for evolution systems has numerous applications, ranging from economics and game theory to machine learning and computer science, and thermodynamics and chemical engineering. This trend to equilibrium for chemical reaction-diffusion systems has been extensively investigated recently using the entropy method. When the diffusion is degenerate, i.e. some of the species do not diffuse, then the problem becomes challenging. Interestingly, the combination of diffusive components and reversible reactions gives rise to some diffusion effect of the non-diffusive component, and this phenomenon is called *indirect diffusion effect*. In this talk, I will describe this phenomenon in more detail and discuss how to exploit it to get quantitative convergence to equilibrium for degenerate reaction-diffusion systems.

Keywords: Chemical reaction-diffusion systems, degenerate diffusion, convergence to equilibrium, entropy methods, indirect diffusion effect.

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When AI “makes things up”: Understanding how large language models work and the challenge of controlling AI hallucinations

Nguyen Tuan Binh¹

Abstract: Large language models (LLMs) such as ChatGPT, Gemini, and Claude are transforming the way we work, learn, and create. However, these systems have a serious weakness: they can confidently produce information that is entirely false, a phenomenon known as hallucination. Such AI errors have already caused real-world consequences in areas including finance, healthcare, law, and software development. In this talk, I will explain the inner workings of the Transformer architecture, from how attention layers process language to why this architecture can be prone to hallucination. We will then discuss several approaches for controlling the behavior of LLMs, including Retrieval-Augmented Generation (RAG) for incorporating external knowledge, improved decoding strategies such as Context-Aware Decoding and DoLA, and methods that directly intervene in a model’s internal representations at inference time. Finally, I will introduce RADIANT, a framework that uses optimal transport theory to steer a model’s activations toward more truthful representations without retraining its weights.

Keywords: AI, LLM, retrieval-augmented generation.

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Equivariant motivic integration for formal schemes and the motivic Milnor fiber of formal functions

Nguyen Hong Duc¹, Le Quy Thuong²

Abstract: Motivated by the classical Milnor fiber for analytic functions and our recent development on the equivariant motivic Integration for algebraic varieties, we construct the theory of equivariant motivic integration for special formal schemes. In this talk, we explain the construction, from the framework for separated topologically of finite type formal schemes to that of special formal schemes. We mention the change of variables formula for this new integration and the rationality of the corresponding motivic Poincaré series. Furthermore, we will discuss motivic Milnor fibers of formal power series and introduce some conjectures concerning the motivic Milnor fiber of complex analytic function germs.

Keywords: Equivariant motivic integration, formal schemes, motivic Milnor fibers.

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Berry-Esseen bounds for the parameter estimations in SDEs

Nguyen Tien Dung¹

Abstract: In this talk, we introduce a general method to bound the Kolmogorov distance in the central limit theorem for parameter estimations in stochastic differential equations.

Keywords: Parameter estimations, Berry-Esseen bounds, Malliavin calculus.

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Some deterministic and stochastic dynamical systems on graphs: A random walk perspective

Phan Thi Ha Duong¹

Abstract: Graphs provide a natural framework for modeling many deterministic and stochastic dynamical systems. Although these systems are often studied independently, they share a number of common ideas and mathematical tools. In this talk, I will present some research topics that I have worked on over the years, including the Chip Firing Game, finite dynamical systems, random walks, and community detection in complex networks.

A recurring theme throughout these topics is the use of random walks on graphs. Basic notions such as stationary distributions, hitting times, and Laplacian operators not only describe the behavior of random walks but also offer useful insights into the analysis of other graph dynamical systems and the design of efficient algorithms. The purpose of this talk is to highlight some of these connections and illustrate how a simple probabilistic process can provide a common perspective on several seemingly different problems.

Keywords: Random walks, community detection, Laplacian matrix, spectrum of graphs.

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The many roles of Mahler measure

Trieu Thu Ha¹

Abstract: The Mahler measure was first introduced in 1962 to study transcendental numbers. Since then, it has been discovered that the Mahler measure is not merely an isolated object in Number Theory, but rather fits seamlessly into various other fields of mathematics, most notably in Arithmetic Geometry and, more recently, in Algebra and Algebraic Topology. In this talk, I will review these fascinating connections, focusing on the close relationship between the Mahler measure and Beilinson regulators, as well as its application to the study of Beilinson's conjectures. Furthermore, I will shortly present recent joint results with Deninger on generalizing the concept of Mahler measure as an algebraic notion and placing it within the framework of K -theory.

Keywords: Mahler measure, motivic cohomology, Beilinson conjectures, K -theory, cyclic cohomology.

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Parameter estimation in surface water and groundwater quality modeling

Dinh Nho Hao¹

Abstract: The reliability of surface water and groundwater quality models intrinsically depends on the accuracy of their parameters. However, parameter identification remains a significant challenge due to natural environmental heterogeneity and limited field data. This talk presents a comprehensive methodological framework for parameter estimation in surface water and groundwater quality modeling. Based on available measurements, we employ the least-squares method combined with Tikhonov regularization to establish theoretical results regarding the stability and convergence of the parameter estimation process. These estimated parameters include hydraulic conductivity, specific storage, dispersion coefficients, and biochemical reaction decay rates. Accurately calibrating and identifying these parameters not only minimizes simulation errors but also enhances the model's predictive capability under climate change and contaminant spill scenarios, supporting sustainable water resources management.

Keywords: Parameter estimation, groundwater quality modeling, Tikhonov regularization, hydraulic conductivity.

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Random cluster model on random graphs

Can Van Hao¹, Remco van der Hofstad²

Abstract: In this talk, we discuss the random cluster model, introduced by Fortuin and Kasteleyn, as a unifying framework for percolation, Ising, and Potts models. On locally tree-like random graphs, we establish a connection between the random cluster model and Ising models with vertex-dependent external fields. As a key application, we provide a complete solution for the pressure per particle of the Potts model on random regular graphs and identify the phase diagram of the model. Additionally, we analyze the high external field and low-temperature phases of the system on graphs with general degree distribution.

Keywords: Random cluster model, Potts model, random graph, phase transition.

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From offline metric to instructional decision: calibration, leakage, and effect size in educational data

Nguyen Van Hau¹

Abstract: Predictive models of learner mastery are increasingly used to reorder exercises, populate dashboards and trigger remediation. A model is typically promoted on the strength of an improvement in an aggregate offline metric. This talk concerns what has to hold before such an improvement licenses a decision. Four conditions are routinely assumed and rarely checked, and each has a precise formulation in the existing statistical literature. First, discrimination and reliability are distinct: a rank-based criterion such as AUC is invariant to monotone transformations of the score, whereas a threshold decision requires the score to be a calibrated probability. Second, aggregate metrics are mass-weighted averages, so on the long-tailed concept distributions typical of educational logs they are governed by a small dense stratum and are close to uninformative about the sparse stratum where support is most needed. Third, leakage is a measurability condition on the information set available at deployment, and auxiliary structure built from pooled data can violate it without any response label being exposed. Fourth, an effect must be separated from its significance and from the dependence structure of the runs that produced it. The talk closes with open problems in estimation and identifiability arising from these conditions.

Keywords: Predictive learner modeling, model calibration, data leakage.

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Singular invariants of plurisubharmonic functions and complex spaces

Pham Hoang Hiep¹

Abstract: This report introduces several concepts of singular invariants of plurisubharmonic functions, which are then used to define new singular invariants for complex spaces in order to classify them.

Keywords: Lelong number, Monge-Ampère operator, log canonical threshold, Hilbert-Samuel multiplicity.

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The L^2 -Caffarelli-Kohn-Nirenberg inequalities: The sharp constants and stability estimate

Nguyen Van Hoang¹

Abstract: The Caffarelli-Kohn-Nirenberg inequalities are the first order interpolation inequalities that have many applications in Analysis and PDEs. In this talk, we present the recent results on the sharp constant and the stability estimate for a family of L^2 -Caffarelli-Kohn-Nirenberg inequalities for the scalar functions and vector fields. The talk is based on the joint works with Xuan Anh Do, Lam Hoang Nguyen, Guozhen Lu, and Anh Tuan Duong.

Keywords: Caffarelli-Kohn-Nirenberg inequality, sharp constants, extremal functions, stability version, spherical harmonic decomposition.

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Recent advances in optimization for drone delivery scheduling

Ha Minh Hoang¹

Abstract: This talk presents recent advancements in mathematical optimization for drone delivery scheduling in last-mile logistics. We review modern extensions of the Vehicle Routing Problem (VRP) incorporating UAVs while addressing critical operational constraints including battery endurance, payload limitations, flight ranges, and truck-drone synchronization. We examine the evolution of solution methodologies from exact mathematical programming formulations to advanced metaheuristics and hybrid algorithms designed to tackle large-scale, dynamic logistics networks under operational uncertainty. Finally, we outline key open challenges and future research directions at the intersection of operations research and intelligent transportation systems to inspire further innovation in smart logistics management.

Keywords: Drone delivery, last-mile logistics, vehicle routing problem.

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Malliavin calculus for local asymptotic properties of stochastic differential equations with and without jumps

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Abstract: In this talk, we discuss local asymptotic properties for the drift and volatility parameters of several classes of stochastic differential equations with or without jumps based on discrete high-frequency observations over either a fixed or an increasing time horizon. The Local Asymptotic Normality (LAN) property and the Local Asymptotic Mixed Normality (LAMN) property are fundamental concepts in asymptotic statistical theory, providing a framework for defining asymptotically efficient estimators in the sense of the Hájek-Le Cam convolution theorem. In general, diffusion and jump-diffusion processes do not admit explicit expressions for their transition densities, which makes the derivation of local asymptotic properties from discrete observations particularly challenging. Our approach relies on Malliavin calculus techniques initiated by Gobet (2001, 2002) to derive explicit representations of the logarithmic derivatives of the transition density with respect to the parameters in terms of conditional expectations involving the Skorohod integral and the Malliavin derivative. In the presence of jumps, the analysis further requires a delicate study of the jump structure of the driving Lévy process. This talk is based on joint work with Ngo Hoang Long (Hanoi National University of Education), Mohamed Ben Alaya (Université de Rouen Normandie, France), Ahmed Kebaier (Université Évry Paris-Saclay, France), Ngo Thi Bao Tram (Université Évry Paris-Saclay, France).

Keywords: Asymptotic efficiency, local asymptotic mixed normality, Malliavin calculus, stochastic differential equations.

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Some recent interactions between research mathematics and artificial intelligence

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Abstract: The rapid development of extremely powerful artificial intelligent tools has brought profound challenges and opportunities to mathematicians. This talk will focus on several interesting recent developments: the use of reinforcement learning for sparse reward search in combinatorial commutative algebra, the collaboration between human experts and AI to map out new and interesting frontiers of classical topics, and the new challenge of building benchmark problems to test (and understand) modern large language models.

Keywords: Artificial intelligence, combinatorial commutative algebra, large language models.

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Recent advances in numerical approximation of stochastic differential equations with irregular coefficients

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Abstract: Stochastic differential equations with irregular coefficients arise naturally in many modern applications, including interacting particle systems, mathematical finance, statistical physics, machine learning, and nonlocal dynamics. However, the low regularity of the drift and diffusion coefficients often invalidates the assumptions underlying classical numerical methods, creating significant challenges for the design and analysis of convergent approximation schemes. In this talk, we will present several recent advances in the numerical analysis of stochastic differential equations with singular or non-smooth structures. We first discuss the construction and strong convergence analysis of approximation methods for McKean–Vlasov stochastic differential equations with distribution-dependent and irregular coefficients, where the interaction between particles and the lack of global regularity require new analytical techniques. We then consider the Dunkl process, a class of stochastic processes associated with reflection groups and Dunkl operators, which plays an important role in harmonic analysis and random matrix theory. We introduce efficient numerical approximation schemes that preserve the intrinsic geometric structure of the process and establish their convergence properties.

Keywords: Dunkl process, Euler-Maruyama approximation, McKean-Vlasov equation, stochastic differential equation.

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Counting representations of real quadratic orders and modular forms

Nguyen Duc Manh¹

Abstract: We consider an arithmetic problem arising from the study of Hilbert modular surfaces, which parametrize the space of Abelian surfaces admitting a real multiplication. In particular, we are interested in enumerating inequivalent proper self-adjoint representations of a fixed real quadratic order over a symplectic vector space preserving an orthogonal decomposition. The aim of the talk is to explain how this problem can be translated into a problem in the realm of number theory, and hence can be solved with tools from the theory of modular forms.

Keywords: Quadratic orders, symplectic spaces, modular forms.

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Analysis of variance for density data

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Abstract: Given samples of density functions on an interval (a, b) of $\mathbb{R}$, categorized according to a factor variable, we aim to test the equality of their mean functions both overall and across the groups defined by the factor. While the Functional Analysis of Variance (FANOVA) methodology is well-established for functional data, its adaptation to density functions (DANOVA) is necessary due to their inherent constraints of positivity and unit integral. To accommodate these constraints, we naturally use Bayes spaces methodology by mapping the densities using the centered log-ratio transformation into the $L_0^2(a, b)$ space where we can use FANOVA techniques. Many traditional contrasts in FANOVA rely on squared differences and can be reinterpreted as squared distances between Bayes perturbations within the densities space. We illustrate our methodology on a dataset comprising daily maximum temperatures across Vietnamese provinces between 1987 and 2016. Within the context of climate change, we first investigate the existence of a non-zero temporal trend of the densities of daily maximum temperature over Vietnam and then examine whether there is any regional effect on these trends. Finally, we explore odds ratio based interpretations allowing to describe the trends more locally.

Keywords: Analysis of variance, density data, functional data, odds ratio, Bayes spaces, climate change, Vietnam.

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Q-Learning trajectory tracking control for a perturbed Three-Wheeled mobile robot with mecanum wheels

Dao Phuong Nam¹

Abstract: A robust data-driven Q-learning control with Robust Integral of the Sign of the Error is proposed for trajectory tracking control of a perturbed three mecanum wheeled mobile robot. This method is designed to simultaneously address the optimal control problem and tracking performance caused by external disturbance and dynamic uncertainties. First, a model-free Q-learning strategy is constructed using data collection and Neural Network approximation, and its weights are updated via optimization problem. Second, a Robust Integral of the Sign of the Error is integrated to estimate the disturbance/dynamic uncertainties term to develop the data driven approach, which is able to develop a model-free Q-learning strategy for the nominal system. Unlike disturbance observer method with model parameters, this approach ensures the model-free development of perturbed systems. Combined with a discount factor and probing noise integration, the proposed control method maintains acceptable control effectiveness in the presence of external disturbance/dynamic uncertainties. The simulation results further validate the effectiveness of the Q-learning method for a perturbed three mecanum wheeled mobile robot.

Keywords: Q-learning, data driven, model-free, reinforcement learning control.

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Some development directions of applied mathematics in healthcare

Nguyen Thi Trang Nhung¹

Abstract: The rapid growth of healthcare data, digital technologies, and artificial intelligence is driving profound changes in medical research, management, and healthcare service delivery. In this context, applied mathematics increasingly plays a foundational role in transforming data into actionable information, forecasting, and supporting medical decision-making. Methods ranging from probability and statistics, mathematical modeling, optimization, and signal processing to machine learning and deep learning are now being widely applied across various domains. These include epidemiology, disease risk prediction, disease surveillance and early warning systems, medical image analysis, precision medicine, and hospital administration. This presentation introduces several prominent development trends of applied mathematics in healthcare. These encompass disease and risk factor modeling; spatio-temporal medical data analysis; the development of clinical prediction models; the application of artificial intelligence in diagnostics and clinical decision support; hospital resource optimization; the integration of environmental, health, and real-time data to build early warning systems; as well as emerging frontiers such as digital patients and “digital twins” in medicine. Through practical real-world problems—such as forecasting hospital admissions, the early detection of abnormal spikes in infectious diseases, assessing the health impacts of air pollution and heatwaves, and predicting intensive care unit (ICU) demand—this presentation elucidates the pipeline of translating a healthcare issue into a mathematical problem, formulating a computational model, and ultimately generating decision-support insights. Furthermore, the presentation discusses the essential competencies and opportunities for Applied Mathematics students to participate in fields such as health data science, medical AI, computational epidemiology, bioinformatics, and smart healthcare systems. The intersection of mathematics, technology, and health sciences is expected to open up an expansive landscape of research and career opportunities for the next generation of young engineers and scientists.

Keywords: Applied mathematics, healthcare, mathematical modeling, health data science, artificial intelligence, forecasting, precision medicine.

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Spectral theory of nonautonomous dynamical systems and applications

Doan Thai Son¹

Abstract: In this talk, we first recall the Lyapunov spectrum and dichotomy spectrum of nonautonomous dynamical systems. Then, we present several results on regularity of these spectra with a connection to the qualitative theory. Finally, we discuss the problem of assignment of spectral in the context of control systems.

Keywords: Lyapunov spectrum, dichotomy spectrum, pole placement.

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Time-integrated optimal transport: A robust minimax framework

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Abstract: Comparing time series in a principled manner requires capturing both temporal alignment and distributional similarity of features. Optimal transport (OT) has recently emerged as a powerful tool for this task, but existing OT-based approaches often depend on manually selected balancing parameters and can be computationally intensive. In this work, we introduce the Time-integrated Optimal Transport (TiOT) framework, which integrates temporal and feature components into a unified objective and yields a well-defined metric on the space of probability measures. This metric preserves fundamental properties of the Wasserstein distance, while avoiding the need for parameter tuning. To address the corresponding computational challenges, we introduce an entropic regularized approximation of TiOT, which can be efficiently solved using a block coordinate descent algorithm. Extensive experiments on both synthetic and real-world time series datasets demonstrate that our approach achieves improved accuracy and stability while maintaining comparable efficiency.

Keywords: Optimal transport, entropic regularization, time series, block coordinate descent.

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Non-existence results for fractional elliptic inequalities on lattice graphs

Duong Anh Tuan¹

Abstract: Let $0 < s < 1$ and $(-\Delta)^s$ be the fractional Laplacian on the lattice graph $\mathbb{Z}^d$, $d > 2s$. In this paper, we first establish a non-existence of positive solution of the fractional elliptic inequality

$$(-\Delta)^s u \geq u^p \text{ in } \mathbb{Z}^d,$$

when $-\infty < p \leq \frac{d}{d-2s}$. Then, we prove corresponding non-existence results of positive solutions of the system of elliptic inequalities

$$\begin{cases} (-\Delta)^s u \geq v^p \text{ in } \mathbb{Z}^d, \\ (-\Delta)^s v \geq u^q \text{ in } \mathbb{Z}^d. \end{cases}$$

To the best of our knowledge, this work seems to be the first to establish non-existence results for fractional elliptic inequalities and systems of fractional elliptic inequalities on lattice graphs.

Keywords: Liouville-type theorems, discrete fractional Laplacian, lattice graphs.

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On the algebra of multiple zeta values

Ngo Dac Tuan¹, Nguyen Chu Gia Vuong², Pham Lan Huong³

Abstract: Classical multiple zeta values MZVs introduced by Euler in the eighteenth century have been studied intensively over the past three decades due to their deep connections to various branches of mathematics and physics, including arithmetic geometry, knot theory and high-energy physics. We review central conjectures on the algebra of these values and report on recent progress. Then we introduce the analogues of MZVs in positive characteristic following the pioneering work of Carlitz and Thakur. After reviewing their basic properties and outlining the main goals of the theory, we report several new results on their algebraic structure. This is based on joint work with Nguyen Chu Gia Vuong and Pham Lan Huong.

Keywords: Zeta values, multiple zeta values.

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International Conference on Applied Mathematics and Informatics Hanoi, August 22, 2026

Location

The conference takes place at Ta Quang Buu Library and C7 Building, which are located on the campus of Hanoi University of Science and Technology, No. 1 Dai Co Viet Road, Bach Mai Ward, Ha Noi, Viet Nam.

Access to the Venue: Although the main entrance of the university campus is No. 1 Dai Co Viet Road, the best way to come to the conference's location is through the side entrance of university campus near the road junction between Ta Quang Buu Street and Tran Dai Nghia Street.

