Ruqi Zhang

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Education

Cornell University Ithaca, NY
Ph.D. in Statistics, 2016–2021
Committee: Christopher De Sa, Thorsten Joachims, Giles Hooker

Cornell University Ithaca, NY
M.S. in Computer Science, 2019–2020

Renmin University of China Beijing, China
B.S. in Mathematics, 2012–2016

Professional Experience

Purdue University West Lafayette, IN
Assistant Professor, Computer Science, 2022–Present

University of Texas at Austin Austin, TX
Postdoctoral Fellow, Institute for Foundations of Machine Learning, 2021–2022

Microsoft Research New England
Research Intern, 2020

Microsoft Research Cambridge, UK
Research Intern, 2019

Publications

G: Graduate student (primary advisor); U: Undergraduate student (primary advisor).

Conference Publications

[C1] Y. Ding[G], B. Li[G], and **R. Zhang**. "ETA: Evaluating Then Aligning Safety of Vision Language Models at Inference Time". In: *International Conference on Learning Representations* (2025).

[C2] Y. Ding[G] and **R. Zhang**. "Sherlock: Self-Correcting Reasoning in Vision-Language Models". In: *Neural Information Processing Systems* (2025).

[C3] B. Li[G], Y. Wang, A. Lochab[G], A. Grama, and **R. Zhang**. "Cascade reward sampling for efficient decoding-time alignment". In: *Conference on Language Modeling* (2025).

[C4] B. Li[G], Y. Wu, X. Luo, and **R. Zhang**. "Reward-Shifted Speculative Sampling Is An Efficient Test-Time Weak-to-Strong Aligner". In: *The Conference on Empirical Methods in Natural Language Processing* (2025).

[C5] X. Liu[G], H. Du, W. Deng, and **R. Zhang**. "Optimal Stochastic Trace Estimation in Generative Modeling". In: *International Conference on Artificial Intelligence and Statistics* (2025).

[C6] A. Lochab[G], L. Yan, P. Pynadath[G], X. Zhang, and **R. Zhang**. "VERA: Variational Inference Framework for Jailbreaking Large Language Models". In: *Neural Information Processing Systems* (2025).

[C7] A. Lochab[G] and **R. Zhang**. "Energy-Based Reward Models for Robust Language Model Alignment". In: *Conference on Language Modeling* (2025).

[C8] J. Lu, G. Rohit, A. Moradipari, K. Han, **R. Zhang**, and W. Ziran. "On Learning Closed-Loop Probabilistic Multi-Agent Simulator". In: *International Conference on Intelligent Robots and Systems* (2025).

[C9] X. Luo, C. S. Bai, B. Li[G], P. Drineas, **R. Zhang**, and B. Bullins. "Stacey: Promoting Stochastic Steepest Descent via Accelerated p-Smooth Nonconvex Optimization". In: *International Conference on Machine Learning* (2025).

[C10] V. Punyamoorty, P. Jutras-Dube[G], **R. Zhang**, V. Aggarwal, D. Conover, and A. Bera. "Dynamic Obstacle Avoidance through Uncertainty-Based Adaptive Planning with Diffusion". In: *International Conference on Intelligent Robots and Systems* (2025).

[C11] P. Pynadath[G] and **R. Zhang**. "Controlled LLM Decoding via Discrete Auto-regressive Biasing". In: *International Conference on Learning Representations* (2025).

[C12] Y. Wang, R. Chen, B. Li[G], D. Cho, Y. Deng, **R. Zhang**, T. Chen, Z. Wang, A. Grama, and J. Hong. "More is Less: The Pitfalls of Multi-Model Synthetic Preference Data in DPO Safety Alignment". In: *Conference on Language Modeling* (2025).

[C13] B. Zhang[G] and **R. Zhang**. "CoT-UQ: Improving Response-wise Uncertainty Quantification in LLMs with Chain-of-Thought". In: *Findings of The Annual Meeting of the Association for Computational Linguistics* (2025).

[C14] H. Zheng, **R. Zhang**, and G. Lin. "Exploring Non-Convex Discrete Energy Landscapes: A Langevin-Like Sampler with Replica Exchange". In: *The AAAI Conference on Artificial Intelligence* (2025).

[C15] P. Jutras-Dube[G], **R. Zhang**, and A. Bera. "Adaptive Planning with Generative Models under Uncertainty". In: *International Conference on Intelligent Robots and Systems* (2024).

[C16] B. Lei, D. Xu, **R. Zhang**, S. He, and B. K. Mallick. "Balance is Essence: Accelerating Sparse Training via Adaptive Gradient Correction". In: *Conference on Parsimony and Learning* (2024).

[C17] B. Lei, D. Xu, **R. Zhang**, and B. Mallick. "Embracing Unknown Step by Step: Towards Reliable Sparse Training in Real World". In: *Transactions on Machine Learning Research* (2024).

[C18] B. Li[G] and **R. Zhang**. "Entropy-MCMC: Sampling from Flat Basins with Ease". In: *International Conference on Learning Representations* (2024).

[C19] J. Li[G], Z. Miao, Q. Qiu, and **R. Zhang**. "Training Bayesian Neural Networks with Sparse Subspace Variational Inference". In: *International Conference on Learning Representations* (2024).

[C20] X. Liu, B. Lei, **R. Zhang**, and D. Xu. "Adaptive Draft-Verification for Efficient Large Language Model Decoding". In: *The AAAI Conference on Artificial Intelligence* (2024).

[C21] T. Papamarkou, M. Skoularidou, **R. Zhang**, et al. "Position paper: Bayesian deep learning in the age of large-scale ai". In: *International Conference on Machine Learning* (2024).

[C22] P. Pynadath[G], R. Bhattacharya, A. Hariharan[G], and **R. Zhang**. "Gradient-based Discrete Sampling with Automatic Cyclical Scheduling". In: *Neural Information Processing Systems* (2024).

[C23] Z. Wang, Y. Chen, Q. Song, and **R. Zhang**. "Enhancing Low-Precision Sampling via Stochastic Gradient Hamiltonian Monte Carlo". In: *Transactions on Machine Learning Research* (2024).

[C24] K. Goshvadi, H. Sun, X. Liu, A. Nova, **R. Zhang**, W. S. Grathwohl, D. Schuurmans, and H. Dai. "DISCS: A Benchmark for Discrete Sampling". In: *Thirty-seventh Conference on Neural Information Processing Systems Datasets and Benchmarks Track*. 2023.

[C25] T. Islam, **R. Zhang**, and D. Goldwasser. "Analysis of Climate Campaigns on Social Media using Bayesian Model Averaging". In: *AAAI/ACM Conference on AI, Ethics, and Society* (2023). Oral Presentation, top 11%.

[C26] B. Lei, **R. Zhang**, D. Xu, and B. Mallick. "Calibrating the Rigged Lottery: Making All Tickets Reliable". In: *International Conference on Learning Representations* (2023).

[C27] Y. Xiang[G], D. Zhu, B. Lei, D. Xu, and **R. Zhang**. "Efficient Informed Proposals for Discrete Distributions via Newton's Series Approximation". In: *International Conference on Artificial Intelligence and Statistics*. PMLR. 2023, pp. 7288–7310.

[C28] W. Zhang and **R. Zhang**. "DP-Fast MH: Private, Fast, and Accurate Metropolis-Hastings for Large-Scale Bayesian Inference". In: *International Conference on Machine Learning* (2023).

[C29] D. Zhu, B. Lei, J. Zhang, Y. Fang, Y. Xie, **R. Zhang**, and D. Xu. "Rethinking data distillation: Do not overlook calibration". In: *Proceedings of the IEEE/CVF International Conference on Computer Vision*. 2023, pp. 4935–4945.

[C30] **R. Zhang**, Q. Liu, and X. Tong. "Sampling in Constrained Domains with Orthogonal-Space Variational Gradient Descent". In: *Advances in Neural Information Processing Systems* 35 (2022), pp. 37108–37120.

[C31] **R. Zhang**, X. Liu, and Q. Liu. "A Langevin-like Sampler for Discrete Distributions". In: *International Conference on Machine Learning*. 2022, pp. 26375–26396.

[C32] **R. Zhang**, A. G. Wilson, and C. De Sa. "Low-Precision Stochastic Gradient Langevin Dynamics". In: *International Conference on Machine Learning*. PMLR. 2022, pp. 26624–26644.

[C33] **R. Zhang**, Y. Li, C. De Sa, S. Devlin, and C. Zhang. "Meta-Learning Divergences for Variational Inference". In: *International Conference on Artificial Intelligence and Statistics*. PMLR. 2021, pp. 4024–4032.

[C34] **R. Zhang**, A. F. Cooper, and C. De Sa. "AMAGOLD: Amortized Metropolis adjustment for efficient stochastic gradient MCMC". In: *International Conference on Artificial Intelligence and Statistics*. PMLR. 2020, pp. 2142–2152.

[C35] **R. Zhang**, A. F. Cooper, and C. M. De Sa. "Asymptotically optimal exact minibatch metropolis-hastings". In: *Advances in Neural Information Processing Systems* 33 (2020). Spotlight Presentation, top 3%, pp. 19500–19510.

[C36] **R. Zhang**, C. Li, J. Zhang, C. Chen, and A. G. Wilson. "Cyclical stochastic gradient MCMC for Bayesian deep learning". In: *International Conference on Learning Representations*. Oral Presentation, top 2%. 2020.

[C37] **R. Zhang** and C. M. De Sa. "Poisson-Minibatching for Gibbs Sampling with Convergence Rate Guarantees". In: *Advances in Neural Information Processing Systems*. Spotlight Presentation, top 2.5%. 2019, pp. 4922–4931.

[C38] **R. Zhang** and Z. Lu. "Large Scale Sparse Clustering." In: *International Joint Conference on Artificial Intelligence*. 2016, pp. 2336–2342.

Journal Publications

[J1] B. Li[G] and **R. Zhang**. "Making Reliable and Flexible Decisions in Long-tailed Classification". In: *Transactions on Machine Learning Research* (2025).

[J2] M. Li[U] and **R. Zhang**. "Reheated Gradient-based Discrete Sampling for Combinatorial Optimization". In: *Transactions on Machine Learning Research* (2025).

[J3] C. Zhuang[G], D. Mukherjee[G], Y. Lu, T. Fu, and **R. Zhang**. "Gradient GA: Gradient Genetic Algorithm for Drug Molecular Design". In: *Transactions on Machine Learning Research* (2025).

Book Chapters

[B1] W. Chen, B. Li[G], **R. Zhang**, and Y. Li. "Bayesian Computation in Deep Learning". In: *In the Handbook of Markov Chain Monte Carlo* (2025).

Preprints

[P1] P. Jutras-Dube[G], P. Pynadath[G], and **R. Zhang**. "Single-Step Consistent Diffusion Samplers". In: *arXiv preprint arXiv:2502.07579* (2025).

[P2] Q. Liao[U], A. Lochab[G], and **R. Zhang**. "VERA-V: Variational Inference Framework for Jailbreaking Vision-Language Models". In: *arXiv preprint arXiv:2510.17759* (2025).

[P3] P. Mohanty[G], R. Bhattacharya, and **R. Zhang**. "Entropy-Guided Sampling of Flat Modes in Discrete Spaces". In: *arXiv preprint arXiv:2505.02296* (2025).

[P4] P. Pynadath[G], J. Shi, and **R. Zhang**. "CANDI: Hybrid Discrete-Continuous Diffusion Models". In: *arXiv preprint arXiv:2510.17759* (2025).

Awards and Honors

- Amazon Research Award (2025)
- AAAI New Faculty Highlights (2025)
- Seed for Success Acorn Award (2024)
- Ross–Lynn Research Scholar (2023)
- UAI Top Reviewer (2023)
- ICML Best Reviewer (Top 10%) (2021)
- Spotlight Rising Star in Data Science, University of Chicago (one of 10, 2020)
- NeurIPS Top 10% Reviewer Award (2020)
- NeurIPS Travel Grant (2019)
- Academic Outstanding Scholarship, Renmin University (2013–2015)
- Exchange Students Scholarship, University of Helsinki (2015)

Talks

- The Future of Probabilistic Modeling in Data Mining and AI, IEEE International Conference on Data Mining Panel, November 2025
- Gradient-Based Discrete Sampling: Algorithms and Applications, Monte Carlo Seminar, October 2025
- Aligned and Safe LLMs via Probabilistic Modeling, IJCAI Workshop on User-Aligned Assessment of Adaptive AI Systems, August 2025
- Toward Capable and Reliable LLMs via Probabilistic Modeling, Midwest Machine Learning Symposium, June 2025
- Aligned and Reliable LLMs via Probabilistic Modeling, Morgan Stanley Machine Learning External Speaker Series, April 2025
- Transformative AI: LLMs, Robotics, and Scientific Innovation, Purdue CS Graduate Symposium Panel, March 2025
- Scalable and Efficient Probabilistic Inference for Bayesian Deep Learning and Generative Modeling, AAAI-25 New Faculty Highlights, March 2025
- New Advances in Discrete Sampling and Applications in LLMs, Purdue Statistics Faculty Retreat, August 2024
- Low-precision Sampling for Probabilistic Deep Learning, Invited talk at NeurIPS Workshop on Machine Learning with New Compute Paradigms, NeurIPS, December 2023
- Sampling in Discrete and Constrained Domains, Invited talk at ICML Workshop on Structured Probabilistic Inference & Generative Modeling, ICML, July 2023
- Scalable and Reliable Inference for Probabilistic Modeling, Invited talk at Center for Data Science and Machine Learning, National University of Singapore, October 2022
- A Langevin-like Sampler for Discrete Distributions, Spotlight presentation at ICML, July 2022
- Low-Precision Stochastic Gradient Langevin Dynamics, Spotlight presentation at ICML, July 2022
- Scalable and Reliable Inference for Probabilistic Modeling, Invited talk at Simons Institute, UC Berkeley, November 2021
- Asymptotically Optimal Exact Minibatch Metropolis-Hastings, Spotlight talk in Rising Stars in Data Science Workshop at University of Chicago, January 2021
- Asymptotically Optimal Exact Minibatch Metropolis-Hastings, Spotlight presentation at NeurIPS, December 2020

- Cyclical Stochastic Gradient MCMC for Bayesian Deep Learning, Oral presentation at ICLR, April 2020
- Poisson-Minibatching for Gibbs Sampling with Convergence Rate Guarantees, Spotlight presentation at NeurIPS, December 2019

Teaching

- **CS 37300** — Data Mining and Machine Learning, Purdue (Spring 2024, Spring 2026)
- **CS 57800** — Statistical Machine Learning, Purdue (Spring 2023, Fall 2023, Fall 2024, Fall 2025)
- **CS 59200** — Probabilistic Machine Learning, Purdue (Fall 2022)
- **CS 57100** — Artificial Intelligence, Purdue (Guest Lecturer)
- Head TA, **CS 4820** — Algorithms, Cornell (Spring 2021)
- TA, **ILRST 5050** — Statistics at Work, Cornell (Fall 2018)
- TA, **STSCI 2100** — Introductory Statistics, Cornell (Spring 2018)
- TA, **MATH 3110** — Introduction to Analysis, Cornell (Spring 2017)
- TA, **STSCI 3110** — Probability Models and Inference for the Social Sciences, Cornell (Fall 2016, 2017, 2020)

Service

Chair
- Midwest Machine Learning Symposium (2025)

Organizer
- Symposium on Advances in Approximate Bayesian Inference (2022–2026)
- NeurIPS Workshop on ML with New Compute Paradigms (2024)
- ICML Workshop on Sampling and Optimization in Discrete Space (2023)
- ICML Women in Machine Learning (WiML) Un-Workshop on Safely Navigating Scalability-reliability Trade-offs in ML Methods (2021)

Area Chair
- ICML 2025
- NeurIPS 2024–2025
- ICLR 2026
- AISTATS 2024–2025
- UAI 2024–2025

Editor
- Transactions on Machine Learning Research (2024-present)

Reviewer
- Journal of the American Statistical Association
- Statistics and Computing
- Entropy
- NeurIPS 2018–2023
- NeurIPS Workshop Proposal 2024–2025
- ICML 2019–2023 (expert reviewer in 2021)
- ICLR 2019–2025
- AISTATS 2020–2023
- AAAI 2020
- UAI 2019
- MLSys 2024

Panelist
- NSF Panels (2022–2024)
- DOE Panel (2024)

Mentor
- Women in Machine Learning (WiML), COLM 2025

- AISTATS Submission Mentoring Program 2022

Department

- Purdue CS PhD Admission Committee (2023–2026)

Sponsored Research

- **Uncertainty-Aware Decision-Making for Optimal Control Transitions in Shared Autonomy**, Toyota Research Institute, Co-PI (50%), $783K (2026–2028)
- **AI-guided design of compact CRISPR-associated transposons for programmable gene insertion**, Purdue Biomolecular Design Seed Grant, Co-PI (25%), $50K (2026–2027)
- **Multi-Modal Imaging and AI Framework for Advanced Visual Inspection of Pharmaceutical Vials**, Young Institute Pharmaceutical Manufacturing Consortium, Co-PI (14%), $400K (2025)
- **NSF IIS RI Small**, PI (100%), $600K (2025–2028)
- **Amazon Research Award**, PI (100%), $69,967 Cash + $50,000 AWS (2025–2026)
- **Researcher Access Program**, OpenAI, PI (100%), $10K (2025–2026)
- **Postdoctoral Research Program Fund**, Purdue Institute for Physical Artificial Intelligence (IPAI), Co-PI (50%), Postdoc salary + $50K (2024–2026)
- **Machine Learning for Predictive Breeding Technology**, Beck's Superior Hybrids, Co-PI (1%), $1.9M (2023–2026)
- **Ross-Lynn Research Scholar Fund**, Purdue, PI (100%), 1 year GRA (2023–2024)

Student Advising

Postdoctoral Scholar

- Jiaru Zhang (co-advised with Ziran Wang), 2025–Present

Ph.D. Students (Primary Advisor)

- Bolian Li (CS), 2022–Present
- Pascal Jutras-Dube (CS), 2023–Present
- Patrick Pynadath (CS), 2023–Present
- Chris Zhuang (CS), 2024–Present
- Anamika Lochab (CS), 2024–Present
- Mohammad Areeb (CS), 2024–Present
- Yi Ding (CS), 2025–Present
- Anant Shyam (CS), 2025–Present

M.S. Students

- Debadyuti Mukherjee (CS), 2024–Present
- Kunal Kapur (CS), 2025–Present

Undergraduate Students

- Ivan Philip (CS), 2024–Present
- Disha Sanjay Maheshwari (ECE), 2024–2025; now CS Ph.D. at Georgia Tech

Ph.D. Committee Member

- Yanran Wu (CS), 2023–Present
- Yifan Wang (CS), 2022–Present
- Yunxin Sun (CS), 2022–Present
- Shahab Rahimirad (CS), 2022–Present
- Chen Peng (CS), 2022–Present
- Xinyu Luo (CS), 2022–Present
- Shilong Lei (CS), 2022–Present
- Chenzhe Jin (CS), 2022–Present
- Ziyi Wang (Statistics), 2022–Present
- Zhaoqing Wu (CS), 2022–Present

- Han Zhu (CS), 2021–Present
- Yucheng Zhang (CS), 2021–Present
- Jinzhao Li (CS), 2021–Present
- Jonathan D. Rosenthal (CS), 2019–Present
- Tunazzina Islam (CS), 2019–2025
- Tinghan Yang (CS), 2018–Present

Interns

- Yi Ding, Intern at Purdue (2024–2025); now CS Ph.D. student at Purdue
- Xinyang Liu, Intern at Purdue (2024–2025); now Statistics Ph.D. student at UT Austin
- Boxuan Zhang, Intern at Purdue (2024–2025); now CS Ph.D. student at Rutgers University
- Junbo Li, Intern at Purdue (2023–2024); now CS Ph.D. student at UT Austin
- Muheng Li, Intern at Purdue (2023–2024); now Statistics Ph.D. student at University of Toronto