

# 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

2019 – 2023	📖 <b>Indian Institute of Technology Bombay, India</b> B.Tech. with Honors in Computer Science Minor in Mathematics	9.75 CPI (top 10% of department)
2017 – 2019	📖 <b>Sri Chaitanya Junior College, India</b> Intermediate/+2	97.80%
2010 – 2017	📖 <b>Delhi Public School, Hyderabad, India</b> Matriculation	10.0 GPA

## Research Experience

2022	📖 <b>Summer Internship</b> • 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>B.Tech. Project</b> • 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 <a href="#">here</a> , and gave a <a href="#">presentation</a> on the same	<i>Guides: Prof. Niranjan Balachandran   IIT Bombay</i>
2021	📖 <b>Summer Internship</b> • 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 <a href="#">here</a>	<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](https://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         $\text{\LaTeX}$ , 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