

# Amit Rajaraman

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🐙 amitrajaraman

🌐 <http://amitrajaraman.github.io/>



## Research Interests

Theoretical computer science, random algorithms, Markov chains, boolean function analysis, pseudorandomness

## Education

2019 – Present	📖 <b>Indian Institute of Technology Bombay, India</b> B.Tech. with Honors in <i>Computer Science and Engineering</i> Minor in Mathematics	9.73 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> • Working 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 and Prof. Rohit Gurjar   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*, 2022. 📄 DOI: 10.48550/ARXIV.2211.04439.




## Service

- 2020      **Teaching Assistant, MA 109 (Calculus I)** *Instructor: Prof. Ravi Raghunathan | IIT Bombay*  
Responsible for conducting tutorial sessions for a batch of 45 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
- 2020      **Coding Theory**     *Summer of Science under Math Club, IIT Bombay*  
Studied Coding Theory from *Essential Coding Theory* by Guruswami, Rudra, and Sudan and *A First Course in Coding Theory* by Raymond Hill  
Prepared a report on the topics studied, which can be found [here](#)





## 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 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 Logics |
| 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