

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

2022	📖 Summer Internship • 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	<i>Guides: Piyush Srivastava and Hariharan Narayanan TIFR, Mumbai</i>
2022	📖 B.Tech. Project • 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	<i>Guides: Prof. Niranjan Balachandran IIT Bombay</i>
2021	📖 Summer Internship • 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	<i>Guide: Navin Goyal Microsoft Research, Bengaluru</i>

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
- 2019  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