Karan Srivastava

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EDUCATION

MA, PhD in Mathematics | *University of Wisconsin-Madison* — Expected 2026
PhD Minor in Computer Science — GPA: 3.7/4
BSc. Mathematics | *University of Illinois at Urbana-Champaign* — May 2020
Magna Cum Laude with Highest Distinction in Mathematics — GPA: 3.97/4
Study Abroad | *Independent University of Moscow* — Spring 2019
Graduate Courses in Pure Mathematics, Math in Moscow Program — GPA: 3.87/4

EXPERIENCE

Research Intern, IBM — May 2025 - Present

- **Genetically trained a large language model (LLM)** to evolve heuristics for vehicle routing, achieving **40% faster convergence** on TSP instances vs. standard ALNS, with strong generalization to out-of-distribution problems.
- Developed a **differential vanishing component analysis** framework to discover **higher-order dynamical systems** from data, outperforming SOTA symbolic regression via **numerical linear algebra and optimization**.

Exploratory Math Sciences Sr Research Intern, IBM — May 2024 - Aug 2024

- Developed a novel **geometric and optimization** framework for discovering scientific formulae from background theory and data with a **>98%** improvement in speed and **1000x** reduction in memory - far exceeding SOTA.
- Created a **computational algebraic framework** for **discovering missing polynomial background theory** with **95% accuracy** - previously unsolved.
- Designed and released the **first benchmark dataset** for symbolic regression models incorporating background theory (polynomials and differential equations), now used to evaluate emerging hybrid data-theory approaches.

PhD Work, University of Wisconsin-Madison and Wisconsin Institute for Discovery — Aug 2020 – Present

- Developing **Transformer** and **Reinforcement Learning-based models** for combinatorial problems.
- Implemented a **Genetic Large Language Model framework** for discovering new algorithms for combinatorial problems. Paper can be found here.
- Found bounds for a novel method of ***reconstructing linear data*** **robust to noise** and published findings at the IEEE ISIT 2022. Slides, code, and paper can be found here.

SELECTED PROJECTS

Learning Tic Tac Toe with Reinforcement Learning — July 2023 - Aug 2023

- Built a reinforcement learning agent for Tic Tac Toe that achieved perfect play through self-play (10,000+ games) without heuristics. *Github link*

Erdös Institute | Data Science Bootcamp | *CoverMyMed Copayment Prediction* — Nov 2022 - Jan 2023

- Worked in a team of 3 PhDs and postdocs to ***train gradient boosting and ensemble models on a 13.9M-row healthcare dataset.***
- ***Reduced RMSE from ~$40 (baseline) to $15.30.*** *Github link*

University of Wisconsin | *Causal Inference through Machine Learning* — Aug 2022 - Dec 2022

- Designed **Support Vector Regression models** that can uncover certain causal relationships in synthetic and real-world data with **~90% accuracy on causal detection**. *Github Link*, blog post.

SKILLS

Languages: Python • Julia • Mathematica • Macaulay2 • Maple • Java • LaTeX • SQL • C++
Libraries / Frameworks: PyTorch • TensorFlow • Keras • Pandas • Scikit-Learn • NumPy • Seaborn • BeautifulSoup
Tools / Platforms: Bash • GitHub(ksrivastava1) • CPLEX • Gurobi • OpenRouter • Docker • Linux computing clusters

LEADERSHIP AND SERVICE

Madison Experimental Math Lab, University of Wisconsin-Madison — 2022 – Present

- Coordinated ~70 undergraduate research projects with faculty and PhD mentors over many semesters.

Directed Reading Program, University of Wisconsin-Madison — 2021 – 2024

- Organized a reading program that grouped ~300 undergraduate students with PhD mentors.

Math Circle, University of Wisconsin-Madison — 2021 – 2022

- Hosted ~30 mathematical talks and workshops by university researchers for local middle and high schools.

Undergraduate Mentor Program, University of Wisconsin-Madison — 2022 – 2024

- Founded and organized a mentorship program that paired ~30 PhD mentors with undergraduates.

CERTIFICATES AND AWARDS

Institute for Foundations of Data Science Research Assistantship - $25,000 Research Grant — Aug 2023 - May 2024
Campus-wide Exceptional Service Award - Awarded to 3/2300 Teaching Assistants — 2022-2023
Exceptional Teaching Award - Demonstrated excellence in teaching for 4 or more semesters — 2020-2022