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: Gradient-Based Discrete Markov Chain Monte Carlo: Algorithms, Theoretical Foundations, and Applications**, 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