Arpon Basu

arpon.basu@gmail.com
ab5541@princeton.edu
https://arponbasu.github.io/
arponbasu

Education

2024 – Present — **Princeton University, USA** — *Academic Advisor: Prof. Pravesh Kothari*
Working on improving lower bounds for q-query LDCs for odd $q \geq 5$ by suitably modifying the Kikuchi matrix method

2020 – 2024 — **Indian Institute of Technology Bombay, India** — 9.67 CPI
B.Tech. with Honors in CSE (10 CGPA) and Minors in Mathematics (10 CGPA)

2018 – 2020 — **Atomic Energy Central School No. 4, Mumbai, India** — 98%
Intermediate/+2

2008 – 2018 — **Atomic Energy Central School No. 4, Mumbai, India** — 96.4%
Matriculation

Workshops

2024 — Chennai Mathematical Institute (CMI), **Chennai, India**: Invited for STEMS (Scholastic Test of Excellence in Mathematical Sciences) Camp 2024, where about 30 of the best scorers in Mathematics, Computer Science, and Physics in the STEMS exam are selected for a fully-funded camp at CMI.

2023 — Max Planck Institute for Software Systems, **Saarbrücken, Germany**: Was selected for the Cornell, Maryland and Max Planck pre-doctoral research school, and attended it in Fall 2023

Publication(s)

2022 — Presented paper "Ablation Study of Indian Automatic Vehicle Number-Plate Recognition Model Trained Over Synthetic Dataset" in FICTA 2022, (proceedings, pg 95) and won the **Best Paper Award** for it

Research Experience

2022-2023 — **Stochastic Particle Models Project** *Guide: Prof. Amitava Bhattacharya | TIFR, Mumbai*

- Proved phase transitions in Manna-type models, and also derived very precise estimates for the critical probability. Also proved results outlining the time of stabilization of the stochastic process.
- Picked up multiple tools in Advanced Probability theory for the same, from Bernoulli percolation through Hugo Copin's notes and Geoffrey Grimmett's book, and Interacting Particle Systems through Holly and Ligett's paper.

Research Experience (continued)

2023 **Cryptography Summer Internship** *Guide: Prof. Prashant Vasudevan | NUS, Singapore*

• Read Liu, Tessaro, and Vaikuntanathan's paper [LTV21] on provable independence bounds of AES. Tried to apply their techniques to ciphers like MiMC, and rediscovered some key insights of Angelos Pelecanos's Master's Thesis, which proved independence bounds on the block cipher MiMC [AGRRT16]

• Surveyed literature (Alon and Lovett, Rubinfield and Xie, Alon et. al.) regarding derandomization of algorithms involving the use of random permutations in an effort to derandomize LTV21's construction of independent block ciphers

• Also explored fine-grained complexity (through Williams-Vassilevska's survey), and connections with average case hardness, through Ball, Rosen, Sabin, and Vasudevan's paper.

2022-2023 **B.Tech. Thesis** *Guide: Prof. Sundar Vishwanathan | IIT Bombay*

• Worked to use structural constraints to prove optimality of Alon's biclique 2-cover bounds

• Studied Fomin and Kratsch's book on Exponential Algorithms and read Zamir's work on breaking the 2^n-barrier for 5-coloring, in the process picking up tools such as Yates' fast zeta transform, and inclusion-exclusion methods for improving exponential algorithms

• Investigating how improvements in Beigel-Eppstein's list-coloring algorithms would have ramifications on Zamir's 5-coloring algorithm

2023-Ongoing **Computational Geometry Research Project** *Guide: Prof. Sujoy Bhore | IIT Bombay*

• Working on dynamic approximation algorithms for maximum independent sets in axis-parallel rectangular systems.

• Looking into improving lower bounds for the ratio between the chromatic number and clique number of intersection graphs of axis-parallel rectangles, en route to applying it for designing algorithms to find independent sets.

Expository Writings

2022–2024 Prepared expository writings on various graduate-level topics pertaining to Computer Science and Mathematics, which can be found here: https://arponbasu.github.io/notes

Service

2024 **Lecturer at Mathematics Olympiad Program** *AECS 2, Mumbai*

Instructed students (grades 8-12) on polynomials and functional equations for Math Olympiads, at a Mathematics Olympiad Orientation Program (December 2023) conducted by AEES. Find the recordings of my talks here, and here.

2021–2024 **Teaching Assistantship** *IIT Bombay*

2024 **CS 786 (Randomized Algorithms)** *Instructors: Prof. Akash Kumar*
2024 **CS 208 (Automata and Logic)** *Instructors: Prof. Supratik Chakraborty*
2023 **CS 215 (Data Analysis & Interpretation)** *Instructors: Prof. Ajit Rajwade, Pushpak B.*
2023 **CS 228 (Logic for CS)** *Instructors: Prof. Ashutosh Gupta, Krishna S.*
2022 **MA 106 (Linear Algebra)** *Instructor: Prof. Gopal Krishna Srinivasan*
2021 **MA 109 (Calculus I)** *Instructor: Prof. Sourav Pal*

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. Created LaTeXed solutions which were referred to by hundreds of students in the batch

Company Internship(s)

2022 **Software Development** *Company Internship at Franklin Templeton*

- Built Django-based **toolbox** for handling data concerning **Australian Fixed Income Securities**
- Wrote scripts for **scraping** data from financial websites and uploading time-series into **Macrobond**
- Implemented **Optimizer** for choosing which bonds to buy based on maximum **CTD utilization**

Scholastic Achievements

2022 Listed in the top quartile in the Simon-Marais Mathematics Competition

2020 Secured an All India Rank of 59 in JEE Advanced among more than 0.15 million aspirants

Received 100 percentile in Physics in both attempts of JEE Mains, among 0.88 million aspirants

Conferred an AP grade in Calculus among the 1371 students registered for the course

Received 100/100 in both Mathematics and Biology in CBSE Board examinations, NCERT

Among 46 students invited to IChO (International Chemistry Olympiad) training camp

Among 100 students declared Times Scholar by Times of India among 0.3 million aspirants

2019 Secured All India Rank 6 in NMTC (National Mathematics Talent Contest) conducted by AMTI

In top 1% students across Maharashtra in NSEB (National Standard Examination in Biology)

Received the prestigious KVPY fellowship with All India Rank 58 awarded by DST, Govt. of India

2018 Among 46 students invited to IJSO (International Junior Science Olympiad) training camp

2016-2018 Qualified the Regional Mathematics Olympiad (RMO) thrice from the state of Maharashtra

Select Courses Undertaken

Computer Science — Advanced Image Processing (Compressed Sensing), Cryptography and Network Security, Geometric Algorithms, Spectral Graph Theory, Game Theory

Mathematics — Extremal Combinatorics, Stochastic Processes, Basic Algebra, Real Analysis, Complex Analysis, Algebra I (Galois Theory), Combinatorics II (Probabilistic Methods in Combinatorics), Differential Geometric Methods in Control

Extra-Curriculars

2021 Performed Inaugural Song at the IIT Bombay Convocation Ceremony twice

Successfully completed the year-long NSO program in Hindustani Classical Music at IIT Bombay

2020 Declared winner of the Freshiezza Writing Competition organized by the Literati Club of IIT Bombay