Arpon Basu
Computer Science & Engineering
Indian Institute of Technology Bombay

200050013
B.Tech.
Gender: Male
DOB: 27/05/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	9.65
Intermediate	CBSE	AECS-4, Anushaktinagar	2020	98.00%
Matriculation	CBSE	AECS-4, Anushaktinagar	2018	96.60%

Pursuing Minors in **Mathematics**

Internships and Research Projects

Theoretical Analysis of Independence of Block-Ciphers *Summer 2023*
University Internship | Research Assistant *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

Software Development for Representation and Analysis of Financial Data *Summer 2022*
Company Internship | Web Development; Scraping *Franklin Templeton*

- Developed Django-based **toolbox** for acquiring and displaying data concerning **Australian Fixed Income Securities**
- Implemented **Optimizer** for aiding Portfolio Managers in choosing which bonds to buy based on maximum **CTD utilisation**
- Used **Highcharts, DataTables** in JavaScript to create tables and charts for visual representation of financial parameters
- Wrote scripts for **scraping** data from official financial websites and uploading their time-series into **Macrobond**

Synthetic Dataset Generation for the Indian ANPR Problem *Winter 2021-22*
Research Assistant

- Presented paper on the **Synthetic Dataset Generation for the Indian Automatic Number Plate Recognition Problem** in **FICTA 2022** and won the **Best Paper Award** for it
- Used a **data-centric approach** for supplanting the small labelled dataset available by introducing **distortion artefacts** into synthetically produced number plate images to closely simulate actual number plate images acquired in real life

Scholastic Achievements

- Received **AP** grade in Calculus awarded to top **15** students among **1371** registered for the course *(2021)*
- Secured an **All India Rank** of **59** in **JEE Advanced** among more than 0.15 million aspirants *(2020)*
- Received **100/100** in both **Mathematics** and **Biology** in **CBSE** Board examinations, **NCERT** *(2020)*
- Received **100 percentile in Physics** in both attempts of **JEE Mains**, among 0.88 million aspirants *(2020)*

Olympiads and Scholarships

- Qualified the **Regional Mathematics Olympiad (RMO) thrice** from the state of Maharashtra *(2016-18)*
- Secured **All India Rank 6** in **NMTC** (National Mathematics Talent Contest) conducted by AMTI *(2019)*
- Among India's **top 46 students** who qualified **INChO (Indian National Chemistry Olympiad)** *(2020)*
- Attended the **Orientation Cum Selection Camp** for **International Junior Science Olympiad** *(2018)*
- Received the prestigious **KVPY** fellowship with **All India Rank 58** awarded by DST, Govt. of India *(2019)*
- Among the **top 1%** aspirants in the **National Standard Examination in Physics (NSEP)** *(2020)*
- Among Maharashtra **top 1%** aspirants in the **National Standard Examination in Biology (NSEB)** *(2019)*
- Awarded **Times Scholar**, by **Times of India** among 0.3 million aspirants, with $<$ **0.06%** selection ratio *(2020)*

Key Projects

Optimization of Tensor Contractions in Quantum Chemistry Computations *Summer 2021*
Guide: Prof. Achintya Dutta ***SURP*** *(Summer Undergraduate Research Program), IIT Bombay*
- Developed a program to render tensor expressions written in LaTeX to python code (with it's **einsum library**)
- Implemented an algorithm to **optimize tensor contractions** through the **generation of intermediates**
- Integrated LaTeX rendering program with tensor optimization algorithm to generate **optimized python code**

The BlueFire Moodle *Fall 2021*
Guide: Prof. Amitabha Sanyal | Course Project: Software Systems Laboratory *IIT Bombay*
- Developed platform for hosting professors and students and enabling **academic interaction** between them
- Established support for **creation** of **courses, registration** for them and **evaluation** of those courses in the platform
- Constructed a **CLI** (Command Line Interface) of the above for **better file management** through the terminal

Image Super Resolution using Convolutional Neural Networks *Summer 2021*
WnCC (Web and Coding Club) ***SoC*** *(Seasons of Coding) , IIT Bombay*
- Implemented a 3-layered SRCNN **Super Resolution Convolutional Neural Network** for up-scaling images
- Utilised **TensorFlow** to deploy the deep learning sequential model with a **mean squared error** loss function
- Achieved a **PSNR** ratio of around **28 dB** against the **36 dB** PSNR that our reference paper had achieved

P2P communication and file-transfer network *Spring 2022*
Guide: Prof. Kameswari Chebrolu | Course Project: Computer Networks Laboratory *IIT Bombay*
- Implemented small-scale **P2P network** over a **TCP protocol layer** with **file search and transfer capabilities** of upto **depth 2**, which worked reliably for small node numbers of upto 5-10
- File transfers were extended to include all types of files, including `cpp`, `png`, `sql` files, and the file memory was managed at a low level to **maintain data integrity**, which was verified through **MD5 hashes** upon receival

Reweighted ℓ_1 norm for Sparse Vector Recovery *Spring 2022*
Guide: Prof. Ajit Rajwade | Course Project: Advanced Image Processing *IIT Bombay*
- Surveyed literature about Compressed Sensing results and algorithms such as Candés-Tao theorems, ISTA, OMP so on
- Reviewed a paper by Candés which iteratively **"reweights" the l_1 norm** to better approximate the l_0 norm
- Implemented and extended above paper by experimenting with different cost functions, different threshold criteria, etc.

SAT solving Games *Spring 2022*
Guide: Prof. Ashutosh Kumar Gupta | Course Assignment: Logic For Computer Science *IIT Bombay*
- Used **z3py SAT solver** to solve popular puzzle rush hour by encoding valid states through binary variables and constraints

Mandelbrot Fractal animation *Fall 2021*
Guide: Prof. Bhaskaran Raman | Course Project: Data Structures and Algorithms Laboratory *IIT Bombay*
- Designed zoomable (upto $\times 10^9$) Mandelbrot Fractal animations using the **SFML graphics library**
- Enabled **multi-threaded rendering** of different parts of the image for **smoother zooming effect**

Technical Skills

Programming	C++, C, Python, Bash (including sed and awk), Java, VHDL, Assembly, SWI-Prolog
Web Development	HTML, CSS, Bootstrap, Django, JavaScript
Software	Git, LaTeX, MATLAB, Android Studio, Keil, Quartus, Intel Vtune

Relevant Courses

Computer Networks, Digital Logic Design and Computer Architecture, Design and Analysis of Algorithms, Logic for Computer Science, Advanced Image Processing, Operating Systems, Artificial Intelligence and Machine Learning, Database and Information Systems, Compiler Theory (Implementation of Programming Languages), Geometric Algorithms, Cryptography and Network Security, Spectral Graph Theory*, Game Theory*, Basic Algebra, Real Analysis*, Numerical Analysis
**To be completed by November 2023*

Teaching and Mentorship

- Entrusted with the responsibility of being a Teaching Assistant in IIT Bombay for the courses MA 109 (**Single Variable Calculus**), MA 106 (**Linear Algebra**), CS228 (**Logic for Computer Science**), and CS215 (**Data Analysis and Interpretation**) which involved helping a batch of 45 students clear conceptual doubts through personal interaction

Extracurricular Activities

- **Received certificate of appreciation** in IIT Bombay essay contest on 75th Independence Anniversary of India *(2021)*
- **Performed Inaugural Song** at the **IIT Bombay Convocation Ceremony** twice in the current year *(2021)*
- Successfully completed the year-long **NSO** programme in **Hindustani Classical Music** at IIT Bombay *(2021)*
- Came **1st** in the **Mathematics** section of **Mimamsa**, a national science quiz conducted by **IISER Pune** *(2021)*
- Ranked **2nd** in **Chemenigma**, a national **chemistry contest** conducted by **Pravega, the IISc Fest** *(2021)*
- Secured **8th** position in **IITB Mathematics Olympiad** held by Mathematics Association of IIT Bombay *(2017)*