Zheng **Ma**

Golomb Visiting Assistant Professor of Mathematics

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Positions

Purdue University   *West Lafayette, USA*
Golomb Visiting Assistant Professor of Mathematics   *Aug. 2017 – Present*
- Mentor: Jingwei Hu

University of Wisconsin Madison   *Madison, USA*
Visiting Scholar of Mathematics Department   *Feb. 2015 – Dec. 2015*
- Collaborator: Shi Jin

Education

Shanghai Jiao Tong Univeristy   *Shanghai, China*
Ph.D. in Computational Mathematics   *Sep. 2012 – July. 2017*
- Dissertation: Numerical Methods for Transport Equations and Wave Propagations with Multiple Scales and Uncertainty
- Advisor: Prof. Shi Jin

Zhiyuan College, Shanghai Jiao Tong Univeristy   *Shanghai, China*
B.S. in Mathematics and Applied Mathematics   *Sep. 2008 – July. 2012*
- Minor: Applied Physics
- Thesis: The WENO Scheme for Liouville Equation of Geometrical Optics with Discontinuous Local Wave Speeds
- Advisor: Prof. Shi Jin

Awards

Academic Related

2019   **Best Article Awards**, Celebrating the 5th anniversary of Research in the Mathematical Sciences

Others

2017   **Outstanding Ph.D. Graduates Awards**, Shanghai Jiao Tong University

Publications

Journal Articles

[1] **Uniformly accurate machine learning-based hydrodynamic models for kinetic equations**
J. Han, C. Ma, Z. Ma, W. E
Proceedings of the National Academy of Sciences (PNAS) 116.44 (2019) pp. 21983–21991. 2019.

[2] **A Fast Spectral Method for the Inelastic Boltzmann Collision Operator and Application to Heated Granular Gases**
J. Hu, Z. Ma
Journal of Computational Physics 385 (2019) pp. 119–134. 2019.

[3] **Theory of the Frequency Principle for General Deep Neural Networks**
T. Luo, Z. Ma, Z.-Q. J. Xu, Y. Zhang
Preprint, 2019.

[4] **The Discrete Stochastic Galerkin Method for Hyperbolic Equations with Non-smooth and Random Coeffi cients**
S. Jin, Z. Ma
Journal of Scientific Computing 74.1 (Jan. 2018) pp. 97–121. 2018.

[5] **Uniform Spectral Convergence of the Stochastic Galerkin Method for the Linear Transport Equations with Random Inputs in Diffusive Regime and a Micro-Macro Decomposition-Based Asymptotic-Preserving Method**
S. Jin, J.-G. Liu, Z. Ma
Research in the Mathematical Sciences 4.1 (Aug. 2017) p. 15. 2017.

[6] **Explicit and Implicit TVD Schemes for Conservation Laws with Caputo Derivatives**
J.-G. Liu, Z. Ma, Z. Zhou

Journal of Scientific Computing 72.1 (July 2017) pp. 291–313. 2017.

[7] **An Improved Semi-Lagrangian Time Splitting Spectral Method for the Semi-classical Schrödinger Equation with Vector Potentials Using NUFFT**

Z. Ma, Y. Zhang, Z. Zhou

Applied Numerical Mathematics 111 (2017) pp. 144–159. 2017.

Conference Proceedings

[1] **A type of generalization error induced by initialization in deep neural networks**

Z.-Q. J. Xu, Y. Zhang, T. Luo, Z. Ma

Submitted to NeurIPS, 2019.

[2] **Explicitizing an Implicit Bias of the Frequency Principle in Two-layer Neural Networks**

Z.-Q. J. Xu, Y. Zhang, T. Luo, Z. Ma

Submitted to NeurIPS, 2019.

[3] **Frequency Principle: Fourier Analysis Sheds Light on Deep Neural Networks**

Z.-Q. J. Xu, Y. Zhang, T. Luo, Y. Xiao, Z. Ma

Submitted to NeurIPS, 2019.

Talks

Innovative Trends in the Numerical Analysis & Simulation of Kinetic Equations *Oberwolfach, Germanny*

Oberwolfach Mini-Workshop *Dec. 2018*

- Title: A Fast Spectral Method for the Inelastic Boltzmann Collision Operator

The 10th International Conference on Computational Physics *Macao, China*

Mini-Symposium on Numerical Simulation and Mathematical Modeling of Kinetic Equations *Jan. 2017*

- Title: Uncertainty Quantification for Linear Transport Equation with Random Inputs: Analysis and Numerics

XVI International Conference on Hyperbolic Problems: Theory Numerics, Applications *Aachen, Germanny*

Session on UQ/Stochastic *Aug. 2016*

- Title: Uncertainty Quantification for Conservation Laws: A Discrete Stochastic Galerkin Approach

Teaching

MA303 (Differential Equations and Partial Differential Equations for Engineering and the Sciences) *Purdue University*

Instructor *Fall 2019*

- Textbook: TBD

MA266 (Ordinary Differential Equations) *Purdue University*

Instructor *Fall 2017 – Spring 2019*

- Textbook: Differential Equations and Boundary Value Problems