

## Education

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- PhD in Computer Science** | University of Pennsylvania | GPA: 4.0 / 4.0 | Philadelphia, PA, US | Aug 2019 - (Current)  
Advisors: Sampath Kannan, Anindya De
- B.E. (Hons) Computer Science** | Birla Institute of Technology and Science (BITS) Pilani | GPA: 8.78 / 10 | Pilani, India | Aug 2014 - Jan 2018

## Experience

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- University of Pennsylvania** | Graduate Research Assistant | Philadelphia, US | Aug 2019 - present
- Identified and characterized optimal machine learning algorithms for strategic settings; analyzed properties of Follow-the-Regularized-Leader Algorithms when used to play repeated games
  - Optimized Time-dynamic responses to algorithms (including gradient descent, multiplicative weights) used in repeated games - came up with a closed form solution to an open problem from control that previously only had a computationally infeasible Dynamic Programming solution/ an unstructured Reinforcement Learning solution; with applications to dynamic pricing, autobidding, market algorithms, etc.
  - Developed Novel Machine Learning Algorithms using tools from Game Theory and Convex Optimization; including the first efficient algorithm for groupwise optimal regret minimization against linear regressors
  - Developed algorithms and corresponding lower bounds for learning ultrametric trees using noisy experiments, with applications to phylogeny reconstruction, a hierarchical clustering problem.
  - Organizer - UPenn CS Theory Seminar | Aug 2022 - current
- Indian Institute of Science (IISc)** | Research Assistant | Bengaluru, India | Jan 2018 - Jul 2019
- Worked on problems from computational fair division with Siddharth Barman
  - Developed state of the art algorithms for envy-free cake cutting, envy-free rent division, and improved algorithms for allocations of indivisible goods under various criteria
- Conduent Research** | Summer Research Intern | Bengaluru, India | May 2017 - Jul 2017
- Worked on Resource Allocation problems, and wrote modules implementing algorithms for these problems.
  - Proved upper bounds on the efficiency of resource allocation with geometric constraints.
- University of Pennsylvania** | Teaching Assistant | Philadelphia, US
- Teaching assistant for Graduate Algorithms (Fall 20) ; Teaching assistant for Randomized Algorithms (Fall 21); Teaching assistant for Graduate Theory of Computation (Fall 22)

## Research Interests and Skills

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**Research Interests** Algorithmic Game Theory, Machine Learning Theory, Online Decision Making, Algorithms

**Technical Skills** Convex Optimization, Discrete Probability, Measure Theory, Real Analysis, Monte Carlo Methods, Regression, Calibrated Forecasting, Multi-Arm Bandits, No-Regret Algorithms, Boosting

**Languages** Python (scikit-learn, pandas, NumPy, SciPy), C, C++

**Relevant Graduate Coursework** Randomized Algorithms, Machine Learning, Game Theory in Machine Learning, Elements of Probability Theory, Algorithms for Big Data, Computational Learning Theory, Analysis of Boolean Functions, Advanced Complexity Theory, Advanced Analysis, Combinatorial Optimization

## Publications

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- Pareto-Optimal Algorithms for Learning in Games** ; With N. Collina, J. Schneider: in *Economics and Computation (EC)*, 2024 ; Accepted at ESIF Economics and AI+ML Meeting, 2024 ; Talk Slides .
- Oracle Efficient Algorithms for Groupwise Regret**; With K. Acharya, S. Kannan, A. Roth, J. Ziani; in *International Conference on Learning Representations (ICLR)*, 2024.
- Efficient Stackelberg Strategies for Finitely Repeated Games** ; With N. Collina, M. Kearns; in *AAMAS (Full Paper)* , 2023.
- Reconstructing Ultrametric Trees from Noisy Experiments**; With A. De, S. Kannan; in *Algorithmic Learning Theory (ALT)*, 2023.
- Wealth Dynamics Over Generations: Analysis and Interventions**; with K. Acharya, S. Kannan, A. Roth, J. Ziani; in *IEEE Conference on Secure and Trustworthy Machine Learning (SaTML)*, 2023.
- Pipeline Interventions**; with S. Kannan, A. Roth, J. Ziani; in **Mathematics of Operations Research** (Originally appeared in *Innovations in Theoretical Computer Science (ITCS)*, 2021).
- Fully Polynomial Time Approximation Schemes for Fair Rent Division**; with S. Barman and N. Rathi; in **Mathematics of Operations Research** (Originally appeared in ACM-SIAM Symposium on Discrete Algorithms (SODA) 19) .
- Fair and Efficient Cake Cutting with Connected Pieces**; with S. Barman, R. Kumar and N. Rathi; in *Web and Internet Economics (WINE)*, 2019.
- Fair Division with a Secretive Agent**; with S. Barman and N. Rathi; in *AAAI*, 2019.

## Working Papers

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- An Elementary Predictor Obtaining  $2\sqrt{T}$  Distance to Calibration**; With N. Collina, A. Roth, M. Shi .

## Funding Awards

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- AWS AI for research in Trustworthy AI Funding Award - 2023**