Eshwar Ram Arunachaleswaran

PhD in Computer Science

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Education

PhD in Computer Science | University of Pennsylvania | GPA: 4.0 / 4.0 | Philadelphia, PA, US — Aug 2019 - Jun 2025
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

Awards and Honors

- Best Paper Award and Best Student Paper Award, ACM Conference on Economics and Computation (EC) 2025, for "Swap Regret and Correlated Equilibria Beyond Normal-Form Games"
- AWS AI for research in Trustworthy AI Funding Award - 2023

Media Coverage

- Research on algorithmic pricing featured in Quanta Magazine article on game theory and algorithmic price increases, reprinted in WIRED and discussed on Quanta Podcast episode covering game theory, algorithms, and pricing mechanisms

Experience

SESCO Enterprises | Quantitative Associate | Pittsburgh, PA — Jun 2025 - present
- Conducting research on electricity markets, focusing on forecasting,market simulation and algorithmic trading strategies

Simons Institute for the Theory of Computing at UC Berkeley | Visiting Researcher | Berkeley, CA — Sep 2024 - Jun 2025
- Attended the program – Theory of Large Language Models and studied problems related to evaluation and alignment

University of Pennsylvania | Graduate Research Assistant | Philadelphia, US — Aug 2019 - Jun 2025
- 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
- Organizer - UPenn CS Theory Seminar — Aug 2022 - Aug 2024

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

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

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, Time series analysis, reinforcement learning

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

- Swap Regret and Correlated Equilibria Beyond Normal-Form Games; With N. Collina, A. Roth: in *Economics and Computation (EC)*, 2025; Best Paper Award; Best Student Paper Award .
- Algorithmic Collusion Without Threats; with N. Collina, S. Kannan, A. Roth, J. Ziani : in *Innovations in Theoretical Computer Science (ITCS) 2025*
- An Elementary Predictor Obtaining $2\sqrt{T}$ Distance to Calibration; With N. Collina, A. Roth, M. Shi : in *ACM-SIAM SODA*, 2025 .
- 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 *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.