2026 China–Italy Conference on Stochastic Analysis

2026 中国–意大利随机分析会议

August 17–21, 2026

Organizer: Academy of Mathematics and Systems Science (AMSS)
Chinese Academy of Sciences (CAS)

组织单位: 中国科学院数学与系统科学研究院

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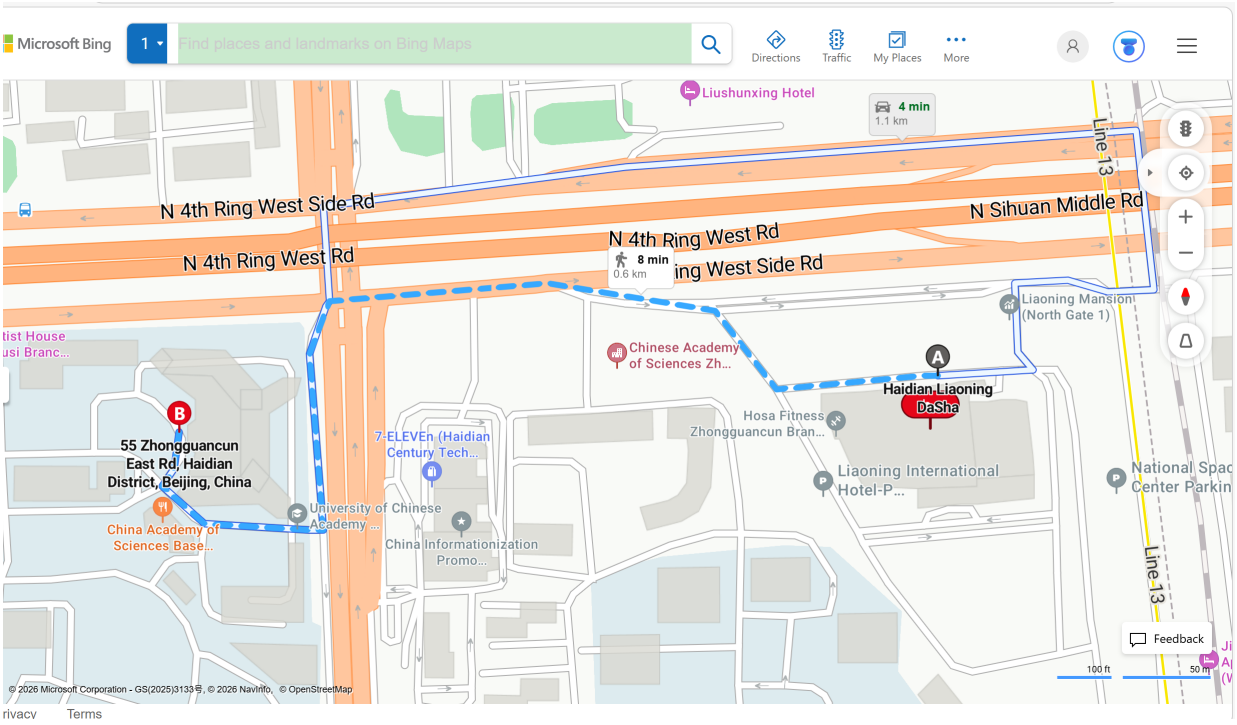
Venue and Location 会场地点

Conference: Lecture hall on the ground floor, Siyuan Building, No. 55, Zhongguancun East Road, Haidian District, Beijing

Residence Hotel: Liaoning Building (辽宁大厦), No. A2, North Fourth Ring West Road, Haidian District, Beijing

Place for Lunch and Dinner: Wu Ke Restaurant (物科餐厅), No. 8, South Third Street, Zhongguancun, Haidian District, Beijing

Banquet: August 17, 18:00. Quanjude, Tsinghua Garden Branch (全聚德清华园店), No. 1, Zhongguancun East Road, Lanqiying, Haidian District, Beijing



Schedule 会议日程

August 16 (Sunday): Arrival

August 17–21 (Monday–Friday): Conference Dates

August 22 (Saturday): Departure

Beijing Time (GMT+8)	**August 17 (Monday)**	**August 18 (Tuesday)**	**August 19 (Wednsday)**	**August 20 (Thursday)**	**August 21 (Friday)**
08:30-08:50	Registration				
08:50-09:00	Opening				
Chairman	**Zhao Dong**	**Tusheng Zhang**	**Flandoli**	**Romito**	**Hui Xiao**
09:00–09:45	Röckner	Flandoli	Funaki	Xicheng Zhang	Romito
09:45–10:30	Kening Lu	Feng-Yu Wang	Jian Wang	Fukuizumi	Jian Song
10:30–11:00	Photo/Tea Break	Tea Break	Tea Break	Tea Break	Tea Break
11:00–11:45	Juan Li	Wei Liu	Butkovsky	Rongchan Zhu	Pappalettera
11:50–14:00	Lunch	Lunch	Lunch	Lunch	Lunch
Chairman	**Kening Lu**	**Feng-Yu Wang**	Free Discussion	**Guohuan Zhao**	**Qiang Zeng**
14:00–14:45	Xue-Mei Li	Tusheng Zhang		Nersesyan	Jinghai Shao
14:45–15:30	Jianliang Zhai	Galeati		Ruojun Huang	Maurelli
15:30–16:00	Tea Break	Tea Break		Tea Break	Tea Break
16:00–16:45	Xin Chen	Deng Zhang		Di Primio	Xinyi Li
16:45–17:30	Marino	Tolomeo		Bin Tang	Rosati
17:45–19:30	Banquet	Dinner	Dinner	Dinner	Dinner

Monday, August 17

Morning

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

09:00–09:45 **Michael Röckner** (Bielefeld University/AMSS, CAS/CUHK, Shenzhen)

Probabilistic representation of solutions to the parabolic p-Laplace equation

09:45–10:30 **Kening Lu** (Sichuan University)

Turbulence, Lyapunov exponents, and SRB measures in infinite-dimensional dynamical systems

10:30–11:00 **Photo & Tea Break**

11:00–11:45 **Juan Li** (Shandong University)

Path-dependent controlled Mean-Field coupled forward -backward SDEs. The associated stochastic maximum principle

11:45–14:00 **Lunch**

Afternoon

Chairman: **Kening Lu** (Sichuan University)

14:00–14:45 **Xue-Mei Li** (EPFL/Imperial College London)

Stochastic Navier–Stokes equations driven by rough paths

14:45–15:30 **Jianliang Zhai** (University of Science and Technology of China)

Irreducibility and ergodicity of SPDEs driven by pure jump noise

15:30–16:00 **Tea Break**

16:00–16:45 **Xin Chen** (Shanghai Jiao Tong University)

High-order convergence rates of periodic homogenization for symmetric Lévy type operators

16:45–17:30 **Lorenzo Marino** (Scuola Normale Superiore of Pisa, Italy)

Stochastic Transport by Heavy-Tailed Jump Processes: From Classical to Anomalous Diffusion

17:45–19:30 **Banquet**

Tuesday, August 18

Morning

Chairman: **Tusheng Zhang** (University of Science and Technology of China)

09:00–09:45 **Franco Flandoli** (Scuola Normale Superiore of Pisa, Italy)
SPDEs in turbulent transport - the fusion plasma perspective

09:45–10:30 **Feng-Yu Wang** (Tianjin University)
Dimension-free Convergence Rate in Sliced Wasserstein Distance for Empirical Measures of Markov Processes

10:30–11:00 **Tea Break**

11:00–11:45 **Wei Liu** (Jiangsu Normal University)
Mean-field SPDEs with Pseudo-monotone Kernels

11:45–14:00 **Lunch**

Afternoon

Chairman: **Feng-Yu Wang** (Tianjin University)

14:00–14:45 **Tusheng Zhang** (University of Science and Technology of China)
Ergodicity of stochastic reaction-diffusion equations on unbounded domains driven by space-time white noise

14:45–15:30 **Lucio Galeati** (University of L'Aquila, Italy)
SDEs driven by fractional Brownian motion with supercritical drifts of bounded divergence

15:30–16:00 **Tea Break**

16:00–16:45 **Deng Zhang** (Shanghai Jiao Tong University)
Recent progress on Stochastic Zakharov system

16:45–17:30 **Leonardo Tolomeo** (University of Edinburgh)
A statistical consequence of the soliton resolution conjecture for the focusing nonlinear Schrödinger equation

17:45–19:30 **Dinner**

Wednesday, August 19

Morning

Chairman: **Franco Flandoli** (Scuola Normale Superiore of Pisa, Italy)

09:00–09:45 **Tadahisa Funaki** (Beijing Institute of Mathematical Sciences and Applications)

Interface motion from Glauber-Kawasaki dynamics

09:45–10:30 **Jian Wang** (Fujian Normal University, China)

Stochastic homogenization of diffusions in turbulence driven by non-local symmetric Levy operators

10:30–11:00 **Tea Break**

11:00–11:45 **Oleg Butkovsky** (Weierstrass Institute (WIAS), Berlin)

Uniqueness for stochastic differential equations in Hilbert spaces with irregular drift

11:45–14:00 **Lunch**

Afternoon

Free Discussion

Thursday, August 20

Morning

Chairman: **Marco Romito** (University of Pisa, Italy)

09:00–09:45 **Xicheng Zhang** (Beijing Institute of Technology)

Quantitative Propagation of Chaos and Fluctuations for Kinetic McKean-Vlasov SDEs with Singular Interaction Kernels

09:45–10:30 **Reika Fukuizumi** (Waseda University, Japan)

Φ^4_d *model associated with the harmonic oscillator*

10:30–11:00 **Tea Break**

11:00–11:45 **Rongchan Zhu** (Beijing Institute of Technology)

Derivation of Gibbs measure from quantum Gibbs state

11:45–14:00 **Lunch**

Afternoon

Chairman: **Guohuan Zhao** (Academy of Mathematics and Systems Science, CAS)

14:00–14:45 **Vahagn Nersesyan** (NYU, Shanghai)

Controllability of PDEs with highly degenerate forces

14:45–15:30 **Ruojun Huang** (Scuola Normale Superiore of Pisa, Italy)

Scaling limit of WASEP to KPZ equation without Gärtner transform

15:30–16:00 **Tea Break**

16:00–16:45 **Andrea Di Primio** (Scuola Normale Superiore of Pisa, Italy)

Stochastic phase separation in complex fluids

16:45–17:30 **Bin Tang** (Nanjing University of Science and Technology)

The anomalous regularization and pathwise uniqueness of stochastic 2D fluid models on the torus

17:45–19:30 **Dinner**

Friday, August 21

Morning

Chairman: **Hui Xiao** (Academy of Mathematics and Systems Science, CAS)

09:00–09:45 **Marco Romito** (University of Pisa, Italy)

Synchronization in transformers

09:45–10:30 **Jian Song** (Shandong University)

Stochastic diffusion equation with time-independent noise in Stratonovich regime

10:30–11:00 **Tea Break**

11:00–11:45 **Umberto Pappalettera** (University of Basel, Switzerland)

Dissipative solutions to randomly forced 3D Euler equations

11:45–14:00 **Lunch**

Afternoon

Chairman: **Qiang Zeng** (Academy of Mathematics and Systems Science, CAS)

14:00–14:45 **Jinghai Shao** (Tianjin University)

On viscosity solutions to HJB equations on Wasserstein space

14:45–15:30 **Mario Maurelli** (University of Pisa, Italy)

Edwards-Wilkinson fluctuations for a stochastic advection diffusion model

15:30–16:00 **Tea Break**

16:00–16:45 **Xinyi Li** (Beijing University)

Tail exponents and exceptional points of (the scaling limit of) 3D uniform spanning tree

16:45–17:30 **Tommaso Rosati** (University of Warwick)

Lyapunov exponents for linear cocycles driven by stochastic Navier-Stokes

17:45–19:30 **Dinner**

Abstracts 会议摘要

Uniqueness for stochastic differential equations in Hilbert spaces with irregular drift

Oleg Butkovsky *Weierstrass Institute (WIAS), Berlin*

Abstract: Joint work with Lukas Anzeletti, Máté Gerencsér, Alexander Shaposhnikov. We obtain strong uniqueness for SDEs in Hilbert spaces with irregular drift:

$$dX_t = (AX_t + b(X_t))dt + (-A)^{-\gamma/2}dW_t, \quad X_0 = x \in H,$$

where H is a separable Hilbert space, A is a self-adjoint negative definite operator with purely atomic spectrum, W is a cylindrical Wiener process, b is an α-Hölder continuous function $H \to H$, and γ is a nonnegative parameter such that the stochastic convolution takes values in H. We show that this equation has a unique strong solution provided that $\alpha > \alpha^*(\gamma)$, with an explicit function α^* that takes values in $(0, 1)$ for all $\gamma \in [0, 3)$. This substantially extends the seminal work of Da Prato and Flandoli (2010), as no structural assumption on b is imposed. To obtain this result, we do not use infinite-dimensional Kolmogorov equations but instead develop a new technique combining Lê's theory of stochastic sewing in Hilbert spaces, Gaussian analysis, and the method of Lasry and Lions for approximation in Hilbert spaces.

High-order convergence rates of periodic homogenization for symmetric Lévy type operators

Xin Chen *Shanghai Jiao Tong University*

Abstract: In this paper, we will establish higher-order convergence rates of the periodic homogenization for symmetric Lévy-type operators, encompassing the subcritical α-stable regime, critical regime, and supercritical diffusive regime. To this end, we develop a systematic framework to decompose the contributions of the underlying jumping kernel across small, intermediate, and large spatial scales – a strategy tailored to all the aforementioned regimes. This talk is based on joint work with Zhen-qing Chen, Takashi Kumagai and Jian Wang.

Stochastic phase separation in complex fluids

Andrea Di Primio *Scuola Normale Superiore of Pisa, Italy*

Abstract: In recent years, liquid-liquid phase separation has attracted considerable attention as a pivotal mechanism underlying structure formation in complex fluids, soft materials, and biological systems. Stochastic modeling provides a natural way to represent thermal fluctuations, molecular interactions, and unresolved microscopic processes that can strongly influence phase separation, particularly near critical regimes or during nucleation. At the continuum level, these effects are introduced through random forcing in diffuse interface models, leading to stochastic Cahn–Hilliard or Allen–Cahn–type equations, typically coupled with those of fluid motion (as, e.g., the Navier–Stokes system). In this talk, I will present well-posedness results and the existence and properties of invariant measures for the stochastic Allen–Cahn–Navier–Stokes system. The talk is based on joint works with Maurizio Grasselli (Politecnico di Milano), Luca Scarpa (Politecnico di Milano)

and Margherita Zanella (Politecnico di Milano). The mentioned activities are carried out within the project: NoisyFluid "Noise in Fluids", Grant Agreement 101053472, CUP E53C22001720006.

SPDEs in turbulent transport - the fusion plasma perspective

Franco Flandoli *Scuola Normale Superiore of Pisa, Italy*

Abstract: SPDEs for turbulent transport is a classical subject of Mathematical Physics investigation. We recall some recent progress in the white noise case and then illustrate results and open questions about the fundamental case of time-correlation, motivated in particular by what happens for confined fusion plasma. The activity was carried out within the project: NoisyFluid "Noise in Fluids", Grant Agreement 101053472, CUP E53C22001720006.

Φ^4_d model associated with the harmonic oscillator

Reika Fukuizumi *Waseda University, Japan*

Abstract: We will present the recent results in collaboration with Aurélien Deya and Laurent Thomann (University of Lorraine, Nancy), concerning the singular stochastic PDE associated with the harmonic oscillator in 3d. We shall begin by discussing the background and physical motivations behind this model. After reviewing the results for $d \leq 2$, we will discuss the key differences in the Φ^4_3 model on the torus and present one idea for overcoming the resulting difficulties.

Interface motion from Glauber-Kawasaki dynamics

Tadahisa Funaki *Beijing Institute of Mathematical Sciences and Applications*

Abstract: Motivated by the problem of dynamic phase transitions, we study the derivation of interface motion from non-gradient Glauber-Kawasaki dynamics. In the balanced case, the limiting interface evolves according to the anisotropic curvature flow, while in the unbalanced case it is governed by a geometric Hamilton-Jacobi equation. We establish this result as a quantitative hydrodynamic limit by applying the method of quantitative homogenization. We also investigate fluctuations of the interface and derive a linear stochastic partial differential equation. This talk is partially based on several joint works with Chenlin Gu (Tsinghua U), Han Wang (Tsinghua U), Shuhan Zhou (Peking U), Hyunjoon Park (Meiji U), Claudio Landim (IMPA), Sunder Sethuraman (U Arizona).

SDEs driven by fractional Brownian motion with supercritical drifts of bounded divergence

Lucio Galeati *University of L'Aquila, Italy*

Abstract: It is by now well understood that SDEs driven by additive (fractional) Brownian motion can be well-posed in the presence of irregular, possibly even distributional drifts, in a regularization by noise fashion. Scaling arguments and explicit counterexamples also establish that positive results can only be expected in so-called subcritical regularity regimes. However,

under additional structural assumptions on the drift, like it being divergence free, it was recently understood in the Brownian case that the regularity conditions on the drift can be weakened, by means of PDE arguments and martingale problems.

In this talk I will show how similar results can be established for fBm-driven SDEs; the proofs are based on rather different methods, based on a Lagrangian approach, combined with Girsanov transform and relative entropy bounds. In particular, for a class of supercritical drifts of bounded divergence, the associated SDE can be shown to admit a unique-in-law solution for Lebesgue a.e. initial condition, and the resulting solution kernel is stable in the total variation norm. Leveraging this, well-posedness results for McKean-Vlasov equations are also derived. Based on a joint work with Zimo Hao (Beijing).

Scaling limit of WASEP to KPZ equation without Gärtner transform

Ruojun Huang *Scuola Normale Superiore of Pisa, Italy*

Abstract: We prove that the fluctuations of the height function of weakly asymmetric simple exclusion processes on the circle converge under suitable scaling toward the Cole-Hopf solution of the KPZ equation. This result, in the setting of full real line, was established by Bertini-Giacomin in 1997 using a linearing transform on the particle system (a microscopic analog of Cole-Hopf transform). Our new approach avoids any such transform, using neither the knowledge of invariant measure, and replies instead on Hairer's theory of regularity structures. Based on joint work with Konstantin Matetski and Hendrik Weber.

Path-dependent controlled Mean-Field coupled forward-backward SDEs. The associated stochastic maximum principle

Juan Li *Shandong University*

Abstract: In the present paper we discuss a new type of mean-field coupled forward-backward stochastic differential equations (MFFBSDEs). The novelty consists in the fact that the coefficients of both the forward as well as the backward SDEs depend not only on the controlled solution processes (X_t, Y_t, Z_t) at the current time t, but also on the law of the paths of (X, Y, u) of the solution process and the process by which it is controlled.

The existence for such a MFFBSDE which is fully coupled through the law of the paths of (X, Y) in the coefficients of both the forward and the backward equations is proved under rather general assumptions. The main part of the work is devoted to the study of Pontryagin's maximal principle for such a MFFBSDE. The dependence of the coefficients of the law of the paths of the solution processes and their control makes that a completely new and interesting criterion for the optimality of a stochastic control for the MFFBSDE is obtained. Furthermore, we show that this necessary optimality condition is, under the assumption of convexity of the Hamiltonian, also sufficient.

The talk is based on joint work with Rainer Buckdahn (UBO, France), Junsong Li (SDU, China), Chuanzhi Xing (SDU, China).

Tail exponents and exceptional points of (the scaling limit of) 3D uniform spanning tree

Xinyi Li *Beijing University*

Abstract: I will talk about the calculation of the Hausdorff dimension of several types of exceptional points in the scaling limit of three-dimensional uniform spanning tree (UST) and discuss how these quantities are determined by a family of intersection exponents related to simple random walk and loop-erased random walk. I will also talk about some tail exponents for 3D UST, and how they are related to exponents of Abelian sandpiles in 3D. This talk is based on (ongoing) joint works with Omer Angel, David Croydon, Saraí Hernández-Torres, Runsheng Liu, Xiangyi Liu and Daisuke Shiraishi.

Stochastic Navier-Stokes equations driven by rough paths

Xue-Mei Li *EPFL/Imperial College London*

Abstract: We introduced a rigorous rough-path solution concept for the stochastic Navier-Stokes equation studied in this paper, for which previously only a numerical notion of solution had been available, and proved that the numerical solution is a solution in this sense. We further showed how temporally rough fractional transport noise arises as the limit of smoother multi-scale fluid dynamics. I initiated the project; S. Sobczak was a first-year PhD student.

Mean-field SPDEs with Pseudo-monotone Kernels

Wei Liu *Jiangsu Normal University*

Abstract: This work investigates the mean-field stochastic PDEs involving a class of pseudo-monotone kernels. We first study the well-posedness within the variational framework by introducing a notion of measure-dependent pseudo-monotone operators. Furthermore, we establish the quantitative dimension-free propagation of chaos within a p-uniformly convex Banach space for general infinite-dimensional weakly interacting systems, obtaining convergence rates that are near-optimal in a suitable sense.

Our results reveal a new insight: the convergence rate of the mean-field limit is intrinsically governed by the geometry of the underlying solution space, specifically its modulus of convexity. As applications, we study several finite- and infinite-dimensional interacting particle systems arising in machine learning and fluid mechanics, including stochastic Stein variational gradient descent, mean-field Allen-Cahn equations, and Lagrangian-averaged Burgers equations.

Turbulence, Lyapunov exponents, and SRB measures in infinite-dimensional dynamical systems

Kening Lu *Sichuan University*

Abstract: In this talk, I will present several results related to Lyapunov exponents, SRB measures, entropy, and horseshoes in the context of infinite-dimensional dynamical systems. I will also discuss recent work on the ergodicity and statistical dynamics of the 2D Navier-Stokes equation, driven by both time-dependent deterministic and stochastic forces. Additionally, I will explore the connection between SRB measures and turbulence.

Stochastic Transport by Heavy-Tailed Jump Processes: From Classical to Anomalous Diffusion

Lorenzo Marino *Scuola Normale Superiore of Pisa, Italy*

Abstract: In the study of turbulent fluid dynamics, modeling the velocity field as a superposition of divergence-free vector fields with stochastic weights provides crucial insights into the effect of small-scale turbulence on large-scale dynamics. Indeed, as shown in the seminal work of Galeati [1], such transport noise can produce an additional dissipation effect on dynamics via a certain scaling limit. While previous results have mainly focused on the diffusive scaling regime (i.e. when the random weights are described by Gaussian or other light-tailed noises), I will present some recent results, in collaboration with Franco Flandoli, exploring the advection of a passive scalar by a turbulent fluid when the driving noise exhibits heavy-tailed jump statistics. This work received funding from the European Union's ERC program (NoisyFluid, Grant No. 101053472).

References:

[1] L. Galeati, On the convergence of stochastic transport equations to a deterministic parabolic one, Stoch. Partial Differ. Equ. Anal. Comput. 8 (2020), no. 4, 833–868.

Edwards-Wilkinson fluctuations for a stochastic advection diffusion model

Mario Maurelli *University of Pisa, Italy*

Abstract: We consider an advection-diffusion model with a random Gaussian, white-in-time velocity field, in both compressible and incompressible setting. In the diffusive limit, the solution is known to converge to a Brownian motion with enhanced diffusivity. Here we show the fluctuations have Gaussian distribution and satisfy an additive stochastic heat equation. Based on the joint work with Sotirios Kotitsas and Dejun Luo, see https://arxiv.org/pdf/2509.07956.

Controllability of PDEs with highly degenerate forces

Vahagn Nersesyan *NYU Shanghai*

Abstract: Controllability is an important tool in the study of stochastic PDEs, allowing us to understand how the effect of degenerate noises propagates through the system and helps to establish properties such as irreducibility, uniqueness of invariant measures, and mixing. In this talk, we will review recent results on the controllability of fluid PDEs driven by highly degenerate forcing. We will discuss in particular the case where the control force is low-dimensional and acts only in a small region of the domain. This talk is partially based on joint work with Manuel Rissel.

Dissipative solutions to randomly forced 3D Euler equations

Umberto Pappalettera *University of Basel, Switzerland*

Abstract: The purpose of this work is twofold. First, we construct probabilistically strong solutions to the three-dimensional Euler equations perturbed by additive noise that are P-almost surely continuous in time, Hölder in space, and satisfy the local energy inequality up to an arbitrarily large stopping time. Second, we prove several non-unique ergodicity results for the forced Euler equations with continuous-in-time external forcing. The solutions we construct are genuinely random and, almost surely, strictly dissipative and not steady states. Based on joint work with Francesco Triggiano (SNS Pisa).

Probabilistic representation of solutions to the parabolic p-Laplace equation

Michael Röckner *Bielefeld University, Academy of Mathematics and System Sciences, Chinese Academy of Sciences, Beijing and School of Data Science, CUHK, Shenzhen*

Viorel Barbu *Romanian Academy, Iaşi*

Abstract: This talk is about the probabilistic representation of solutions to the p – Laplace evolution equation $\frac{\partial u}{\partial t} = \operatorname{div}\big(|\nabla u|^{p-2}\nabla u\big)$ in $(0,\infty)\times\mathbb{R}^d$, $u(0,x) = u_0(x)$, $x \in \mathbb{R}^d$. The main result states that, if $p \geq 4$, and if u_0 is a probability density with compact support and $u_0 \in L^2$, $|\nabla u_0| \in L^\infty$, then u can be represented as $u(t,x) = \mathcal{L}_{X(t)}(dx)$, where $\mathcal{L}_{X(t)}$ denotes the time marginal law of X at time t with X being a probabilistic weak solution to a corresponding McKean–Vlasov stochastic differential equation. This result is based on a new second order global regularity result for the weak solutions to the parabolic p-Laplace equation.

References:

1. Barbu/R: arXiv:2604.26719
2. Barbu/Grube/Rehmeier/R: arXiv:2508.12979
3. Barbu/Rehmeier/R: arXiv:2409.18744v2, AOP 2025+
4. Barbu/R: Springer LN 2024
5. Barbu/R/Deng Zhang: arXiv:2309.13910, JEMS 2025+
6. Barbu/R: PTRF 2024
7. Barbu/R: AOP 2020 and SIAM 2018

Synchronization in transformers

Marco Romito *University of Pisa*

Abstract: The first part of the talk will introduce a mathematical framework for transformers architectures, focusing in particular on how information moves through the layers of the network. The second part will deal with infinite-width, infinite-depth limits, as well as propagation of chaos in the limit of infinite context. The last part will focus on some noise-induced phenomena. This is a joint work with A. Agazzi, G. Bruno, E. Mosig, and S. Saviozzi.

Lyapunov exponents for linear cocycles driven by stochastic Navier-Stokes

Tommaso Rosati *University of Warwick*

Abstract: We provide the first convergence result for finite time Lyapunov exponents of Passive Scalar Advection and Linearized Stochastic Navier-Stokes (two linear cocycles driven by the stochastic Navier-Stokes equations). The proof is based on establishing unique ergodicity for a

Markov process with values in an infinite-dimensional projective space. Uniqueness of the invariant measures requires an extension of asymptotic coupling tools, and a generic non-collinearity for passive scalar advection. Joint work with Sam Punshon-Smith.

On viscosity solutions to HJB equations on Wasserstein space

Jinghai Shao *Tianjin University*

Abstract: Associated with the optimal control problem for distribution-dependent stochastic differential equations, we study the existence and uniqueness of viscosity solutions to Hamilton-Jacobi-Bellman equations on the Wasserstein space. We will introduce the results obtained when the Wasserstein space is endowed with Mortensen's derivative and the intrinsic derivative, respectively.

Stochastic diffusion equation with time-independent noise in Stratonovich regime

Jian Song *Shandong University*

Abstract: We study the precise long-term asymptotics for p-th moments of Stratonovich solutions to a class of stochastic diffusion equations with time-independent noise. This is joint work with Yuhui Guo and Guanyu Wu.

The anomalous regularization and pathwise uniqueness of stochastic 2D fluid models on the torus

Bin Tang *Nanjing University of Science and Technology*

Abstract: We consider stochastic 2D Euler equations with L^2 initial data on the torus, driven by Kraichnan transport noise with parameter $\alpha \in (0, 1/2)$. Thanks to the noise, the equation admits weak solutions with anomalous regularity, roughly speaking, the $H^{1-\alpha}$ norm of solution is square integrable in time. This enables us to prove the anomalous dissipation for small L^2 initial data and the pathwise uniqueness of weak solutions. Similar results hold for stochastic 2D mSQG equations with suitably chosen parameters. The talk is based on a joint work with Dejun Luo.

A statistical consequence of the soliton resolution conjecture for the focusing nonlinear Schrödinger equation

Leonardo Tolomeo *University of Edinburgh*

Abstract: In this talk, I will discuss concentration of measure phenomena for the Gibbs of the focusing, mass-subcritical Schrödinger equation on the real line.

I will first discuss how these results connect to the soliton resolution conjecture for NLS, and then explain how to approach this family of problems, combining the variational representation of solitons with more probabilistic techniques.

This talk is based on joint works with T. Oh (Edinburgh), M. Okamoto (Osaka), H. Weber (Münster), J. Forlano (Monash), and F. Höfer (Münster).

Dimension-free Convergence Rate in Sliced Wasserstein Distance for Empirical Measures of Markov Processes

Feng-Yu Wang *Tianjin University*

Abstract: To derive dimension-free convergence rates of empirical measures for Markov processes on a Banach space, we adopt the sliced Wasserstein distance (SW distance) induced by a probability measure with full support on the unit ball of the dual space. This distance is topologically stronger than the convergence in finite-dimensional distributions, and is topologically equivalent to the Wasserstein distance in finite-dimensions. Under this distance, we derive dimension-free convergence rates for the empirical measures of ergodic Markov processes, which can be sharp as illustrated by concrete examples.

Stochastic homogenization of diffusions in turbulence driven by non-local symmetric Levy operators

Jian Wang *Fujian Normal University*

Abstract: We investigate the stochastic homogenization of a class of turbulent diffusions generated by non-local symmetric Levy operators with divergence-free drift fields in ergodic random environments, where neither the drift fields nor their associated stream functions are assumed to be bounded. A pivotal step in our proof is the establishment of $W^{1,q}_{loc}$ estimates with $q \in (1,2)$ for the corresponding correctors, under mild prior regularity conditions imposed on the Levy measure and the stream function.

Irreducibility and ergodicity of SPDEs driven by pure jump noise

Jianliang Zhai *University of Science and Technology of China*

Abstract: We develop a new and effective method to obtain the irreducibility of SPDEs and SDEs driven by multiplicative pure jump noise. As an application of our main results, we remove all the restrictive conditions on the driving noises in the literature, and derive new irreducibility results of a large class of equations driven by pure jump noise, including SPDEs with locally monotone coefficients, SPDEs/SDEs with singular coefficients, nonlinear Schrödinger equations etc. As further applications of the main results, we obtain the ergodicity of multi-valued, singular stochastic evolution inclusions such as stochastic 1-Laplacian evolution (total variation flow), stochastic sign fast diffusion equation, stochastic minimal surface flow, stochastic curve shortening flow, etc.

Recent progress on Stochastic Zakharov system

Deng Zhang *Shanghai Jiao Tong University*

Abstract: In this talk we will review some recent results on the well-posedness theory and noise-regularization effect on scattering for stochastic Zakharov systems in high dimensions and beyond the energy space. Our focus is particularly directed at the large data regime, where the global existence and long-time dynamics of the deterministic Zakharov system remain largely open. This work is in joint with Martin Spitz and Zhenqi Zhao.

Ergodicity of stochastic reaction-diffusion equations on unbounded domains driven by space-time white noise

Tusheng Zhang *University of Science and Technology of China*

Abstract: In this talk, we will report recent progresses on the ergodicity, exponential mixing as well as irreducibility of solutions of stochastic reaction-diffusion equations on unbounded domains driven by space-time white noise. We stress that the solutions of this type of equations are not semimartingale and the Itô formula/energy equalities are not available.

Quantitative Propagation of Chaos and Fluctuations for Kinetic McKean-Vlasov SDEs with Singular Interaction Kernels

Xicheng Zhang *Beijing Institute of Technology*

Abstract: We prove a quantitative propagation of chaos estimate and a central limit theorem for the particle system associated with a class of degenerate kinetic McKean–Vlasov SDEs with external drifts and singular interaction kernels in Kato's class. In particular, the interaction kernel can be in the mixed $L_t^q L_v^{p_v} L_x^{p_x}$-space, where $\frac{2}{q} + \frac{3d}{p_x} + \frac{d}{p_v} < 1$. For the associated N-particle system, we obtain a path-space relative entropy bound of order k/N for the first k particles, assuming only entropic chaoticity of the initial data. The key ingredients are kinetic Krylov–Khasminskii estimates and a conditional Hilbert-space subgaussian estimate for empirical interaction fields. For the CLT, we also prove a Berry–Esseen–type bound for finite-dimensional projections. This is a joint work with Zimo Hao and Xianliang Zhao.

Derivation of Gibbs measure from quantum Gibbs state

Rongchan Zhu *Beijing Institute of Technology*

Abstract: We derive the Φ_3^4 measure on the torus as a rigorous limit of the quantum Gibbs state of an interacting Bose gas. To be precise, starting from many-body quantum mechanics, where the problem is linear and regular but involving non commutative operators, we justify the emergence of the Φ_3^4 measure as a semiclassical limit which captures the formation of Bose–Einstein condensation just above the critical temperature. We employ and develop several tools from both stochastic quantization and many-body quantum mechanics. Since the quantum problem is typically formulated using a nonlocal interaction potential, our first key step involves approximating the Φ_3^4 measure through a Hartree measure with nonlocal interaction, achieved by developing new techniques in paracontrolled calculus. The connection between the quantum problem and the Hartree measure emerges through a variational interplay between classical and quantum models. In particular, I will talk about recent result on singular kernel including Yukawa kernel, which has the same small scale behavior as Coulomb potential.
