

2021 第二届随机动力学研讨会

The 2nd Workshop on Stochastic Dynamics

会议手册



西北工业大学数学与统计学院

中-德复杂性与统计科学国际联合实验室

Swansea University, UK

2021年06月19日

This is a joint workshop with Swansea University. We mainly focus on some recent developments in stochastic dynamics and its applications.

Speakers:

Zhao Dong (Chinese Academy of Sciences)

Yuzuru Inahama (Kyushu University)

Xue-Mei Li (Imperial College London)

Bin Pei (Northwestern Polytechnical University)

Feng-Yu Wang (Swansea University & Tianjin University)

Jiang-Lun Wu (Swansea University)

Bin Xie (Shinshu University)

Time: June 23, 2021

Location: Zoom Meeting

Meeting Topic: The 2nd Workshop on Stochastic Dynamics

Meeting Time: 2021/06/23 14:00-22:00 (Beijing Time)

2021/06/23 07:00-15:00 (UK Time)

2021/06/23 15:00-23:00 (Tokyo Time)

Click the link to join the meeting or to add it to your meeting list:

<https://us02web.zoom.us/j/89564387702?pwd=M053MzNSZDNvTG9ZTkNWNs9BcDZwZz09>

Meeting ID: 895 6438 7702

Key: 123456

Organizing committee:

Yong Xu (Northwestern Polytechnical University)

Jiang-Lun Wu (Swansea University)

Bin Pei (Northwestern Polytechnical University)

Zhe Jiao (Northwestern Polytechnical University)

Contact: 裴斌 (Bin PEI) binpei@nwpu.edu.cn

Schedule

Date	Beijing Time	Speaker	Title	Chair
	UK Time			
	Tokyo Time			
June 23	14:00-14:10 07:00-07:10 15:00-15:10	Opening ceremony (Yong Xu, Jiang-Lun Wu)		Bin Pei
	14:10-15:00 07:10-08:00 15:10-16:00	Yuzuru Inahama	Large deviations for rough path lifts of Watanabe's pullbacks of delta functions	Yong Xu
	15:00-15:50 08:00-08:50 16:00-16:50	Bin Xie	Asymptotic behavior of a quasilinear PDE in random environment by paracontrolled calculus	
	15:50-16:10 08:50-09:10 16:50-17:10	Break		
	16:10-17:00 09:10-10:00 17:10-18:00	Xue-Mei Li	A journey to fractional dynamics	Bin Pei
	17:00-17:50 10:00-10:50 18:00-18:50	Zhao Dong	Stability of rarefaction wave for stochastic Burgers equation	
	17:50-19:00 10:50-12:00 18:50-20:00	Break		
	19:00-19:50 12:00-12:50 20:00-20:50	Feng-Yu Wang	Distribution dependent reflecting SDEs	Yong Xu
	19:50-20:40 12:50-13:40 20:50-21:40	Bin Pei	Two-time-scale functional SDEs driven by multiplicative fractional Brownian noise: averaging principle	Zhe Jiao
	20:40-21:30 13:40-14:30 21:40-22:30	Jiang-Lun Wu	On a generalised population dynamics equation with environmental noise	
	21:30-21:40 14:30-14:40 22:30-22:40	Closing ceremony (Yong Xu, Jiang-Lun Wu)		Bin Pei

Abstract

Zhao Dong (Academy of Mathematics and Systems Science, CAS)

Title: Stability of rarefaction wave for stochastic Burgers equation

Abstract: The large time behavior of strong solutions to the stochastic Burgers equation is considered in this paper. It is first shown that the unique global strong solution to the one dimensional stochastic Burgers equation time-asymptotically tend to a rarefaction wave provided that the initial data $u_0(x)$ satisfies $\lim_{x \rightarrow \pm\infty} u_0(x) = u_{\pm}$ and $u_- < u_+$, that is, the rarefaction wave is non-linearly stable under white noise perturbation for stochastic Burgers equation. A time-convergence rate is also obtained. Moreover, an important inequality (denoted by Area Inequality) is derived. This inequality plays essential role in the estimates, and may have various applications in the related problems, in particular for the time-decay rate of solutions of both the stochastic and deterministic PDEs. As an application, the stability of planar rarefaction wave is shown stable for a two dimensional viscous conservation law with stochastic force. This is joint work with Feimin Huang, Houqi Su.

Yuzuru Inahama (Kyushu University)

Title: Large deviations for rough path lifts of Watanabe's pullbacks of delta functions

Abstract: We study Donsker-Watanabe's delta functions associated with strongly hypoelliptic diffusion processes indexed by a small parameter. They are finite Borel measures on the Wiener space and admit a rough path lift. Our main result is a large deviation principle of Schilder type for the lifted measures on the geometric rough path space as the scale parameter tends to zero. As a corollary, we obtain a large deviation principle conjectured by Takanobu and Watanabe, which is a generalization of a large deviation principle of Freidlin-Wentzell type for pinned diffusion processes on a Euclidean space. If time permits, we also talk about an extension of this result to the case of sub-Riemannian manifolds. (This manifold part is an ongoing project.)

Xue-Mei Li (Imperial College London)

Title: A journey to fractional dynamics

Abstract: The ergodic properties of Markov systems is fairly well understood and widely studied. In contrast the ergodic properties for non-Markov processes is less known. I will discuss this aspect of the stochastic differential equations driven by fractional Brownian motion and also including aspects of rough paths and multi-scales.

Bin Pei (Northwestern Polytechnical University)

Title: Two-time-scale functional SDEs driven by multiplicative fractional Brownian noise: averaging principle

Abstract: The main goal of this article is to study an averaging principle for a class of two-time-scale functional SDEs in which the slow-varying process includes a multiplicative fractional Brownian noise with Hurst parameter $1/2 < H < 1$ and the fast-varying process is a rapidly-changing diffusion. We would like to emphasize that the approach proposed in this paper is based on the fact that a stochastic integral with respect to fractional Brownian motion with Hurst parameter in $(1/2,1)$ can be defined as a generalized Stieltjes integral. In particular, to prove a limit theorem for the averaging principle, we will introduce a sequence of stopping times to control the size of the multiplicative fractional Brownian noise. Then, inspired by the Khasminskii's approach, an averaging principle is developed in the sense of convergence in the p -th moment uniformly in time.

Feng-Yu Wang (Swansea University & Tianjin University)

Title: Distribution dependent reflecting SDEs

Abstract: To characterize the Neumann problem for nonlinear Fokker-Planck equations, we investigate distribution dependent reflecting SDEs (DDRSDEs) in a domain. We prove the well-posedness and establish functional inequalities for reflecting SDEs with singular drifts. By establishing a criterion deducing the well-posedness of DDRSDEs from that of reflecting SDEs, and by using coupling methods,

these results are extended to DDRSDEs with singular or monotone coefficients. Moreover, three different types of exponential ergodicity are derived for DDRSDEs under dissipative, partially dissipative, and fully non-dissipative conditions respectively.

Jiang-Lun Wu (Swansea University)

Title: On a generalised population dynamics equation with environmental noise

Abstract. In this talk, I will present existence and uniqueness of global (in time) positive strong solutions for a generalised population dynamics equation with environmental noise, while the global existence fails for the deterministic equation. Furthermore, we will discuss sharpness of the posed index condition for the global existence in the sense that the solution could explode in finite time under the complementary condition. The talk is based on a joint paper with Rongrong Tian and Jinlong Wei [Statistics and Probability Letters 168 (2021)].

Bin Xie (Shinshu University)

Title: Asymptotic behavior of a quasilinear PDE in random environment by paracontrolled calculus

Abstract: We study the asymptotic behavior of a certain quasilinear PDE with smeared mild noise, which originally appears as the space-time scaling limit of a particle system (zero-range process) in random environment on one dimensional discrete lattice. We establish the convergence result of the quasilinear SPDE driven by a smeared mild noise and show the local-in-time well-posedness of the limit quasilinear SPDE with spatial white noise by the approach of the paracontrolled calculus. This talk is based on a joint work with T. Funaki, M. Hoshino and S. Sethuraman.