

Ruiwen Shu – Curriculum Vitae

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Education

- 2021-present** Postdoctoral Research Associate - Mathematical Institute, University of Oxford
Mentor: Prof. José Carrillo
- 2018-2021** Serguei Novikov Postdoctoral Fellowships - Department of Mathematics, University of Maryland, College Park
Mentor: Prof. Eitan Tadmor
- 2014-2018** PhD - Department of Mathematics, University of Wisconsin-Madison
Major: Mathematics
Advisor: Prof. Shi Jin
- 2010-2014** Bachelor of Mathematics - School of Mathematical Sciences, Peking University
Major: Mathematics

Honors and awards

- Nov 2017** **Excellence in Research Award** (UW-Madison)
for significant and substantial contributions to research in mathematics
- July 2013** **Bronze Medal, L. -K. Hua Awards (Analysis)**
S.-T. Yau College Student Mathematics Contests
(Gold/Silver/Bronze=1/3/6)
- Oct 2013** **Huirong Li Scholarship** (Peking University)
- Oct 2012** **Wengang Li Scholarship** (Peking University)
- Oct 2011** **Wusi Scholarship** (Peking University)
- Sept 2010** **Outstanding Freshman Scholarship** (Peking University)
- July 2009** **Silver Medal**, National Olympiad in Informatics (China)

Research interest

My main research interests are energy minimization and related dynamical problems, including gradient flows and other models from collective dynamics. I'm also interested in numerical methods for kinetic and hyperbolic problems.

Selected publications

- [21] Ruiwen Shu and Jiuya Wang, *Generalized Erdős-Turán inequalities and stability of energy minimizers*, preprint, arXiv:2110.03019.
- [20] Ruiwen Shu and Jiuya Wang, *The sharp Erdős-Turán inequality*, preprint, arXiv:2109.11006.
- [19] José A. Carrillo and Ruiwen Shu, *From radial symmetry to fractal behavior of aggregation equilibria for repulsive-attractive potentials*, preprint, arXiv:2107.05079.

- [18] Mingchang Ding, Jing-Mei Qiu and Ruiwen Shu, *Accuracy and stability analysis of the Semi-Lagrangian method for stiff hyperbolic relaxation systems and kinetic BGK model*, preprint.
- [17] Mingchang Ding, Jing-Mei Qiu and Ruiwen Shu, *Semi-Lagrangian nodal discontinuous Galerkin method for the BGK Model*, preprint.
- [16] Sigal Gottlieb, Zachary Grant, Jingwei Hu and Ruiwen Shu, *High order unconditionally strong stability preserving multi-derivative implicit and IMEX Runge-Kutta methods with asymptotic preserving properties*, SIAM Numer. Anal., accepted.
- [15] Douglas P. Hardin, Edward B. Saff, Ruiwen Shu and Eitan Tadmor, *Dynamics of Particles on a Curve with Pairwise Hyper-singular Repulsion*, Discrete Contin. Dyn. Syst., accepted.
- [14] Ruiwen Shu and Eitan Tadmor, *Newtonian repulsion and radial confinement: convergence towards steady state*, Mathematical Models and Methods in Applied Sciences, 1-25, 2021.
- [13] Ruiwen Shu, *Tightness of radially-symmetric solutions to 2D aggregation-diffusion equations with weak interaction forces*, preprint, arXiv:2006.01955.
- [12] Ruiwen Shu, *Equilibration of aggregation-diffusion equations with weak interaction forces*, SIAM J. Math. Anal., accepted.
- [11] Jingwei Hu and Ruiwen Shu, *On the uniform accuracy of implicit-explicit backward differentiation formulas (IMEX-BDF) for stiff hyperbolic relaxation systems and kinetic equations*, Mathematics of Computation, 90: 641-670, 2021.
- [10] Ruiwen Shu and Eitan Tadmor, *Anticipation breeds alignment*, Archive for Rational Mechanics and Analysis, 240(1): 203-241, 2021.
- [9] Jingwei Hu, Shi Jin and Ruiwen Shu, *On stochastic Galerkin approximation of the nonlinear Boltzmann equation with uncertainty in the fluid regime*, J. Comput. Phys., 397: 108838, 2019.
- [8] Ruiwen Shu and Eitan Tadmor, *Flocking hydrodynamics with external potentials*, Archive for Rational Mechanics and Analysis, 2020: 1-35.
- [7] Jingwei Hu and Ruiwen Shu, *A second-order asymptotic-preserving and positivity-preserving exponential Runge-Kutta method for a class of stiff kinetic equations*, SIAM Multiscale Model. Simul., 17(4): 1123-1146, 2019.
- [6] Ruiwen Shu and Shi Jin, *A study of Landau damping with random initial inputs*, J. Differ. Equat., 266(4), 1922-1945, 2019.
- [5] Jingwei Hu, Ruiwen Shu and Xiangxiong Zhang, *Asymptotic-preserving and positivity-preserving implicit-explicit schemes for the stiff BGK equation*, SIAM J. Numer. Anal., 56(2), 942-973, 2018.
- [4] Qin Li, Jian-Guo Liu and Ruiwen Shu, *Sensitivity analysis of Burgers' equation with shocks*, SIAM/ASA J. Uncertainty Quantification, 8(4): 1493-1521, 2020.
- [3] Qin Li, Ruiwen Shu and Li Wang, *A new numerical approach to inverse transport equation with error analysis*, SIAM J. Numer. Anal., SIAM J. Numer. Anal., 56(6), 3358-3385, 2018.
- [2] Ruiwen Shu and Shi Jin, *Uniform regularity in the random space and spectral accuracy of the stochastic Galerkin method for a kinetic-fluid two-phase flow model with random initial inputs in the light particle regime*, ESAIM Math. Model. Numer. Anal., 52(5), 1651-1678, 2018.
- [1] Shi Jin and Ruiwen Shu, *A stochastic Asymptotic-Preserving scheme for a kinetic-fluid model for disperse two-phase flows with uncertainty*, J. Comput. Phys., 335, 905-924, 2017.

Organized activities

2022 Mar Minisymposium "Aggregation-diffusion equations and related topics", in SIAM PD22 (virtual conference)

Invited conference talks

2020 Mar International Workshop on Interacting Particle Systems, SJTU, China

2019 Dec SIAM PD19, La Quinta, CA

2019 Oct Young Researchers Workshop: Ki-Net 2012-2019, University of Maryland, College Park

2019 July SciCADE 2019, Innsbruck, Austria

2019 June Young Researcher Workshop on Uncertainty Quantification and Machine Learning, SJTU, China

2019 Mar Mathematical Aspects of Collective Dynamics: Kinetic Description and Fractional Diffusion, University of Maryland, College Park

2018 Nov Multiscale Computations for Kinetic and Related Problems, North Carolina State University

2018 Oct Young Researchers Workshop: Kinetic descriptions in theory and applications, University of Maryland, College Park

2018 Feb Young Researchers Workshop: Kinetic models in biology and social sciences, Arizona State University

2017 Oct Hypocoercivity and Sensitivity Analysis in Kinetic Equations and Uncertainty Quantification, UW-Madison

2017 July International Conference on Uncertainty Quantification in Computational Fluid Dynamics, SJTU, China

2017 Feb 2017 SIAM Conference on Computational Science and Engineering, Atlanta, GA

Contributed conference talks

2019 July ICIAM 2019, Valencia, Spain

2016 Aug XVI International Conference on Hyperbolic Problems, Aachen, Germany

Attended conferences and summer schools

- 2018 June** International workshop on Kinetic Theory and Related Topics, TSIME, China
- 2018 Mar** Workshop on kinetic and fluid Partial Differential Equations, Univ. Paris Descartes and Univ. Paris Diderot, France
- 2017 July** Summer School on Applied and Stochastic Analysis for Partial Differential Equations, SJTU, China
- 2017 Apr** Pre-School on Stochastic Dynamics out of Equilibrium, CIRM, France
- 2017 Jan** IPAM Big Data Meets Computation Program, UCLA
- 2016 July** Conference on Quantum and Kinetic Transport, SJTU, China
- 2016 June** Summer School on Quantum and Kinetic Theory for Complex Systems, UCSB
- 2016 Apr** Boundary Value Problems and Multiscale Coupling Methods for Kinetic Equations, UW-Madison
- 2016 Feb** Advances in Kinetic and Fluid Dynamics Transport: Analysis and Approximations, UT-Austin
- 2015 Nov** Young Researchers Workshop: Kinetic Theory with Applications in Physical Sciences, CSCAMM
- 2015 May** Asymptotic Preserving and Multiscale Methods for Kinetic and Hyperbolic Problems, UW-Madison

Teaching (at University of Oxford)

- Michaelmas 2021** B4.1 (Functional analysis 1), as tutor

Teaching (as instructor, at University of Maryland, College Park)

- Spring 2020-2021** Math 461 (Linear algebra) and Math 310 (Introduction to proofs)
- Fall 2020-2021** Math 246 (Introduction to ODEs)
- Spring 2019-2020** AMSC 460 (Numerical methods)
- Fall 2019-2020** AMSC 460 (Numerical methods), 2 sections
- Spring 2018-2019** Math 136 (Calculus for life sciences)
- Fall 2018-2019** Math 141 (Calculus 2)

Teaching (as teaching assistant, at University of Wisconsin-Madison)

- Fall 2017-2018** Math 234 (Calculus 3)
- Fall 2016-2017** Math 222 (Calculus 2)
- Fall 2015-2016** Math 234 (Calculus 3)
- Spring 2014-2015** Math 221 (Calculus 1)
- Fall 2014-2015** Math 221 (Calculus 1)