Pratik Rathore — US Citizen

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Education

Stanford University **Stanford, CA**
PhD Candidate in Electrical Engineering *9/2021-Present*
Advisor: Madeleine Udell

University of Maryland **College Park, MD**
B.S. in Electrical Engineering, summa cum laude *8/2017-5/2021*

University of Maryland **College Park, MD**
B.S. in Mathematics, summa cum laude *8/2017-5/2021*

Research & Industry Experiences

Stanford University **Stanford, CA**
Graduate Researcher *7/2022-Present*
Department of Management Science & Engineering

- Investigating approaches for improving optimization of physics-informed neural networks
- Developing efficient preconditioned stochastic gradient methods for solving large-scale problems in machine learning

Gridmatic **Cupertino, CA**
Research Scientist Intern *6/2024-9/2024*
Power Trading & Optimization Team

- Applied scenario reduction to reduce runtime for solving linear programs in battery scheduling, while preserving profits
- Developed a new backtest framework that accounts for Gridmatic's price impact in ERCOT market
- Formulated, implemented, and tested price impact models based on residual demand curves
- Proposed an ADMM-based algorithm for price impact-aware portfolio optimization

Stanford University **Stanford, CA**
Graduate Researcher *9/2021-12/2021, 3/2022-6/2022*
Autonomous Systems Laboratory

- Developed a quantum computing-based algorithm to solve mixed-integer quadratic programs (MIQPs)
- Applied matrix sketching techniques to improve scalability of semidefinite programming-based neural network verification

STR **Arlington, VA**
Electrical Engineering Intern *5/2020-8/2021*
Prototype Systems & Technology Group

- Aided in the development of an object-oriented environment for radar I/Q simulation, and modeled sub-banded adaptive beamforming in phased arrays

- Contributed to data generation for a deep learning-based platform that performs automatic target recognition on maritime ISAR images
- Worked on a US Department of Defense funded SBIR research project focused on improving Inverse Synthetic Aperture Radar (ISAR) signal processing to enhance ISAR image quality

Lockheed Martin Space **Littleton, CO**
Electrical Engineering Intern *5/2019-8/2019*
Military Support Programs

- Led reviews for computational models (frequency sweep generator, solar array controller, attitude determination with Kalman filter) being developed for satellites in MATLAB/Simulink
- Developed test cases, added new functionality, and improved upon existing documentation in MATLAB/Simulink for these computational models
- Presented model walkthroughs and review suggestions to colleagues during meetings

University of Maryland **College Park, MD**
Undergraduate Researcher *5/2018-8/2018*
Department of Mathematics

- Investigated Descartes numbers, a family of odd spoof perfect numbers
- Proved new results regarding the prime factorizations of Descartes numbers
- Developed and submitted a research manuscript containing the proofs of these results to arXiv

Papers

In the pipeline

P. Rathore, Z. Frangella, and M. Udell. *Have ASkotch: Fast Methods for Large-scale, Memory-constrained Kernel Ridge Regression*. Preprint, 2024, arxiv:2407.10070

Z. Frangella, **P. Rathore**, S. Zhao, and M. Udell. *SketchySGD: Reliable Stochastic Optimization via Randomized Curvature Estimates*. Accepted at SIMODS, 2022, arxiv:2211.08597

Published

Z. Frangella*, **P. Rathore***, S. Zhao, and M. Udell. *PROMISE: Preconditioned Stochastic Optimization Methods by Incorporating Scalable Curvature Estimates*. JMLR, 2024, arxiv:2309.02014

P. Rathore, W. Lei, Z. Frangella, L. Lu, and M. Udell. *Challenges in Training PINNs: A Loss Landscape Perspective*. ICML, 2024, arxiv:2402.01868 **(Oral, top 1.5% of all submissions)**

Miscellaneous

P. Rathore. *There are no Cube-free Descartes Numbers with Exactly Seven Distinct Prime Factors* (2018), arxiv:1808.10027

Talks & Posters

The Alan Turing Institute (online) *10/2024*
Challenges in Training PINNs: A Loss Landscape Perspective

Bridging the Farm: AI for Science at SLAC and Stanford (Stanford) *10/2024*
Challenges in Training PINNs: A Loss Landscape Perspective

* denotes equal contribution.

Naval Surface Warfare Center, Carderock Division (online) *8/2024*
Challenges in Training PINNs: A Loss Landscape Perspective

Oral Presentation, ICML (Vienna) *7/2024*
Challenges in Training PINNs: A Loss Landscape Perspective

Lu Group, Yale University (online) *2/2024*
Challenges in Training PINNs: A Loss Landscape Perspective

Gridmatic (Cupertino) *2/2024*
PROMISE: Preconditioned Stochastic Optimization via Scalable Curvature Estimates

Honors & Awards

Banneker-Key Scholar – a full merit scholarship awarded to top 1% of undergraduates *2017-2021*
Dean's List – A. James Clark School of Engineering *2017-2021*
Dean's List – College of Computer, Mathematical, & Natural Sciences *2018-2021*
Honors College, University Honors, University of Maryland *2017-2021*
University of Maryland Department of Mathematics High Honors Medal *5/2021*
NSF GRFP Honorable Mention *3/2021*
University of Maryland Department of Electrical and Computer Engineering Chair's Award *3/2021*
International Mathematics Competition for University Students, Second Prize *7/2020*
Putnam Math Competition, Ranked in Top 5% of 4200+ Participants *2/2020*
Member of UMD Putnam Team, 14^{th} place team in the nation *2/2020*
University of Maryland Dan Shanks Award for research in number theory *4/2019*
Putnam Math Competition, Ranked in Top 3% of 4600+ Participants *3/2019*
Member of UMD Putnam Team, 9^{th} place team in the nation *3/2019*
Virginia Tech Regional Math Contest, Ranked 15^{th} out of 739 participants *10/2017*
United States of America Mathematical Olympiad (USAMO) Qualifier *5/2017*

Skills

Programming Languages & Frameworks

- *Proficient*: Python, PyTorch, NumPy, MATLAB, LaTeX
- *Familiar*: Pandas, C/C++, Julia, Java, R, Simulink

Advising

Weimu Lei, MS ICME *6/2023-8/2024*
Projects: Physics-informed neural networks; software for fast convex optimization

Academic Service

Reviewing

AISTATS 2023, ICML 2024, NeurIPS 2024

Organized Sessions

INFORMS: Advances in Optimization for Machine Learning — **Seattle, WA**
Co-organizer (with Zachary Frangella and Madeleine Udell) — *10/2024*

Teaching

CME307: Optimization — **Stanford University**
Course Assistant — *9/2024-Present*

CME307: Optimization — **Stanford University**
Course Assistant — *1/2024-3/2024*

EE364B: Convex Optimization II — **Stanford University**
Course Assistant — *4/2023-6/2023*

ENEE150: Intermediate Programming Concepts for Engineers — **University of Maryland**
Undergraduate Teaching Fellow — *1/2021-5/2021*

Relevant Courses

Machine Learning, Machine Learning for Sequence Modeling, Machine Learning for Discrete Optimization, Reinforcement Learning, Convex Optimization, Theory of Statistics, Numerical Linear Algebra, Parallel Computing