

Amit Rajaraman

✉ amit.rajaraman@gmail.com

🐙 amitrajaraman

🌐 <https://amitrajaraman.github.io/>



Research Interests

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

Education

2019 – Present	📖 Indian Institute of Technology Bombay, India B.Tech. with Honors in <i>Computer Science and Engineering</i> Minor in Mathematics	9.73 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 | <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 start• Proved that the coordinate hit-and-run Markov chain mixes rapidly from a cold start | |
| 2022 | 📖 B.Tech. Project | <i>Guides: Prof. Niranjan Balachandran and Prof. Rohit Gurjar IIT Bombay</i> |
| | <ul style="list-style-type: none">• 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 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 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 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, Submitted to STOC 2023.




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







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