Avi Bagchi

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Education

The University of Texas at Austin — Austin, TX
PhD in Computer Science — *Aug. 2026 –*

University of Pennsylvania — Philadelphia, PA
BSE in Computer Science, graduated summa cum laude — *Aug. 2022 – May 2026*

- Senior Thesis: "Toward Trustworthy AI: Robustness, Generalization, and Provenance"

Papers

"Watermarking Discrete Diffusion Language Models" | *ICLR 2026 Trustworthy AI Workshop (Poster)*
Avi Bagchi, Akhil Bhimaraju, Moulik Choraria, Daniel Alabi, Lav R. Varshney

"Bias–Variance Tradeoff in Diffusion Portfolio Models" | *ICLR 2026 TSALM Workshop (Poster)*
Avi Bagchi, Michael Tesfaye, Om Shastri

"Doppler Invariant CNN for Signal Classification" | *arXiv:2511.14640 (2025)*
Avi Bagchi, Dwight Hutchenson

"Edge-Intelligent Mosquito Threat Prediction using IoT-Enabled Hardware System" | *Sensors (2022)* (cited 14)
S. Polineni†, O. Shastri†, **A. Bagchi**†, G. Gnanakumar†, S. Rasamsetti†, P. Sundaravadivel (†=equal contribution)

"The South Sea Bubble" | The Concord Review (2021)
Avi Bagchi

Experience

Research Intern — May 2025 – Aug. 2025
MIT Lincoln Laboratory: Group 64 (Tactical Satellite Communications) — *Lexington, MA*

- Built complex-valued convolutional neural net invariant to Doppler shifts for interference signal classification.

Undergraduate Researcher — June 2024 – Present
University of Illinois Urbana-Champaign (advised by Professors Lav Varshney & Daniel Alabi) — *Remote*

- Created first watermark for discrete diffusion. Used distribution-preserving gumbel-max trick for diffusion sampling. Theoretical proofs of distortion-freeness and soundness. Benchmark analysis with SEDD & LLaDA.
- Designed polynomial-based flow matching framework modeling curved transport paths to accelerate inference.

Quantitative Research Intern — Oct. 2023 – Aug. 2024
Nebula Research and Development — *New York, NY*

- Developed LLM fine-tuning library for the hedge fund, predicting returns from earnings call transcript sentiment.

Small Projects

Elliptic Curve Cryptography

- Presentation to Penn Mathematics Dpt on attacks to the discrete log problem; Pollard's Rho, Shor's Algorithm.

Computational Ecology & Policy Advocacy

- Built IoT device for real-time malaria tracking. Created model predicting invasive species niches in future climate change scenarios (international recognition). Traveled to Mongolia, documenting regional water insecurity.

Awards

Grand Prize Winner | *Regeneron International Science and Engineering Fair, 2nd in category (7 million participants)*

Borlaug Scholar | *Selected as New York State Youth Representative at World Food Prize Conference*

Interests

Research Interests: AI safety, diffusion models, cryptography, signal processing, ecology / water insecurity

Course Electives: Real Analysis, Deep Learning, Computational Learning Theory, Mathematical Statistics, Computer Security, Convex Optimization, Signal Processing, Linguistics, Russian Literature