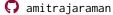
# **Amit Rajaraman**

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http://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 Computer Science and Engineering 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** Guides: Piyush Srivastava and Hariharan Narayanan | TIFR, Mumbai

- 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** Guides: Prof. Niranjan Balachandran and Prof. Rohit Gurjar | IIT Bombay

- 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** Guide: Navin Goyal | Microsoft Research, Bengaluru
  - 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)

H. Narayanan, A. Rajaraman, and P. Srivastava, Sampling from convex sets with a cold start using multiscale decompositions, 2022. ODOI: 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

## **Reading Projects**

Representation Theory of Finite Groups
Studied representation theory from Representation Theory of Finite Groups by Benjamin Steinberg
Prepared a report on the topics studied, which can be found here

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

Secured All India Rank 102 in JEE Main among 1.2 million aspirants

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

Amongst the top 300 students across the nation in NSEC and appeared for the INChO

Amongst the top 300 students across the nation in NSEA and appeared for the INAO

Attended a camp in Delhi for securing All India Rank 33 in the DPS Talent Examination

### **Technical Skills**

Software TFX, 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

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Weak Convergence and Martingale Theory, Graph Theory, Combinatorics I, Topics in Algebra II, Real Analysis, Complex Analysis, General Topology, Linear Algebra

# Miscellaneous

Mathematics

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