

Jing An

Curriculum Vitae

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Employment

- 2022-2025 **Phillip Griffiths Assistant Research Professor**, Department of Mathematics, Duke University
- 2021-2022 **Postdoctoral Researcher**, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany

Education

- 2016-2021 **Ph.D.**, Computational and Mathematical Engineering, Stanford University
Advisors: Lenya Ryzhik and Lexing Ying
- 2012-2016 **B.S.**, Mathematics of Computation, University of California, Los Angeles

Research Interests

Mathematical analysis of machine learning and data science problems, reaction-diffusion equations, non-local interaction problems

Publications and Preprints

14. *Why does the two-timescale Q-learning converge to different mean field solutions? A unified convergence analysis*
with Jianfeng Lu, Yue Wu, and Yang Xiang, arXiv:2404.04357, submitted.
13. *Front location determines convergence rate to traveling waves*
with Christopher Henderson and Lenya Ryzhik, Annales de l'Institut Henri Poincaré C Analyse non linéaire (2024).
12. *Convergence of stochastic gradient descent under a local Łojasiewicz condition for deep neural networks*
with Jianfeng Lu, arXiv:2304.09221, submitted.
11. *Critical points and convergence analysis of generative deep linear networks trained with Bures-Wasserstein loss*
with Pierre Bréchet, Katerina Papagiannouli, and Guido Montúfar, International Conference on Machine Learning (ICML) 2023.
10. *Voting models and semilinear parabolic equations*
with Christopher Henderson and Lenya Ryzhik, Nonlinearity, 36.11 (2023):6104.
9. *Quantitative steepness, semi-FKPP reactions, and pushmi-pullyu fronts*
with Christopher Henderson and Lenya Ryzhik, Archive for Rational Mechanics and Analysis, 247.5 (2023):88.
8. *Pushed, pulled and pushmi-pullyu fronts of the Burgers-FKPP equation*
with Christopher Henderson and Lenya Ryzhik, Journal of the European Mathematical Society (2023).

7. *Combining resampling and reweighting for faithful stochastic optimization* with Lexing Ying, Communications in Mathematical Sciences 21.6 (2023): 1569-1588.
6. *Why resampling outperforms reweighting for correcting sampling bias with stochastic gradients* with Lexing Ying and Yuhua Zhu, International Conference on Learning Representations (ICLR) 2021.
5. *On the gradient flow structure of the isotropic Landau equation* with Lexing Ying, Communications in Mathematical Sciences, 19.8 (2021), 2319-2333.
4. *Global well-posedness for the Euler alignment system with mildly singular interactions* with Lenya Ryzhik, Nonlinearity, 33 (2020), 4670-4699.
3. *Stochastic modified equations for the asynchronous stochastic gradient descent* with Jianfeng Lu and Lexing Ying, Information and Inference: A Journal of the IMA, 2019.
2. *Fast algorithms for integral formulations of steady-state radiative transfer equation* with Yuwei Fan and Lexing Ying, Journal of Computational Physics, 380 (2019), 191-211.
1. *Image segmentation with dynamic artifacts detection and bias correction* with D. Zosso, J. Stevick, N. Takaki, M. Weiss, L. S. Slaughter, H. H. Cao, P. S. Weiss, and A. L. Bertozzi, AIMS Inverse Problems and Imaging, 11(3): 577-600, 2017.

Invited Talks

- May 2025 "Emerging Connections between Reaction-Diffusion, Branching Processes, and Biology", BIRS Workshop
- Dec 2024 "Mathematical Modeling of Biological Interfacial Phenomena", Institute for Mathematical and Statistical Innovation (IMSI)
- Dec 2024 Math Machine Learning seminar, MPI MIS/UCLA
- Nov 2024 Applied math seminar, University of Arizona
- Nov 2024 Applied math seminar, UC Berkeley
- Oct 2024 "Modern Scientific Machine Learning from a Statistical Perspective", SIAM Conference on Mathematics of Data Science (MDS24)
- May 2024 "Propagation and Stability in Evolution Equations", BIRS-UBC-O Workshop
- Jan 2024 "Dynamics and Regularity of PDEs", JMM 2024
- Jan 2024 Forum for young mathematicians at National University of Singapore (declined due to visa issue)
- May 2023 Applied math seminar, Fudan University
- May 2023 Applied math seminar, Shanghai Jiaotong University
- Mar 2023 Workshop on "Branching Processes and Reaction Diffusion Equations", Brin Mathematics Research Center
- Nov 2022 ACM seminar, University of South Carolina
- Oct 2022 Special session on "Mathematics of Collective Behavior", Fall Western Sectional AMS Meeting, University of Utah
- Aug 2022 "Interfacial Phenomena in Reaction-Diffusion Systems", BIRS Workshop
- Jun 2022 Hausdorff School on Foundational Methods in Machine Learning, Hausdorff Center for Mathematics
- Nov 2021 Jiantao Jiao's group seminar, UC Berkeley (online)

- Jul 2021 Arbeitsgemeinschaft Applied Analysis Seminar, Max Planck Institute for Mathematics in the Sciences
- Dec 2020 SFB Seminar, Hausdorff Center for Mathematics (online)
- Dec 2020 Arbeitsgemeinschaft Applied Analysis Seminar, Max Planck Institute for Mathematics in the Sciences (online)
- Dec 2020 Applied Math and Analysis Seminar, Duke University (online)

Awards and Honors

- 2023-2025 AMS-Simons Travel Grant
- 2018 First place in Citadel Datathon competition at Stanford
- 2018-2021 Olinger Memorial Fellowship Award, ICME, Stanford University
- 2017-2018 Gene Golub Fellowship Award, ICME, Stanford University
- 2016 Sherwood Prize, UCLA Department of Mathematics
- 2015-2016 Joan Palevsky Honors Research Scholarship, UCLA
- 2015 Library Prize for Undergraduate Research in Science, Engineering, and Mathematics, UCLA

Academic Visits

- Jan 2022 - Mathematical modeling of organization in living matter,
- Mar 2022 Institut Henri Poincaré Paris, France

Work Experience

- June 2020 - Research Intern, Exploratory Design Group at Apple Cupertino, CA
- Sep 2020

Teaching Experience

- Fall 2023 Instructor for Math 353: Ordinary and Partial differential equations
- Summer 2023 Instructor for Math 218D-2: Matrices and Vectors
- Spring 2023, Instructor for Math 361S: Mathematical Numerical Analysis
- 2025
- Fall 2022, Instructor for Math 356: Elementary Differential Equations
- 2024
- Sep 2018 Lecturer for ICME refresher course: Ordinary/Partial differential equations
- Summer 2018 Course Assistant for CME 108/Math 114: Introduction to Scientific Computing
- Spring 2018 Course Assistant for CME 306/Math 226: Numerical Solution of Partial Differential Equations
- Summer 2017 Course Assistant for CME 106: Introduction to Probability and Statistics for Engineers

Code

PYTHON, C++, MATLAB, R, L^AT_EX

Service

- Summer 2023 Mentor of Math+, undergraduate summer research program, Duke University
- Spring 2023 Co-organizer, Applied Math and Analysis seminar, Duke University

Nov-Dec 2021 Co-organizer, Arbeitsgemeinschaft Applied Analysis Seminar, Max Planck Institute
2018 President, SIAM Stanford student chapter
2018 Co-organizer, CME 500 (interdisciplinary student research) seminar
2017-2020 Mentor, Stanford Women in Math Mentoring (SWIMM) Program
2017-2018 Mentor, ICME first-year mentoring program
Reviewer for: Communications in Mathematical Sciences, Journal of Scientific Computing, Nonlinear Analysis, SIAM Journal on Mathematical Analysis, EMS Surveys in Mathematical Sciences, Communications in Partial Differential Equations, International Conference on Learning Representations, Math Reviews, Journal of Dynamics and Differential Equations