Zhiyan Ding

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Appointments

University of Michigan 08/2025-Now
Assistant Professor, Department of Mathematics

University of California, Berkeley 07/2022-06/2025
Morrey Visiting Assistant Professor, Department of Mathematics
Host: Prof. Lin Lin

Education

University of Wisconsin-Madison 07/2018-05/2022
Ph.D. in Mathematics
Advisor: Prof. Qin Li

University of Wisconsin-Madison 09/2016-06/2018
First year: Exchange Student
Second year: M. A. in Mathematics

Shanghai Jiao Tong University 09/2013-06/2017
B. A. in Mathematics

Publications

Preprints:

[7] **Z Ding**, I Ekren, Y Han, A Zitridis, Quantitative homogenization of convex Hamilton-Jacobi equations in the Wasserstein space, arXiv/2606.22103, 2026.

[6] K. Wang, Z. Jia, S. Veerapaneni, **Z. Ding**, Quantum Algorithms for Nonlinear Differential Equations via Pivot-Shifted Carleman Linearization, arXiv/2605.20071, 2026.

[5] H. Chen, **Z. Ding**, R. Zhang, Overcoming the Lamb Shift in System-Bath Models via KMS Detailed Balance: High-Accuracy Thermalization with Time-Bounded Interaction, arXiv/2604.15615, 2026.

[4] Z. Huang, **Z. Ding**, K. Wang, J. Kaye, X. Li, L. Lin, Provably Efficient Long-time Exponentil Decompositions of Non-Markovnian Gaussian Baths, arXiv/2603.25708, 2026.

[3] E. Bayraktar, **Z. Ding**, I. Ekren, H. Zhou, Uniform-in-time propagation of chaos for consensus-based minimax algorithm , arXiv/2602.14403, 2026.

[2] K. Wang, **Z. Ding**, Beyond Lindblad Dynamics: Rigorous Guarantees for Thermal and Ground State Preservation under System Bath Interactions, arXiv/2512.03457, 2025.

[1] Z. Chen, J. Basso, **Z. Ding**, L. Lin, Quantum Replica Exchange, arXiv/2510/07291, 2025.

Peer reviewed papers:

[33] **Z. Ding***, Y. Zhan*, J. Preskill, L. Lin, End-to-end efficient quantum thermal and ground state preparation made simple, accepted by Nature Physics, 2026.

[32] **Z. Ding**, Y. Dong, Y. Tong, L. Lin, Robust ground-state energy estimation under depolarizing noise, accepted by APL Computational Physics (Featured article), 2026.

[31] **Z. Ding**, Z. Landau, B. Li, L. Lin, R. Zhang, Polynomial-Time Preparation of Low-Temperature Gibbs States for 2D Toric Code, Journal of Mathematical Physics, 67, 052201, 2026.

[30] **Z. Ding**, L. Lin, Y. Yang, R. Zhang, Quantum Filtering and Analysis of Multiplicities in Eigenvalue Spectra, PRX Quantum, 7, 020318, 2026.

[29] J. Leng, **Z. Ding**, Z. Chen, L. Lin, Operator-Level Quantum Acceleration of Non-Logconcave Sampling, PNAS, 123(e), 2026.

[28] Y. Zhan*, **Z. Ding***, J. Huhn, J. Gray, J. Preskill, G. Chan, L. Lin, Rapid quantum ground state preparation via dissipative dynamics, Physical Review X, 16, 011004, 2026.

[27] **Z. Ding**, M. Junge, P. Schleich, P. Wu, Lower bound for simulation cost of open quantum systems: Lipschitz continuity approach, , Communications in Mathematical Physics, 406(3), 60, 2025.

[26] **Z. Ding**, B. Li, L. Lin, Efficient quantum Gibbs samplers with Kubo-Martin-Schwinger detailed balance condition, Communications in Mathematical Physics, 406, 67, 2025.

[25] **Z. Ding**, H. Li, L. Lin, H. Ni, L. Ying, R. Zhang, Quantum Multiple Eigenvalue Gaussian filtered Search: an efficient and versatile quantum phase estimation method, Quantum, 8, 1487, 2024.

[24] **Z. Ding**, M. Guerra, Q. Li, E. Tadmor, Swarm-based gradient descent meets simulated annealing, SIAM Journal on Numerical Analysis, accepted, 2024.

[23] **Z. Ding**, Z. Ding, C. Chen, L. Lin, Single-ancilla ground state preparation via Lindbladians, Physical Review Research, 06, 033147, 2024.

[22] **Z. Ding**, E. N. Epperly, L. Lin, R. Zhang, The ESPRIT algorithm under high noise: Optimal error scaling and noisy super-resolution, FOCS 2024, accepted, 2024.

[21] S. Chen, **Z. Ding**, Q. Li, Bayesian sampling using interacting particles, Active Particles, Volume 4, Birkhäuser Cham, 2024.

[20] **Z. Ding**, T. Ko, J. Hao, L. Lin, X. Li, Random coordinate descent: a simple alternative for optimizing parameterized quantum circuits, Physical Review Research, 6, 033029, 2024.

[19] N. Abrahamsen, **Z. Ding**, G. Goldshlager, L. Lin, Convergence of variational Monte Carlo simulation and scale-invariant pre-training, Journal of Computational Physics, 513, 113-140, 2024.

[18] **Z. Ding**, X. Li, L. Lin, Simulating open quantum systems using hamiltonian simulations, Physical Review X Quantum, 5, 020332, 2024.

[17] **Z. Ding**, L. Lin, Simultaneous estimation of multiple eigenvalues with short-depth quantum circuit on early fault-tolerant quantum computers, Quantum 7, 1136, 2023.

[16] **Z. Ding**, L. Lin, Even shorter quantum circuit for phase estimation on early fault-tolerant quantum computers with applications to ground-state energy estimation, Physical Review X Quantum, 4(2), 2023.

[15] S. Chen, **Z. Ding**, Q. Li, L. Zepeda-Núñez, High-frequency limit of the inverse scattering problem: asymptotic convergence from inverse Helmholtz to inverse Liouville, SIAM Journal on Imaging Sciences, 16(1), 111-143, 2023.

[14] S. Chen, **Z. Ding**, Q. Li, S. Wright, A reduced order Schwarz method for nonlinear multiscale elliptic equations based on two-layer neural networks, Journal of Computational Mathematics, 2023.

[13] **Z. Ding**, S. Chen, Q. Li, S. Wright, Overparameterization of deep ResNet: zero loss and mean-field analysis, Journal of Machine Learning Research, 23(48): 1-65, 2022.

[12] **Z. Ding**, Q. Li, Constrained Ensemble Langevin Monte Carlo, Foundations of Data Science, 4(1): 37-70, 2022.

[11] **Z. Ding**, Q. Li, Langevin Monte Carlo: random coordinate descent and variance reduction, Journal of Machine Learning Research, 22(205): 1-51, 2021.

[10] **Z. Ding**, Q. Li, J. Lu, S. Wright, Random Coordinate Underdamped Langevin Monte Carlo, 24th International

Conference on Artificial Intelligence and Statistics (AISTATS 2021), 2021.

[9] **Z. Ding**, Q. Li, J. Lu, S. Wright, Random Coordinate Langevin Monte Carlo, 34th Annual Conference on Learning Theory (COLT 2021), 2021.

[8] **Z. Ding**, Q. Li, J. Lu, Ensemble Kalman Inversion for nonlinear problems: weights, consistency, and variance bounds, Foundations of Data Science, 3(3): 371-411, 2021.

[7] **Z. Ding**, Q. Li, Ensemble Kalman Sampler: mean-field limit and convergence analysis, SIAM Journal on Mathematical Analysis, 53(2): 1546–1578, 2021.

[6] **Z. Ding**, Q. Li, Ensemble Kalman Inversion: mean-field limit and convergence analysis, Statistics and Computing, 31, 9, 2021.

[5] **Z. Ding**, L. Einkemmer, Q. Li, Dynamical low-rank integrator for the linear Boltzmann equation: Error analysis in the diffusion limit, SIAM Journal on Numerical Analysis, 59, 4, 2021.

[4] **Z. Ding**, H. Hajaiej, On a Fractional Schrödinger equation in the presence of Harmonic potential, Electronic Research Archive, 29(5): 3449-3469, 2021.

[3] **Z. Ding**, S. Ha, S. Jin, A local sensitivity analysis in Landau Damping for the kinetic Kuramoto equation with random inputs, Quarterly of Applied Mathematics, 79, 229-264, 2021.

[2] **Z. Ding**, Q. Li, Variance reduction for Random Coordinate Descent-Langevin Monte Carlo, 34th Conference on Neural Information Processing Systems (NeurIPS 2020), 2020.

[1] **Z. Ding**, S. Jin, Random regularity of a nonlinear Landau Damping solution for the Vlasov-Poisson equations with random inputs, International Journal for Uncertainty Quantification, 9, 123-142, 2019.

Invited talks and posters

2026 July The Third Symposium on Quantum Scientific Computing, WCCM, Munich, Germany

2026 July Quantum information and quantum algorithms workshop, FoCM 2026, Austria

2026 June 2026 SciCADE Minisymposium on Quantum Computing: Theory, Methods and Applications, Edinburgh, United Kingdom

2026 May Quantum Algorithm Research Seminar (QARS), Institut quantique, Université de Sherbrooke, Canada

2026 April Quantum research seminar, Phasecraft, Washington DC

2026 March Quantum Computing for Quantum Chemistry, Molecular Dynamics, and Beyond, Telluride

2026 Feb Bridging the Gap Between NISQ and FTQC, IPAM, UCLA

2026 Feb Financial Mathematics Seminar, University of Michigan

2026 Jan New Frontiers in Quantum Algorithms for Open Quantum Systems, IPAM, UCLA

2025 Dec AI Quantum Learning session, University of Michigan

2025 Dec Quantum Research Institute Seminar, University of Michigan

2025 Oct Quantum Seminar, IIIT Hyderabad, India

2025 Aug QSim 2025, New York

2025 July USNCCM18 Minisymposium on Quantum Scientific Computing, Chicago

2025 Mar Quantum SC and AI Seminar, Tsinghua University, online

2025 Mar Special seminar (job talk), NYU Courant

2025 Feb Special Colloquium (job talk), University of Minnesota

2025 Jan Colloquium Seminar (job talk), University of Michigan

2025 Jan Special Colloquium (job talk), Purdue University

2025 Jan AMS Special Session on Variational Methods in Quantum Computing, II, Joint Mathematics Meetings, Seattle

2024 Dec Numerical Analysis Seminar (job talk), University of Maryland

2024 Dec Math Colloquium (job talk), Carnegie Mellon University

2024 Dec Recruitment Seminar (job talk), Ohio State University

2024 Dec CAM Colloquium talk (job talk), Penn State University

2024 Nov Colloquium talk (job talk), Texas A&M University

2024 Nov NA&PDE and QIC joint seminar, University of Delaware

2024 Oct Mathematical Challenges of Quantum Algorithms for Open Quantum Systems workshop, UC Berkeley

2024 Oct Applied Math seminar, University of Toronto

2024 Aug Worshop: Data-driven PDE-based inverse problem, in theory and practice, UW MADISON

2024 June Geometric Analysis seminar, Peking University

2024 May AMS Sectional Meeting, SFSU

2024 Feb CIQC Quantum Gathering Talk, UC Berkeley

2024 Jan Applied Math seminar, Standford

2024 Jan IMS Young Mathematical Scientist Forum—Applied Mathematics, NUS

2023 Dec Online seminar talk, Hon-Hai Research Institute

2023 Oct IPAM CQC2023 Workshop I: Quantum Algorithms for Scientific Computation, UCLA

2023 Sept IPAM CQC2023 Young Researcher Seminar, UCLA

2023 August ICIAM 2023-Particle Methods for Bayesian Inference, Tokyo, Japan

2023 April CIQC Quantum Gathering Talk, UC Berkeley

2023 March Applied Math seminar, UC Berkeley

2022 Dec The International Conference on New Trends in Computational and Data Sciences, Caltech: poster

2021 Oct IFDS Ideas Forum, UW-Madison: 1-hour talk

2021 Aug The 34th Annual Conference on Learning Theory (COLT 2021) : poster

2021 Aug Workshop: Mathematical fundation and Mathematical foundation and applications of deep learning, Purdue University: 20-min contributed talk

2021 July IFDS summer school, UW-Madison: poster

2021 April IFDS Ideas Forum, UW-Madison: 1-hour talk

2021 April The 24th International Conference on Artificial Intelligence and Statistics (AISTATS 2021): poster

2020 Dec The 34th Conference on Neural Information Processing Systems (NeurIPS 2020) : poster

2020 April AMS sectional meeting, Spring Central Sectional Meeting, Purdue University: 30-min talk (cancelled for COVID-19)

2019 Dec Statistical Mechanics Conference, the 122nd, Rutgers University: short talk

2019 Sept AMS sectional meeting, Fall Central Sectional Meeting, UW-Madison: 30-min talk

Honors and Awards

Excellence in Graduate Research, UW Madison	11/2021
John Nohel Prize in Applied Mathematics, UW Madison	10/2019
Excellent Graduate for College students, SJTU	04/2017
The Exchange and Visiting International Student Academic Excellence award, UW Madison	02/2017
Third Scholarship for Shanghai College students	09/2016
Excellent Student in Shanghai Jiao Tong University	09/2016
Third Prize in National Mathematical Modeling for College Students, Shanghai	10/2015
Third Scholarship for Shanghai College students	09/2015
First Prize in Department of Mathematics Mathematical Competition for College Students	10/2014
Second Prize in National Mathematical Competition for College Students	10/2014