Zhongjian Wang

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EMPLOYMENT

Department of Statistics and CCAM, The University of Chicago **Chicago**
William H. Kruskal Instructor *2020–*
Mentor: Prof. Guillaume Bal

EDUCATION

Department of Mathematics, The University of Hong Kong **Hong Kong**
Doctor of Philosophy *2016–2020*
Supervisor: Dr. Zhang Zhiwen, Thesis title: Robust Lagrangian Numerical Schemes in Computing Effective Diffusivities for Chaotic and Random Flows

Department of Mathematical Sciences, Tsinghua University **Beijing**
Bachelor of Science *2012–2016*

VISITING EXPERIENCES

Tsinghua University **Beijing**
Visiting Ph.D. Student *2018.11-19.1*
hosted by Professor Steven Shing Tung Yau

California Institute of Technology **Pasadena**
Visiting Ph.D. Student *2018.4-5*
hosted by Professor Thomas Hou

Ecole Normale Superieure **Paris**
Exchange Student *2016.1-6*
For Bachelor Thesis, supervised by Professor Espen Robstad Jakobsen

University of Oxford **Oxford**
Visitor *2013.7*
Tsinghua University Distinguished Newcomer Student Leadership Program

AWARDS AND SCHOLARSHIPS

Hong Kong Mathematical Society
Best PhD thesis Award *2021*

Society for Industrial and Applied Mathematics
Student Travel Award for UQ20 *2020*

Department of Mathematics, HKU
Doris Chen Postgraduate Travel Grant *2019*

Society for Industrial and Applied Mathematics
Student Travel Award for CSE19 *2019*

Faculty of Science, HKU
Pilot Scheme on International Experience *2018*

Institute for Pure & Applied Mathematics, UCLA
IPAM Student Travel Support 2017

Research Grants Council
Hong Kong Ph.D. Fellowship 2016

Tsinghua University
Scholarship for Academic Excellence 2013

China Mathematics Olympiad
Gold Medalist 2012

RESEARCH INTERESTS

Applied analysis and computational methods for physics and engineering problems, including but not limited to,

- **homogenization problems:** effective diffusion in periodic, random flows; convection enhancement in the large Péclet regime; KPP front wave speed.
- **reduced order models:** non-linear filtering, uniform accuracy schemes in time integration, neural network.

PUBLICATIONS AND PREPRINTS

1. DeepParticle: learning invariant measure by a deep neural network minimizing Wasserstein distance on data generated from an interacting particle method (*submitted to JCP, with Xin, J., Zhang, Z.*)
2. A data-driven model reduction method for parabolic inverse source problems and its convergence analysis (*submitted to Inverse Problem, Wang Z., Zhang W., Zhang Z.*
3. A robust stochastic structure-preserving Lagrangian scheme in computing effective diffusivity of 3D time-dependent flows (*submitted to ESAIM:M2NA, with Xin, J., Zhang, Z.*)
4. Tensor train method for high-dimensional nonlinear filtering problems (*submitted to IEEE TAC, with Li, S., Yau, S. S. T., Zhang, Z.*)
5. A class of robust numerical methods for solving dynamical systems with multiple time scales (*submitted to IMA J NA, with T. Hou, Zhang, Z.*)
6. Wang, Z., Lyu, J., Xin, J., Zhang, Z., A convergent interacting particle method and computation of KPP front speeds in chaotic flows (*Accepted by SINUM.*)
7. Wang, Z., Xin, J., Zhang, Z., Sharp uniform in time error estimate on a stochastic structure-preserving Lagrangian method and computation of effective diffusivity in 3D chaotic flows, Multiscale Model and Simulation, 19 (2021), no. 3, 1167–1189
8. Wang, Z., Lyu, J., Xin, J., Zhang, Z.., Convergence of stochastic structure-preserving schemes for computing effective diffusivity in random flows, SIAM Journal on Numerical Analysis, 58 (2020), no. 5, 3040–3067. .
9. Wang, Z., Zhang, Z., A new mesh-free method for PDE with discontinuous coeffcients using the deep learning approach, Journal of Computational Physics, 400 (2020), 108963.
10. Wang, Z. Luo, X., Yau, S. S. T., Zhang, Z., Proper orthogonal decomposition method to nonlinear filtering problems in medium-high dimension, IEEE Transactions on Automatic Control, 65 (2020), no. 4, 1613–1624.
11. Wang, Z., Xin, J., Zhang, Z., Computing Effective Diffusivity of Chaotic and Stochastic Flows Using Structure-Preserving Schemes. SIAM Journal on Numerical Analysis, 56(4), 2322-2344.

TEACHING EXPERIENCES

- at **The University of Chicago**
  21/22 Spring: Lecturer of STAT251 Introduction to Probabilities

  21/22 Winter: Lecturer of MATH185 Mathematical Methods in the Physical Sciences (III: ODE and Fourier Transform)

  21/22 Winter: Lecturer of STAT31120 Numerical Methods for Stochastic Differential Equations

  20/21 Spring: Lecturer of STAT31120 Numerical Methods for Stochastic Differential Equations

  20/21 Autumn: Lecturer of STAT251 Introduction to Probabilities
- at **The University of Hong Kong**
  Certificate: I was awarded the Certificate of Teaching and Learning in Higher Education from HKU Center of the Enhancement of Teaching and Learning in 2016.

  19/20 Fall: Tutor of MATH3601 Numrical analysis, MATH3401 Analysis.

  18/19 Spring: Tutor of MATH4602 Scientific computing.

  18/19 Fall: Tutor of MATH3601 Numerical analysis.

  17/18 Spring: Tutor of MATH4602 Scientific computing.

  17/18 Fall: Tutor of MATH2014 Multivariable calculus and linear algebra, MATH1009 Basic mathematics for business and economics.

  16/17 Fall: Tutor of MATH1009 Basic mathematics for business and economics.

RESEARCH PRESENTATIONS

- **Tensor train method for high-dimensional nonlinear filtering problems**
  2022.4: SIAM Conference on Uncertainty Quantification (UQ22), Atlanta
- **A convergent interacting particle method and computation of KPP front speeds**
  2021.11: CCAM Seminar, Purdue University, IN

  2021.11: Applied Math Seminar, BUAA, Beijing
- **A Robust Lagrangian Scheme in Computing Effective Diffusivities**
  2020.12: Applied Mathematics Seminar, IIT, Chicago

  2020.3: Applied Mathematics Seminar, Cermics ENPC, Paris

  2020.1: Special Applied Mathematics Colloquium, Columbia University, New York

  2019.7: International Congress on Industrial and Applied Mathematics (ICIAM 2019), Valencia

  2019.2: (*poster*) SIAM Conference on Computational Science and Engineering (CSE19), Spokane

  2018.7: (*poster*) The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Taibei

  2017.11: (*poster*) IPAM Workshop IV of Complex High-Dimensional Energy Landscape, Los Angeles
- **A new mesh-free method for PDE with discontinuous coeffcients using the deep learning approach**
  2018.11: (*poster*) Big Data Challenges for Predictive Modeling of Complex Systems,

Hong Kong

- **POD method to nonlinear filtering problems in medium-high dimension**
  2019.6: The 8th International Congress of Chinese Mathematicians (ICCM 2019), Beijing