ZIMO HAO

Employment

Bielefeld University: 2023.08 – now. Research post-doctor
Advisor: Professor Michael Röckner.

Education

Bielefeld University: 2020.07 – 2023.07. Ph.D. in Mathematics.
Thesis advisor: Professor Michael Röckner.
Thesis name: McKean-Vlasov equation with singular drift.

Wuhan University: 2018.09 – 2023.06. Ph.D. in Mathematics.
Thesis advisor: Professor Xicheng Zhang. Thesis name: Singular kinetic equations.

Wuhan University: 2014.09 – 2018.06. B.S. in Mathematics.
Thesis advisor: Professor Xicheng Zhang.
Thesis name: Hardy-Littlewood maximal function and singular integral.

Research interests

(♠) Kinetic equations. Probabilistic representation of some Kinetic equations with singular coefficients, including singular coefficient case, interacting particle system, and Fokker-Planck-Kolmogorov equations.

(♡) SDE and DDSDE with singular drift. Well-posedness, heat kernel estimates, and long-time behavior of SDE and distributional dependent SDE (DDSDE) driven by α-stable process with distribution or integrable drift. Propagation of chaos for DDSDE.

(♣) Nonlinear Fokker-Planck equations. Well-posedness, long-time behavior, and propagation of chaos of some nonlinear Fokker-Planck equations, such as the velocity-vorticity form of Navier-Stokes equations, porous media equations, and Vlasov-Poisson equations.

(♢) Euler approximation and averaging principle for SDE or DDSDE with singular coefficients. Euler approximation and averaging principle problems for SDE or distributional dependent SDE (DDSDE) with singular (L^p and distribution) drifts.

Publications and preprints

1. Singular kinetic equations and applications, with Xicheng Zhang, Rongchan Zhu and Xiangchan Zhu, to appear in *The Annals of Probability*. Available in arXiv:2108.05042. (♠) & (♡)

2. Strong and weak convergence for averaging principle of DDSDE with singular drift, with Mengyu Cheng and Michael Röckner, to appear in *Bernoulli*. Available in arXiv:2207.12108. (♢)

3. Schauder's estimates for nonlocal equations with singular Lévy measures, with Zhen Wang and Mingyan Wu, to appear in *Potential Analysis*. Available in arXiv::2002.09887. (♡)

4. Strong convergence of propagation of chaos for McKean-Vlasov SDEs with singular interactions, with Michael Röckner and Xicheng Zhang, submitted. Available in arXiv:2204.07952. (♡)

5. Well-posedness of density dependent SDE driven by α-stable process with Hölder drifts, with Mingyan Wu, *Stochastic Processes and their Applications* **164** (2023), 416-442. (♡) & (♢)

6. SDE driven by cylindrical α-stable process with distributional drift and application, with Mingyan Wu. Available in arXiv:2305.18139. (♡) & (♢)

7. Second order fractional mean-field SDEs with singular kernels and measure initial data, with Michael Röckner and Xicheng Zhang, submitted. Available in arXiv:2302.04392. (♠) & (♡) & (♣)

8. Hörmander's hypoelliptic theorem for nonlocal operators, with Xuhui Peng and Xicheng Zhang, *Journal of Theoretical Probability*. **34** (2021), 1870-1916. (♠)

9. Euler scheme for density dependent stochastic differential equations, with Michael Röckner and Xicheng Zhang, *Journal of Differential Equations*. **274** (2021), 996-1014. (♡) & (♢)

10. Hölder regularity and gradient estimates for SDEs driven by cylindrical α-stable processes, with Zhen-Qing Chen and Xicheng Zhang, *Electronic Journal of Probability*. **25** (2020), 1-23. (♡)

11. Schauder estimates for nonlocal kinetic equations and applications, with Mingyan Wu and Xicheng Zhang, *Journal de Mathématiques Pures et Appliquées*. **140** (2020), 139-184. (♠)

Awards and Fundings

- **DFG Grant:** SFB1283 Taming uncertainty and profiting from randomness and low regularity in analysis, stochastics and their applications; Project B1: New trends in stochastic partial differential equations & Project A5: Fokker-Planck-Kolmogorov equations on general state spaces 2020-2025.

- **Chinese National Scholarship** (2021 and 2020).
- **Outstanding Graduate:** Wuhan University (2018).
- **Outstanding undergraduate graduation thesis:** Wuhan University (2018).
- **Honorable Mention for Analysis and Differential Equations:** The 7th. session of S.-T. Yau College Student Mathematics Contest (2016).

Teaching

- Tutorial for Probability Theory II, Bielefeld University (2022 Spring).
- Teaching Assistant for Probability, Wuhan University (2019 Fall).
- Teaching Assistant for Numerical Analysis, Wuhan University (2018 Spring).

Conference and Workshop Talks

- The 7th National Conference on Probability Theory, Shangdong University, Weihai, China, August 2022. *Singular kinetic equations.*
- 15th Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis, Berlin, Germany, May 2022. *Strong convergence of propagation of chaos for McKean-Vlasov SDEs with singular interactions.*
- CRC Retreat 2020, Bielefeld, Germany, August 2020. *Euler approximation for SDEs with irregular coefficients.*
- LSA winter meeting-2019, National Research University Higher School of Economics, Moscow, Russia, December 2019. *Gradient estimate for SDEs driven by cylindrical Levy processes.*
- Workshop for Stochastic Analysis, Peking University, Beijing, China, August 2019. *Heat kernel of nonlocal kinetic operators.*
- The 7th IMS-China, International Conference on Stochastic and Probability, Dalian University of Technology, Dalian, China, July 2019. *Gradient estimate for SDEs driven by cylindrical Levy processes.*
- Workshop on Stochastic Analysis and Applications, Nanyang Technological University, Singapore, June 2019. *Gradient estimates for SDEs driven by cylindrical α-stable processes.*
- Perturbation Techniques in Stochastic Analysis and Its Applications, CIRM, Marseille, France, 11 – 15 March 2019. *Schauder estimates for nonlocal kinetic equations and applications.*