Amit Rajaraman

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amitrajaraman
https://amitrajaraman.github.io/

Research Interests

Theoretical computer science, random algorithms, Markov chains, sum-of-squares method

Education

2023 – Present **Massachusetts Institute of Technology**
PhD in Computer Science

2019 – 2023 **Indian Institute of Technology Bombay, India** 9.75 CPI
B.Tech. with Honors in Computer Science (top 10% of department)
Minor in Mathematics

2017 – 2019 **Sri Chaitanya Junior College, India** 97.80%
Intermediate/+2

2010 – 2017 **Delhi Public School, Hyderabad, India** 10.0 GPA
Matriculation

Research Experience

2022 **Summer Internship** *Guides: Piyush Srivastava and Hariharan Narayanan | TIFR, Mumbai*
- Analyzed a novel multiscale Markov chain on convex bodies that mixes rapidly from a cold start
- Proved that the coordinate hit-and-run Markov chain mixes rapidly from a cold start

2022 **B.Tech. Project** *Guide: Prof. Niranjan Balachandran | IIT Bombay*
- Worked towards proving Bagchi's conjecture, a problem in combinatorial geometry
- Studied some general methods to solve combinatorial problems, as well as various results in the analysis of boolean functions, including the KKL Theorem and a result on independent sets in graph products due to Dinur, Friedgut, and Regev
- Prepared a report on all the topics and papers studied, which can be found here, and gave a presentation on the same

2021 **Summer Internship** *Guide: Navin Goyal | Microsoft Research, Bengaluru*
- Worked towards proving the KLS Conjecture and Hyperplane Slicing Conjecture, elusive problems in high-dimensional geometry, using the localization and stochastic localization methods
- Prepared a report on the topics studied, covering several topics in asymptotic convex geometry from scratch, which can be found here

Publication(s)

1. K. Liu, S. Mohanty, P. Raghavendra, **A. Rajaraman**, and D. X. Wu, "Locally stationary distributions: A framework for analyzing slow-mixing markov chains," *arXiv preprint arXiv:2405.20849*, 2024.
2. K. Liu, S. Mohanty, **A. Rajaraman**, and D. X. Wu, "Fast mixing in sparse random ising models," *arXiv preprint arXiv:2405.06616*, 2024.

3 H. Narayanan, **A. Rajaraman**, and P. Srivastava, "Sampling from convex sets with a cold start using multiscale decompositions," in *Proceedings of the 55th Annual ACM Symposium on Theory of Computing*, ser. STOC 2023, Orlando, FL, USA: Association for Computing Machinery, 2023, 117–130, ISBN: 9781450399135. DOI: 10.1145/3564246.3585172.

Service

Teaching Assistantship *IIT Bombay*

2020 **MA 109 (Calculus I)** *Instructor: Prof. Ravi Raghunathan*

2023 **CS 228 (Logic for CS)** *Instructors: Prof. Ashutosh Gupta and Prof. Krishna S.*

Responsible for conducting tutorial sessions for a batch of students throughout the semester, helping them clear conceptual doubts through personal interaction, and correcting answer sheets

2021–2022 **Mentor, Summer of Science**

Guided students interested in topology and graph theory by creating an action plan, recommending resources, clearing doubts, having discussions, and reviewing their reports

2020–Present **Notes**

Prepared notes for various undertaken courses and other topics, referred to by hundreds of peers, which can be found at amitrajaraman.github.io/notes

Reading Projects

2022 **Representation Theory of Finite Groups** *Summer of Science under Math Club, IIT Bombay*

Studied representation theory from *Representation Theory of Finite Groups* by Benjamin Steinberg
Prepared a report on the topics studied, which can be found here

2022 **Derandomization and Pseudorandomness Course Project**

Presented a paper on pseudorandom generators for space-bounded computation by Nisan (link)

2020 **Topics in Algebra II Course Project**

Prepared a presentation on the quiver of the Tits algebra and the Saliola lemma

Scholastic Achievements

2019 Secured All India Rank 12 in JEE Advanced among 245,000 aspirants

2019 Secured All India Rank 102 in JEE Main among 1.2 million aspirants

Conferred an AP grade for exceptional performance in

- 2022 MA214 (Numerical Analysis), awarded to 7 out of 739 students
- 2020 MA106 (Linear Algebra), awarded to 8 out of 1108 students
- 2019 CS101 (Computer Programming and Utilization), awarded to 1 out of 1212 students
- 2019 MA105 (Calculus), awarded to 35 out of 1137 students
- 2019 PH107 (Quantum Physics and Application), awarded to 12 out of 1115 students

2019 Secured All India Rank 2 in the admission test to Indian Statistical Institute, Kolkata

2019 Secured Rank 17 in the Telangana State EAMCET among 142,000 candidates

2019 Scored 415/450 in BITSAT (Birla Institute of Technology and Science Admission Test)

Scholarships and Recognition

- 2017 Recipient of the prestigious Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship
- 2019 Amongst the top 300 students across the nation in NSEC and appeared for the INChO
- 2019 Amongst the top 300 students across the nation in NSEA and appeared for the INAO
- 2015 Attended a camp in Delhi for securing All India Rank 33 in the DPS Talent Examination

Technical Skills

- Software: LaTeX, MATLAB, Git, LEAN
- Programming: C++, C, Python, Bash, Julia

Select Courses Undertaken

- Computer Science: Derandomization and Pseudorandomness, Game Theory and Algorithmic Mechanism Design, Artificial Intelligence and Machine Learning, Special Topics in Automata and Logic
- Mathematics: Weak Convergence and Martingale Theory, Graph Theory, Combinatorics I, Topics in Algebra II, Real Analysis, Complex Analysis, General Topology, Linear Algebra

Miscellaneous

- 2019 Successfully completed an intermediate course in Table Tennis under the National Sports Organization at IIT Bombay
- 2016 Appointed as the Deputy Head Boy at Delhi Public School, Hyderabad