

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 B.Tech. with Honors in Computer Science Minor in Mathematics	9.75 CPI (top 10% of department)
2017 – 2019	📖 Sri Chaitanya Junior College, India Intermediate/+2	97.80%
2010 – 2017	📖 Delhi Public School, Hyderabad, India Matriculation	10.0 GPA

Research Experience

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|------|--|---|
| 2022 | 📖 Summer Internship | <i>Guides: Piyush Srivastava and Hariharan Narayanan TIFR, Mumbai</i> |
| | <ul style="list-style-type: none">Analyzed a novel multiscale Markov chain on convex bodies that mixes rapidly from a cold startProved that the coordinate hit-and-run Markov chain mixes rapidly from a cold start | |
| 2022 | 📖 B.Tech. Project | <i>Guide: Prof. Niranjan Balachandran IIT Bombay</i> |
| | <ul style="list-style-type: none">Worked towards proving Bagchi's conjecture, a problem in combinatorial geometryStudied 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 RegevPrepared a report on all the topics and papers studied, which can be found here, and gave a presentation on the same | |
| 2021 | 📖 Summer Internship | <i>Guide: Navin Goyal Microsoft Research, Bengaluru</i> |
| | <ul style="list-style-type: none">Worked towards proving the KLS Conjecture and Hyperplane Slicing Conjecture, elusive problems in high-dimensional geometry, using the localization and stochastic localization methodsPrepared a report on the topics studied, covering several topics in asymptotic convex geometry from scratch, which can be found here | |

Publication(s)

- 1 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

Other Projects

2022 **Compiler for C-like language** Guide: Prof. Uday Khedker | IIT Bombay

- Developed a compiler for a subset of C, supporting functions, scope levels, and control sequences
- Used lex for tokenizing and yacc for parsing to construct the Abstract Syntax Tree and Three Address Code

2020 **Red Plag: Plagiarism Checker** Guide: Prof. Amitabha Sanyal | IIT Bombay

- Implemented a modified version of latent semantic analysis which calculates the cosine similarity between different vectors in the covariance matrix corresponding to the data
- Added further functionality for reliable detection if the program is written in C++, Python, or Java for ignoring language-specific syntax
- Built a user interface using Angular with a Django backend where registered users can upload and process files and view the similarities between the different pairs, visualised as a heat map

2021 **IITB Proc** Guide : Prof. Virendra Singh | IIT Bombay

- Developed a 16-bit processor using VHDL to execute operations based on instruction format
- Implemented a finite state machine for the execution of 15 instructions in a 6-stage pipeline

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