

School of Statistics
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Academic Appointments

IRSA Faragher Distinguished Postdoctoral Fellow, School of Statistics, University of Minnesota
2025–2027

Education

Ph.D. in Statistics (2025), University of Minnesota,
Adviser: Adam J. Rothman
M.S. in Mathematical Sciences (2020), University of Minnesota,
B.S. in Statistics (2018), Jilin University, China

Research interests

High-Dimensional Statistics; Observational Astrophysics and Cosmology; Quantum Tomography; Generative AI and Diffusion Models; Reinforcement Learning from Human Feedback; Deep Learning Theory; Machine Learning; Sequential Analysis; Random Matrix Theory; Non-Convex Optimization.

Research

— Manuscripts submitted for publication

Hongru Zhao and R. Oliver VandenBerg. (2026) Adaptive Optimal Design for Quantum State Tomography under Intrinsic State-Space Losses. *Preprint*.

Hongru Zhao and Huiqian Feng. (2026) Convex Reparameterization and Self-Concordant Algorithms for Multivariate Regression with Covariance Estimation. *Preprint*.

Hongru Zhao, Jinwen Fu, Tuan Pham. (2025) [Convergence and Stability Analysis of Self-Consuming Generative Models with Heterogeneous Human Curation](#). *Preprint*.

Hongru Zhao. (2025) Allocation-Constrained Adaptive Design and Sequential Estimation: Theory and Application to Bradley–Terry–Davidson Models. *Preprint*.

Hongru Zhao, Aaron J. Molstad, and Adam J. Rothman. (2025) [Subspace Decompositions for Association Structure Learning in Multivariate Categorical Response Regression](#). *Preprint*.

— Peer reviewed articles

Xiangyu Zhang, Erik Floden, Hongru Zhao, Sara Algeri, Galin Jones, Vuk Mandic, and Jesse Miller. (2026) [Validating Angular Power Spectral Models for the Stochastic Gravitational-Wave Background Without Distributional Assumptions](#). *Physical Review D*, 113(2), 023051.

Sara Algeri, Xiangyu Zhang, Erik Floden, Hongru Zhao, Galin L. Jones, Vuk Mandic, and Jesse Miller. (2026) [Testing models for angular power spectra: A distribution-free approach](#). *Physical Review D*, 113(2), L021306.

Zhibo Zhang, Bixiong Li, Zhiwen Wang, Lianghai Li, Qingshun Nong, and Hongru Zhao. (2026) [Microstructure-sensitive modeling of foam concrete based on pore-scale effect quantification and nonlinear assessment of its multifunctional performance](#). *Construction and Building Materials*, 537, 147017.

Hongru Zhao and Xiaotong Shen. (2025) [Distributed Algorithms for High-Dimensional Statistical Inference and Structure Learning with Heterogeneous Data](#). *Statistica Sinica*, 38(1).

Xiaou Li and Hongru Zhao. (2025) [Globally-Optimal Greedy Active Sequential Estimation](#). *IEEE Transactions on Information Theory*, 71(5), 3871–3924.

Hongru Zhao, and Jinchao Xu. (2024) [Convergence Analysis and Trajectory Comparison of Gradient Descent for Overparameterized Deep Linear Networks](#). *Transactions on Machine Learning Research*, ISSN: 2835-8856.

Kangsheng Liu, Zhuangyi Liu, and Hongru Zhao. (2024) [Exponential stability of the linear KdV-BBM equation](#). *Discrete and Continuous Dynamical Systems-B*, 29(3), 1206-1216.

Yongcheng Qi, and Hongru Zhao. (2021) [Limiting empirical spectral distribution for products of rectangular matrices](#). *Journal of Mathematical Analysis and Applications*, 502(2),125237.

Grants & Proposals

NSF DMS—CDS&E: On the detection of new astrophysical signals in spectral data:a new suite of highly scalable data-driven solutions.

Co-Principal Investigator *proposal number*: 2603537

2025

Mentoring & Supervision

— Undergraduate Research

Huiqian Feng — Undergraduate Research Mentee (high-dimensional statistics), School of Statistics, UMN

Fall 2025 – Spring 2026

Invited presentations

Invited Talk and Scholarly Exchange, School of Physics and Astronomy, Sun Yat-sen University, China: *Statistical Analysis of the Angular Power Spectrum of the Stochastic Gravitational-Wave Background* (2026).

Contributed Paper Presentation, Joint Statistical Meetings (JSM), Nashville, TN: *Subspace Decompositions for Association Structure Learning in Multivariate Categorical Response Regression* (2025).

Poster Presentation, IRSA Conference, School of Statistics, University of Minnesota: *Structure Learning in Multivariate Categorical Response Regression* (2024).

Colloquium Seminar, Computer, Electrical, and Mathematical Science and Engineering Division, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia: *Exploring the Optimization Landscape and Training Dynamics of Deep Linear Networks* (2023).

Professional service

— Departmental Service

Seminar Coordinator, UMN School of Statistics Seminar Series, Fall 2025

— External Outreach and Sponsorship

Sponsor representative, WiADS Conference — Represented the IRSA; staffed the sponsor desk, and promoted IRSA consulting and statistical workshops.

— Reviewer Service

Journal of Machine Learning Research (2026); IEEE Transactions on Information Theory (2025); Electronic Journal of Statistics (2025); Annals of Applied Probability (2022); Transactions on Machine Learning Research (2024–2025).

Courses taught

— UMN-TC: Graduate Instructor

Spring 2026: STAT 4052 Statistical Machine Learning II

Fall 2025: STAT 4102 Theory of Statistics II

Spring 2025: STAT 3301 Regression and Statistical Computing

Fall 2024: STAT 4101 Theory of Statistics I

Spring 2024: STAT 3301 Regression and Statistical Computing

Fall 2023: STAT 3011 Introduction to Statistical Analysis

— UMN-TC: Graduate Teaching Assistant

Fall 2022: STAT 5101 Theory of Statistics I

Spring 2022: STAT 5102 Theory of Statistics II

Fall 2021: STAT 3021 Introduction to Probability and Statistics

Programming Skills

R, MATLAB, Mathematica, Python.