




# Amit Rajaraman





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## Research Experience

- 2022     **Summer Internship**    *Guides: Piyush Srivastava and Hariharan Narayanan | TIFR, Mumbai*
- Analyzed a novel multiscale Markov chain on convex bodies that mixes fast
  - Proved that the coordinate hit-and-run Markov chain mixes rapidly from a cold start
  - Wrote a paper on the above ([arxiv.org/abs/2211.04439](https://arxiv.org/abs/2211.04439)), and submitted it to STOC 2023
- 2022     **B.Tech. Project**    *Guides: Prof. Niranjana Balachandran and Prof. Rohit Gurjar | IIT Bombay*
- Working towards proving Bagchi's conjecture, a problem in combinatorial geometry
  - Studied 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
  - Covered various general methods to solve combinatorial problems, also preparing a report on all the topics and papers studied, which can be found [here](#).
- 2021     **Summer Internship**    *Guide: Navin Goyal | Microsoft Research, Bengaluru*
- Worked towards proving the **KLS Conjecture** and **Hyperplane Slicing Conjecture**, elusive problems in high-dimensional geometry, using the **(stochastic) localization** method
  - Prepared a report on the topics studied, covering several topics in **asymptotic convex geometry** from scratch, which can be found [here](#)




## 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
- 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  
Became proficient in several topics, notably **linear codes**, **perfect codes**, numerous bounds on the volume of the **Hamming sphere**, and **Shannon's Theorem**  
Prepared a report on the topics studied, which can be found [here](#)












## Other Projects

- 2022  **Compiler for C-like language** *Guide: Prof. Uday Khedkar | 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 Flag: 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

## Education

- 2019 – 2022\*  **Indian Institute of Technology Bombay, India** 9.73 CPI  
(top 10% of department)  
B.Tech. with Honors in *Computer Science and Engineering*  
Minor in Mathematics
- 2017 – 2019  **Sri Chaitanya Junior College, India** 97.80%  
Intermediate/+2
- 2010 – 2017  **Delhi Public School, Hyderabad, India** 10.0 GPA  
Matriculation

## 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
-  Awarded 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, Java, 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

- 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    📖    **Mentor, Summer of Science**  
Mentored freshmen interested in **topology** and **graph theory** by recommending resources and clearing doubts
- 2020–2022    📖    **Notes**  
Prepared notes for various undertaken courses, referred to by hundreds of peers, which can be found [here](#)