Recent Advances in Stochastic Analysis and Control

Conference Booklet

Overview

We are delighted to announce the workshop

Recent Advances in Stochastic Analysis and Control,

to be held at the **University of Warwick**.

This one-day workshop is supported by the
Centre for Research in Statistical Methodology (CRiSM) and the
Heilbronn Institute for Mathematical Research (HIMR),
with additional support from the **Engineering and Physical Sciences Research Council** (EPSRC).

The workshop will bring together leading researchers to discuss recent developments in **stochastic analysis**, **stochastic control**, and their applications in **mathematical finance** and **applied probability**.

The conference will take place on **1 May 2026** at the **University of Warwick**, Coventry.

Organisers :

Andreas Kyprianou, Gechun Liang, Aleksandar Mijatovic, Kathrin Schutrumpf.

Programme – Friday 1 May

09:30 – 10:00

Location: MSB Atrium
Arrival and Coffee

10:00 – 11:00

Location: MSB007
Speaker: Zhen-Qing Chen — University of Washington

Title: *Coupled time-fractional parabolic equations and probabilistic representation*

Abstract:
Anomalous diffusion is observed across diverse natural systems, ranging from cellular signaling and animal foraging to contaminant transport in groundwater, and is closely

related to time-fractional equations. In the first part of this talk, I will discuss these connections, specifically how fractional models arise naturally as scaling limits of random walks. I will then present some recent results on time-dependent, time-fractional parabolic equations and their probabilistic representations.

11:00 – 12:00

Location: MSB007
Speaker: Umut Cetin — London School of Economics

Title: *Recurrent transformations of Markov processes*

Abstract:
Partly motivated by problems in Monte-Carlo simulation of killed diffusion processes, we develop a theory of Girsanov transformations for a general (standard) Markov process Xthat turns them into recurrent processes while keeping the Markovian structure. To this end we consider transformations via multiplicative functionals of the form $h(X)\exp(A)$, where $h$is the potential function of a positive continuous additive functional (PCAF) and $A$is another PCAF. We show that after the measure change, $X$is a recurrent Markov process if the Revuz measure of $C$is finite with compact support under a mild duality assumption. When $X$is a symmetric Markov process, a weaker integrability condition on $h$turns Xinto a recurrent process after the measure change. Based on joint work with Zhen-Qing Chen.

12:00 – 13:00

Location: MSB Atrium
Lunch

13:00 – 14:00

Location: MSB007
Speaker: Ben Hambly — University of Oxford

Title: *Stochastic Stefan problems and limit order books*

Abstract:
In electronic financial markets buyers and sellers post orders indicating how many units of asset they are prepared to buy or sell and at what price. The collection of all these posted orders is called the limit order book. Those who need to trade then take the best available price for either buying or selling. This mechanism gives rise to the evolution of asset prices that we see. From a simple model for the arrival and cancellation of limit

orders, and taking scaling limits, we will show how it may be natural to model the limit order book as a stochastic Stefan problem. The Stefan problem arises as a model for the evolution of temperature in two phases of a material. It is a partial differential equation with a free boundary describing the interface between phases. By regarding the sides of the order book as different phases and driving them with white noise, we obtain a system of coupled stochastic PDEs, where the asset price corresponds to the interface. We will discuss existence, uniqueness and properties of the interface motion.

14:00 – 15:00

Location: MSB007
Speaker: Harry Zheng — Imperial College London

Title: *Reinforcement Learning for Speculative Trading under Exploratory Framework*

Abstract:
We study a speculative trading problem within the exploratory reinforcement learning (RL) framework of Wang et al. (2020). The problem is formulated as a sequential optimal stopping problem over entry and exit times under general utility function and price process. We consider a relaxed formulation where stopping times are modeled via Cox processes driven by bounded intensity controls. Under the exploratory setting, randomized controls are characterized through probability measures over intensities, with entropy regularization. This leads to a system of exploratory HJB equations and Gibbs distributions as optimal policies. We establish convergence and error estimates, and demonstrate an RL algorithm in a pairs-trading application. (Joint work with Alex Tse and Yun Zhao)

15:00 – 15:30

Location: MSB Atrium
Coffee Break

15:30 – 16:30

Location: MSB007
Speaker: Huaizhong Zhao — Durham University

Title: *Ergodic theory under nonlinear expectations*

Abstract:
This talk discusses ergodic theory under nonlinear expectations (nonadditive probabilities). Ergodicity is defined via invariant sets having upper probability zero or

one. We review equivalence results linking ergodicity to irreducibility, spectral simplicity, and Birkhoff-type laws. For stochastic systems under sublinear expectations, the theory is developed via lifting to canonical dynamical systems. Recent developments include invariant expectations of G-SDEs, ergodic optimal control, and equivalence between ergodicity and mixing. We also discuss weaker ergodic regimes and connections to Hurewicz-type problems.

16:30 – 17:30

Location: MSB007
Speaker: Chunrong Feng — Durham University

Title: *Ergodicity of non-stationary stochastic processes*

Abstract:
While classical ergodic theory focuses on invariant measures and stationary processes, there exist non-stationary yet ergodic systems. This talk explores ergodic theory for random periodic, quasi-periodic, and nonlinear expectation-driven processes. The focus will be on random periodic processes and periodic measures. Based on joint work with Y. Liu, Y. J. Liu, Baoyou Qu, Huaizhong Zhao and Johnny Zhong.

18:00 – 20:00

Location: Scarman
Conference Dinner (by invitation)

Conference Participants

- Angie Achram — University of Warwick
- Nigel Burroughs — University of Warwick
- Iker Caballero Bragagnini — University of Warwick
- Salvatore Ciano — University of Warwick
- Zhen-Qing Chen — University of Washington
- Xinyu Chen — University of Warwick
- Umut Cetin — London School of Economics
- Benjamin Dzah — University of Warwick
- Chunrong Feng — Durham University

- Miryana Grigorova — University of Warwick
- Florian Gutekunst — University of Warwick
- Karen Habermann — University of Warwick
- Ben Hambly — University of Oxford
- Emma Horton — University of Warwick
- Lianzi Jiang — Shandong University of Science and Technology / University of Warwick
- Andreas Kyprianou — University of Warwick
- Usman Ladan — University of Warwick
- Gechun Liang — University of Warwick
- Jing Liu — University of Warwick
- Shishen Lin — University of Warwick
- Sumayya Manji — University of Warwick
- Aleksandar Mijatovic — University of Warwick
- Immad A. Shah — SKUAST-K
- Jordan Simbananiye — University College London
- Moris Strub — University of Warwick
- Edward Wang — University of Warwick
- Haokai Xie — University of Warwick
- Huaizhong Zhao — Durham University
- Harry Zheng — Imperial College London