

Ming Zhong

Curriculum Vitae

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Academic Appointments

- Aug. 2024–present **Assistant Professor**, *University of Houston*, Houston, TX
Department of Mathematics
- Aug. 2022–
Aug. 2024 **Assistant Professor**, *Illinois Institute of Technology*, Chicago, IL
Department of Applied Mathematics
- Jul. 2021–
Aug. 2022 **Assistant Research Scientist**, *Texas A&M University*, College Station, TX
Texas A&M Institute of Data Science
- Jul. 2016–
Jun. 2021 **Postdoctoral Researcher**, *Johns Hopkins University*, Baltimore, MD
Department of Applied Mathematics & Statistics
▪ Mentor: Mauro Maggioni

Research Interests

Inverse problems; scientific machine learning; data-driven modeling of complex systems; numerical analysis and scientific computing.

Education

- May 2016 **Ph.D. in Applied Mathematics**, *University of Maryland*, College Park, MD
▪ Adviser: Eitan Tadmor
- Jun. 2008 **M.Sc. in Mathematics**, *California State Polytechnic University, Pomona*, Pomona, CA
- Aug. 2005 **B.Sc. in Mathematics**, *University of Oregon*, Eugene, OR

Additional Appointments and Research Experience

- Jun. 2025–May
2026 **Assistant Professor (Courtesy Appointment)**, *Department of Applied Mathematics*, Illinois
Institute of Technology, Chicago, IL
- Mar. 2024–May
2024 **Visiting Researcher for long program: “Data-Driven Materials Informatics: Statistical
Methods and Mathematical Analysis”**, *IMSI*, University of Chicago, Chicago, IL
- Summers 2012,
2013, 2014 **Summer Graduate Student Research Intern**, *Multiscale Methods and Dynamics Group*,
Oak Ridge National Laboratory, Oak Ridge, TN
▪ Supervisor: Dr. Cory D. Hauck

Research Grants and Awards

Ongoing

- Dec. 1,
2022–Dec. 31,
2026 NSF-CCF-AoF-2225507, “A Bayesian Paradigm for Physics-Informed Machine Learning”,
Co-PI, Award amount: \$586,319.

Completed

- Jul. 1,
2024–Dec. 31,
2025 ORAU Ralph E. Powe Junior Faculty Enhancement Award, “Data-driven Modeling of Emergent
Behaviors in Social Sciences”, PI, Award amount: \$10,000.

Publications

Journal Articles

- [J1] C. Chen, C. Liu, **M. Zhong**. Unified Learning of the Profile Function in Discrete Keller-Segel Models, to appear in *Advances in Computational Science and Engineering*, arXiv:2510.23381.
- [J2] S. Shang, **M. Zhong**, R. Wang. Dimension Domain Co-Decomposition: Solving PDEs with Interpretability, *Transactions on Machine Learning Research*, 2026. Openreview.
- [J3] X. Chen, U. Braga-Neto, L. Wang, D. Kasen, Z. Liu, F. K. Röpke, **M. Zhong**, D. J. Jeffery. SEDONA-GesaRaT: A Deep Learning Accelerated Radiative Transfer Program for 3D Supernova Simulations, *The Astrophysical Journal*, 1006(1): 86, 2026.
- [J4] B. Hao, C. Liu, U. Braga-Neto, L. Wang, **M. Zhong**. Stability in Training PINNs for Stiff PDEs: Why Initial Conditions Matter, *Foundations of Data Science*, 2026. doi:10.3934/fods.2026016.
- [J5] B. Hao, K. Milly, A. Quaini, **M. Zhong**. A Finite Element Framework for Simulating Residential Burglary in Realistic Urban Geometries, *Mathematical Models and Methods in Applied Sciences*, 36(5): 1019–1050, 2026.
- [J6] B. Hao, **M. Zhong**, and K. O’Keeffe. Attractive and repulsive interactions in the one-dimensional swarms model, *Physical Review E*, 108: 064214, 2023.
- [J7] E. J. R. Coutinho, M. Dall’Aqua, L. McClenny, **M. Zhong**, U. Braga-Neto, and E. Gildin. Stabilized hyperbolic PDE solver by adding adaptive localized artificial viscosity to physics-informed neural networks, *Journal of Computational Physics*, 489: 112265, 2023.
- [J8] J. Greene, E. Tadmor, and **M. Zhong**. The emergence of lines of hierarchy in collective motion of biological systems, *Physical Biology*, 20(5): 055001, 2023.
- [J9] J. Miller, S. Tang, **M. Zhong**, and M. Maggioni. Learning theory for inferring interaction kernels in second-order interacting agent systems, *Sampling Theory, Signal Processing, and Data Analysis*, 21: 21, 2023.
- [J10] S. Foucart, E. Tadmor, and **M. Zhong**. On the sparsity of lasso minimizers in sparse data recovery. *Constructive Approximation*, 57: 901–919, 2023.
- [J11] **M. Zhong**, J. Miller, and M. Maggioni. Data-driven discovery of emergent behaviors in collective dynamics. *Physica D: Nonlinear Phenomena*, 411: 132542, 2020.
- [J12] F. Lu, **M. Zhong**, S. Tang, and M. Maggioni. Nonparametric inference of interaction laws in systems of agents from trajectory data. *Proceedings of the National Academy of Sciences*, 116(29): 14424–14433, 2019.
- [J13] B. Ganis, I. Yotov, and **M. Zhong**. A stochastic mortar mixed finite element method for flow in porous media with multiple rock types. *SIAM Journal on Scientific Computing*, 33(3): 1439–1474, 2011.

Conference and Workshop Papers

- [C1] R. Wang, **M. Zhong**, K. Xu, L. G. Sánchez-Cortés, I. de Cominges Guerra. PINNs-Based Uncertainty Quantification for Transient Stability Analysis, accepted to the 9th International Conference on Electrical Engineering and Green Energy (CEEGE), 2026 (Best Poster Award).
- [C2] S. Shang, **M. Zhong**, R. Wang. 3D-PINNS: A Unified Framework for Dimension-wise Interpretability and Adaptive Domain Decomposition, ICLR 2026 Workshop on AI&PDE, 2026.
- [C3] Y. Shang, Y. Lu, J. Feng, **M. Zhong**, Y. Yan. Noise-based Regularized Training for Diffusion Models, 19th International Conference on Machine Vision Applications (MVA), Kyoto, Japan, 1-6, 2025.
- [C4] Z. Guo, I. Cialenco, **M. Zhong**. Learning Stochastic Dynamics from Data, ICLR Workshop on AI4DiffEqtnsInSci, 2024.

- [C5] B. Duan, **M. Zhong** and Y. Yan. Towards saner deep image registration, Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV), 12459–12468, 2023.
- [C6] J. Feng, M. Maggioni, P. Martin, and **M. Zhong**. Learning interaction variables and kernels from observations of agent-based systems. IFAC-PapersOnLine, 55(30): 162–167, 2022. 25th International Symposium on Mathematical Theory of Networks and Systems 2022.
- [C7] J. Park, C. Saltijeral, and **M. Zhong**. Grassmannian packings: Trust region stochastic tuning for matrix incoherence. 58th Annual Allerton Conference on Communication, Control, and Computing (Allerton), 1-6, 2022.
- [C8] M. Maggioni, J. Miller, H. Qiu, and **M. Zhong**. Learning interaction kernels for agent systems on Riemannian manifolds. In Marina Meila and Tong Zhang, editors, Proceedings of the 38th International Conference on Machine Learning, volume 139 of Proceedings of Machine Learning Research, pages 7290–7300. PMLR, 2021.

Book Chapter

- [BC1] J. Feng, **M. Zhong**. Learning Collective Behaviors from Observation, in “Explorations in the Mathematics of Data Science: The Inaugural Volume of the Center for Approximation and Mathematical Data Analytics”, 101–132, 2024.

Manuscripts Under Review

- [R1] C. Chen, C. Liao, **M. Zhong**. Physics-Informed Random Feature Neural Networks for Solving PDEs, Sep. 2026, arXiv:2609.16406.
- [R2] B. Hao, M. Maggioni, **M. Zhong**. Learning Interaction Kernels from Collective Steady States, Sep. 2026, arXiv:2609.12004.
- [R3] N. de Silva, **M. Zhong**, J. Greene. Simultaneous inference of environmental and interaction forces in collective dynamics, Aug. 2026, arXiv:2608.25181.
- [R4] B. Hao, C. Hu, **M. Zhong**, R. Wang. Event-Structured Physics-Informed Neural Networks for Differentiable Critical Clearing Boundaries, Jul. 2026, arXiv:2607.27681.
- [R5] B. Hao, K. Milly, A. Quaini, **M. Zhong**. Crime hotspot dynamics in residential burglary models with police response, May 2026, arXiv:2605.17709.
- [R6] Z. Guo, I. Cialenco, **M. Zhong**. Noise-Aware System Identification for High-Dimensional Stochastic Dynamics, Oct. 2024, arXiv:2411.00002.

Manuscripts in Preparation or Revision

- [P1] B. Hao, M. Maggioni, J. Miller, **M. Zhong**. Machine learning for discovering effective interaction kernels between celestial bodies from ephemerides. Under revision before resubmission; earlier version: arXiv:2108.11894.
- [P2] B. Hao, A. Quaini, **M. Zhong**. Discovery of hidden crime dynamics, Part I: Parametric Structures.
- [P3] Z. Guo, J. Greene, **M. Zhong**. Learning Stochastic Dynamical Systems with Structured Noise. Under revision before resubmission; earlier version: arXiv:2503.01077.
- [P4] Z. Guo, J. Greene, **M. Zhong**. An integrated framework for learning stochastic differential equations.
- [P5] Z. Guo, I. Cialenco, **M. Zhong**. Identification of Diffusion and Reaction Functions from Stochastic Diffusion-Reaction PDEs.
- [P6] **M. Zhong**, D. Liu, R. Arroyave, U. Braga-Neto. Label Propagation for Physics-Informed Neural Networks and Physics-Informed Gaussian Processes. Under revision before resubmission; earlier version: arXiv:2404.05817.

Other Preprints

- [A1] X. Chen, D. J. Jeffery, **M. Zhong**, L. McClenny, U. Braga-Neto, L. Wang. Using physics-informed neural networks for supernova radiative transfer simulation, Nov. 2022, arXiv:2211.05219.
- [A2] T. Gerew, **M. Zhong**. Concurrent Emergence of Clustering, Flocking and Synchronization in Systems of Interacting Agents, Feb. 2023, arXiv:2302.06732.
- [A3] **M. Zhong**. Time Relaxation with Iterative Modified Lavrentiev Regularization, Sep. 2018, arXiv:1809.09517.
- [A4] N. Mays, **M. Zhong**. Iterative Refinement of A Modified Lavrentiev Regularization Method for De-convolution of the Discrete Helmholtz Type Differential Filter, Jan. 2018, arXiv:1801.08913.

Doctoral Dissertation

- [T1] **M. Zhong**. Hierarchical Reconstruction Method for Solving Ill-posed Linear Inverse Problems. Ph.D. thesis, University of Maryland, College Park, MD, 2016.

Student Research Supervision

Completed Doctoral Research Supervision and Mentoring

- Aug. 2023–
Jul. 2026 Ziheng Guo (Ph.D., University of Houston, 2026)
 - Sole adviser; advising began at Illinois Institute of Technology.
 - Thesis: System Identification of Stochastic Dynamics; defended in May 2026.
 - Placement: Assistant Vice President at Wells Fargo (Quantitative Researcher).
 - Papers: C4, R6, P3, P4, P5.
- Jun. 2019–
Jun. 2021 Jason Miller (Ph.D., Johns Hopkins University, 2021)
 - Research co-mentor.
 - Thesis: Learning Interaction Kernels and Emergent Behaviors for Second Order Interacting Agent Systems.
 - Placement: Quantitative Researcher at Tower Research.
 - Papers: J9, J11, C8, P1.

Current Doctoral Research Supervision and Mentoring

- Aug. 2025–present Joseph Dingillo (UH Math)
 - Primary co-adviser.
 - Passed both qualifying examinations; first conference talk scheduled for the 2026 SIAM TX-LA Sectional Meeting.
- Feb. 2025–present Kamrun Milly (UH Math)
 - Co-adviser.
 - Expected completion by May 2027.
 - Thesis: Mathematical Modeling of Social Dynamics: Crowd Behavior and Urban Crime.
 - Papers: J5, R5.
- Aug. 2024–present Chi-An Chen (Illinois Tech Applied Math)
 - Research co-mentor.
 - Expected completion by May 2027.
 - Topic: Data-driven Modeling of Keller–Segel type PDEs and SPDEs.
 - Papers: J1, R1.

- Aug. 2022–present Baoli Hao (Illinois Tech Applied Math)
- Co-adviser.
 - Expected completion by May 2027.
 - Topic: Data-driven Modeling of Complex Systems and their Emergent Behavior.
 - Papers: J4, J5, J6, R2, R4, R5, P1, P2.

Undergraduate Research Mentoring

- 2025–2026 Egemen Senvardarli (UH CS)
- Honors Thesis committee member and research co-mentor.
- Summer 2023 Jean-Yves Thomason (Illinois Tech Applied Math), Cameron Hatler (Pomona College), Camryn Rhude (Winona State University)
- Sole adviser; REU Scholars at Illinois Tech.
- Jan. 2023–May 2024 Trenton Gerew (IIT Applied Math)
- Sole adviser; Paper: A2.
 - Placement: Ph.D. student at University of Kansas.

Teaching and Curriculum Development

- Aug. 2024–present **Instructor**, *University of Houston*
- Spring 2025, Math 3331 (Intermediate Differential Equations)
- Spring 2026
- Fall 2026 Math 3363 (Introduction to Partial Differential Equations).
- Fall 2024 Math 4364 (Introduction to Numerical Analysis in Scientific Computing)
- Spring 2027 Math 6397 (Selected Topics in Math: Learning Differential Equations from Data: Theory and (scheduled) Applications)
- Aug. 2022–Jul. 2024 **Instructor**, *Illinois Institute of Technology*
- Fall 2022, Fall 2023 DS 151 (Introduction to Data Science)
- Created this new course at Illinois Institute of Technology.
- Spring 2023 Math 332 (Elementary Linear Algebra)
- Spring 2024 Math 569 (Statistical Learning)
- Jul. 2021–Aug. 2022 **Co-Instructor**, *Texas A&M University*
- Spring 2022 ECEN 744 (Scientific Machine Learning)
- Co-created this new course in the Department of Electrical and Computer Engineering.
- 2016–2021 **Instructor**, *Johns Hopkins University*
- Applied Math for Engineering (graduate, 2017–2018); Scientific Computing: Linear Algebra (2017); Introduction to Mathematical Programming (2018); Calculus I and II for Biological, Social and Management Sciences (2019).
- ### Summer Schools and REU Instruction
- Summer 2025 Introduction to Scientific Machine Learning (3-day lectures out of a 5-day summer school), Texas A&M Institute of Data Science
- Summer 2025 Introduction to Data Science and Machine Learning, Lectures at UH REU.

Selected Presentations

Selected Invited Conference and Workshop Talks

- Jan. 2027 Recent Advances in Learning Collective Behavior, JMM 2027, Chicago, IL. (Scheduled)
- Nov. 2026 Understanding Collective Behaviors, SIAM MDS, Salt Lake City, UT. (Scheduled)
- Oct. 2026 Modeling, Simulation, and Data-driven Discovery of Crime Dynamics, SIAM NY-NJ-PA Sectional Meeting, Piscataway, NJ. (Scheduled)
- Oct. 2026 Enhanced Training Methods for PINN for Solving Stiff PDEs and Hyperbolic PDEs, SIAM Central States, Jackson, MS. (Scheduled)
- Jul. 2026 Discover Dynamics from Static Patterns, Equation Based Learning at SIAM Life Sciences, Cleveland, OH
- May 2026 Structure-Aware Physics-Informed Random Feature Networks, SIAM Conference on Waves and Coherence Structures, Concordia University, Montréal, Québec, Canada.
- May 2026 Discover Dynamics from Static Patterns, 9th International Conference on Computational Harmonic Analysis, Vanderbilt University, Nashville, TN.
- Sep. 2025 Discover Dynamics from Static Patterns, SIAM TX-LA Sectional Meeting, University of Texas - Austin, Austin, TX
- May 2025 Recent Advances in Efficient Learning from High-Dimensional Data, NSF CompMath Pls Meeting, University of Utah, Salt Lake City, UT.
- May 2025 Learning Stochastic Dynamics from Structured Noise, AMS Spring Southeastern Sectional Meeting, Clemson University, Clemson, SC.
- Apr. 2024 Learning Collective Variables and Kernels from Observations, Workshop: Learning Collective Variables and Coarse-Grained Models, IMSI at University of Chicago, Chicago, IL.
- Apr. 2024 Learning Collective Behaviors from Observation, Midwest Numerical Day, University of Iowa, Iowa City, IA.
- Aug. 2023 Machine Learning of Self-Organization from Observation, Recent Advances on Interfaces Dynamics Modeling and Simulation, ICIAM 2023, Tokyo, Japan.
- Jul. 2023 Physics Informed Machine Learning for Solving Stiff and Nonlinear PDEs, 17th U.S. National Congress on Computational Mechanics, Albuquerque, New Mexico.
- May 2023 Machine Learning of Self-Organization from Observation, BIRS Workshop: Emergent Collective Behaviors, Banff International Research Station, Banff, AB, Canada.
- May 2023 Machine Learning of Collective Behaviors from Observation, SIAM DS23, Portland, OR
- Apr. 2022 Machine Learning of Self-Organization from Observation, Workshop I for the Thematic Einstein Semester "Mathematics of Complex Social Systems: Past, Present, and Future", Berlin Mathematics Research Center, Berlin, Germany.

Selected Invited Seminars

- Mar. 2026 Discover Dynamics from Static Patterns, Applied Math Seminar, University of California, Riverside, Riverside, CA.
- Aug. 2024 Recent Advances in Structured Learning from High-Dimensional Data, Data Enabled Science Seminar, University of Houston, Houston, TX.
- Sep. 2023 Machine Learning of Collective Behaviors, Applied Math Seminar, University at Buffalo, Buffalo, NY
- Feb. 2023 Machine Learning of Self-Organization from Observation, Applied Math Seminar, University of Notre Dame, South Bend, IN.

- Feb. 2023 Machine Learning of Self-Organization from Observation, ACM Seminar, University of South Carolina, Columbia, SC.
- Mar. 2022 Machine Learning of Self-Organization from Observation, DDPS Webinar, Lawrence Livermore National Laboratory, Livermore, CA.

Professional Service

Conference and Summer School Organization

- May 12-16, 2025 Summer School on Scientific Machine Learning for differential equations, Texas A&M Institute of Data Science at Texas A&M University.
- Mar. 17-21, 2025 Emergent Behavior in Complex Systems of Interacting Agents, IMSI at University of Chicago.
- May 27-31, 2024 Nonlocal Models: Analysis and Applications, University of South Carolina.

Minisymposium and Special Session Organization

- Jan. 2027 AMS Special Session on Recent Advances in Scientific Machine Learning: Theory, Algorithms, and Applications, Joint Mathematical Meetings, 2027 (scheduled).
- Oct. 2026 Minisymposium (Learning-Based Methods for Differential Equations: Mathematical Foundations and Computational Algorithms), SIAM TX-LA Sectional Meeting, 2026 (scheduled).
- Sep. 2026 Minisymposium (Multiscale Dynamics in Nonlinear PDEs and Complex Systems), SIAM Great Lakes Sectional Meeting, 2026.
- Jul. 2026 Minisymposium (Modeling, learning, and control of collective biological systems), SIAM Conference on the Life Sciences, 2026.
- Sep. 2025 Minisymposium (Recent Advances in Data-Driven Methods for Time-Evolutionary Systems), SIAM TX-LA Sectional Meeting, 2025.
- Oct. 2024 Minisymposium (Recent Advances in Learning from High-Dimensional Data), SIAM Conference on Mathematics of Data Science, 2024.
- Oct. 2024 Minisymposium (Recent Advances in Physics Inspired Machine Learning), SIAM TX-LA Sectional Meeting, 2024.
- Jul. 2023 Minisymposium (Data Science for Dynamical Systems), SIAM Conference on Applications of Dynamical Systems, 2023.

Workshop and Seminar Organization

- Fall 2024–present Data-Enabled Science Seminar at University of Houston.
- Fall 2023 Data Science Seminar (jointly with CS and ECE departments) at Illinois Tech.
- Fall 2022–Spring 2024 Seminar Series for Multiscale Modeling and Computation group at Illinois Institute of Technology.
- Apr. 2023 IDEAL Workshop on Machine Learning, Interpretability, and Logic (at IIT).

Session Chair

- May 2025 Session chair, Data Science and Machine Learning, NSF CompMath PI Meeting, University of Utah.

Program Committees

- 2027 AAAI.
- 2026 Conference on Complex Systems.

Journal Refereeing

Applied and Computational Harmonic Analysis; Analysis and Applications; Sampling Theory, Signal Processing, and Data Analysis; Engineering with Computers; SIAM Journal on Numerical Analysis; Nonlinearity.

Professional Membership

Jul. 2016–present Society for Industrial and Applied Mathematics (SIAM).

Departmental and University Service

University of Houston

- Fall 2026 Undergraduate Studies Committee
- Jul. 2026 Master's Thesis Defense and Committee for Michael Holland (UH Math)
- Spring 2026 Founding member of the High-Dim Data Analysis Group.
- Spring 2026 Member, adjunct professor search committee (postdoctoral appointment with Kresimir Josic), Mathematics.
- 2024–2026 Member of individual graduate student Annual Performance Review (APR) committees, Mathematics and Physics (four students).

Illinois Institute of Technology

- 2023–2024 Steering committees, MAS and BS programs in Data Science; Computational Mathematics qualifying examination committee.
- 2023–2024 Faculty search committees (open-rank professor, 2024; open-rank teaching professor, 2023).
- 2023–2024 Doctoral thesis committees: Bin Duan and Ruo Yang (Computer Science); Huiyuan Yu (Applied Mathematics).
- 2023–2024 REU subprogram on learning and modeling collective dynamics (2023); committee member and host for George Karniadakis (Menger Day) and Lars Peter Hansen (colloquium), 2024.