East Midlands Stochastic Analysis Seminar

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Organisers:

Zdzislaw Brzezniak (York), David Elworthy (Warwick), Chunrong Feng (Loughborough), Zhongmin Qian (Oxford), Huaizhong Zhao (Loughborough)

Department of Mathematical Sciences, Loughborough University
26 November 2018

Talks

12:00-13:00: **Liangpan Li (Loughborough)**, venue: SCH013
An introduction to metric Diophantine approximation and some probabilistic techniques

14:30-15:30: **Mickael Chekroun (UCLA)**, venue: CC110
From stochastic invariant manifold reduction to a variational approach to closure of nonlinear SDEs

16:00-17:00: **Gaurav Dhaliwal (TU Wien)**, venue: CC110
Global martingale solutions for a stochastic population cross-diffusion system

17:00-18:00: **Giuseppe Cannizzaro (Warwick)**, venue: CC110
A new Universality Class in (1+1)-dimensions: the Brownian Castle

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Liangpan Li (Loughborough)

Title: An introduction to metric Diophantine approximation and some probabilistic techniques

Abstract: In this talk we first give an introduction to metric Diophantine approximation. Many problems in this area can be simplified as establishing optimal lower bounds for union sets. Finally, we review some probabilistic techniques that have played significant roles in this field. These techniques include the first and second Borel-Cantelli lemmas, Vitali's covering lemma, Cassels' theorem on lim sup sets, Beresnevich, Haynes and Velani's cross fibering principle, and so on.

Mickael Chekroun (UCLA)

Title: From stochastic invariant manifold reduction to a variational approach to closure of nonlinear SDEs

Abstract: After revisiting the efficient determination of approximations of stochastic invariant manifolds, this talk will address the closure problem of nonlinear systems of SDEs, for which no slaving principle holds. In particular, solutions which do not lie on any stochastic invariant manifold and for which we seek for a reduced parameterization, will be of primary interest. Adopting the framework of parameterizing manifolds, we will show that efficient parameterizations can be explicitly determined as a continuous deformation of stochastic invariant manifolds; deformations that can be themselves optimized by minimization of cost functionals naturally associated with the dynamics. Rigorous error estimates will be presented in the context of slow-fast stochastic systems without pronounced time-scale separations. Applications to the closure of other nonlinear systems of SDEs issued from fluid dynamics will be also discussed.

Gaurav Dhaliwal (TU Wien)

Title: Global martingale solutions for a stochastic population cross-diffusion system

Abstract: The existence of global nonnegative martingale solutions to a stochastic cross-diffusion system for an arbitrary but finite number of interacting population species is shown. The random influence of the environment is modeled by a multiplicative noise term. The diffusion matrix is generally neither symmetric nor positive definite, but it possesses a quadratic entropy structure. This structure allows us to work in a Hilbert space framework and to apply a stochastic Galerkin method. The existence proof is based on energy-type estimates, the tightness criterion of Brzeźniak and co-workers, and Jakubowski's generalization of the Skorokhod theorem. The nonnegativity is proved by an extension of Stampacchia's truncation method due to Chekroun, Park, and Temam. Co-Authors: Ansgar Jüngel (TU Wien), Nicola Zamponi (TU Wien)

Giuseppe Cannizzaro (Warwick)

Title: A new Universality Class in (1+1)-dimensions: the Brownian Castle

Abstract: In the context of randomly fluctuating surfaces in (1+1)-dimensions two Universality Classes have generally been considered, the Kardar-Parisi-Zhang and the Edwards-Wilkinson. Models within these classes exhibit universal fluctuations under 1:2:3 and 1:2:4 scaling respectively. Starting from a modification of the classical Ballistic Deposition model we will show that this picture is not exhaustive and another Universality Class, whose scaling exponents are 1:1:2, has to be taken into account. We will describe how it arises, briefly discuss its connections to KPZ and introduce a new stochastic process, the Brownian Castle, deeply connected to the Brownian Web, which should capture the large-scale behaviour of models within this Class. This is joint ongoing work with Martin Hairer.