

EDUCATION

Indian Institute of Technology, Bombay

('21-'25)

Major & Honors in Computer Science and Minor in Mathematics

Current Major CPI/GPA after 7 semesters: 9.37/10

SCHOLASTIC ACHIEVEMENTS

- Received the **Institute Academic Award** for **Institute Rank 1** among **1400+** students ('22)
- Secured **5 AP (Advanced Proficiency)** grades awarded to **top 1%** among 1400+ students ('22)
- Secured **All India Rank 46** in Joint Entrance Examination Advanced amongst **0.25 million** candidates ('21)
- Achieved **All India Rank 39** and was awarded the prestigious **KVPY fellowship** by IISc Bangalore, India ('21)

OLYMPIADS

- Qualified for the **Mathematics Olympiad Orientation Camp** (MOOC) conducted by HBCSE ('21)
- Cleared **Indian Olympiad Qualifier in Mathematics** (IOQM) conducted by MTA(I) with **State rank 1** ('21)
- Among **top 64** students in the country in the **Indian National Chemistry Olympiad** (INChO) ('21)
- Attended the **Chemistry Olympiad Orientation Camp** (COOC) conducted by HBCSE ('21)

RESEARCH PROJECTS

Submodular Partitioning Problems ([arXiv](#))

Summer '24

Guide : [Prof. Karthekeyan Chandrasekaran](#) | Research Internship

U of I, Urbana-Champaign

- Examined **multi-way cut** for monotone submodular functions and showed a novel **1.33-approximation** algorithm
- Showed oracle hardness, better than **1.1-approximation** for the problem requires exponentially many queries
- Accepted** by 26th conference on Integer Programming and Combinatorial Optimization (IPCO 2025) for publication.

Evolutionary Game Theory ([arXiv](#)) ([doi](#))

Summer '23

Guide : [Prof. Krishnendu Chatterjee](#) | Research Internship

Chatterjee Group, IST Austria

- Examined the **morán process** with birth-death and death-birth updating for weighted population networks
- Showed robust, modular amplifiers for **birth-death** and **death-birth** updating resolving an important open problem
- Showed existence of quantities that are impossible to improve for death-birth and birth-death updating simultaneously
- Accepted** by PLOS Computational Biology, a **peer reviewed journal** for publication

Extension of Matroids ([Report](#)) ([Survey](#))

Autumn '23 & Spring '24

Guide : [Prof. Rohit Gurjar](#) | Research Project

IIT Bombay

- Proved that if matroids have a **small extension** complexity then the **matroid union** also has a small extension
- Studied the extension complexity for transversal, regular matroids and exploring it for **dilworth truncation**
- Surveyed **randomised communication** based protocols for finding extension complexity of $k - l$ sparsity matroids

Distributional safety for MDPs

Autumn '23 & Spring '24

Guide : [Prof. S. Akshay](#) | Research Project

IIT Bombay

- Examining algorithms for template based approaches to **affine invariant synthesis** for affine safety objectives
- Proved that for 2-state MDPs, distributional strategies with initialised safety, **memoryless** strategies suffice
- Examined the **computational complexity** of the problem for the affine safety of general MDPs
- Expected to result in a publication in the near future crediting me as a **co-author**

KEY PROJECTS

Laplacian-steered stylized neural painting

Autumn '23

Guide: [Prof. Preethi Jyothi](#) | Course Project : Introduction to AI & ML

IIT Bombay

- Modified stylized painting using **Laplacian Loss** to create a **neural painting** model leading to **improved PSNR**
- Applied the stylized neural painter to individual video frames creating short, **stylized animations**
- Developed a **lightweight model** rendering images faster than the original model while maintaining high quality.
- Optimized code of Stylized Neural Painter, achieving **significant speed improvements** in the rendering process.

Optimizing Hardware Prefetching

Spring '23

Guide: [Prof. Biswabandan Panda](#) | Course Project : Digital Logic Design and Computer Architecture

IIT Bombay

- Designed a **data prefetecher** with specialised improvements for SAT-Solver, SPEC traces and server workloads
- Achieved **7%** improvement in IPC for **graph traces** via tuning of prefetcher on the **champsim simulator**
- Used **multi-parameter indexing** of instruction memory, **customized stride** prefetchers for different cache levels
- Exploited **spatial access patterns** in cache heirarchy using **finer addressing** methods part of the bingo prefetcher

Algorithmic Implementations for a Railway Planner

Autumn '22

Guide: Prof. Supratik Chakraborty | Course Project: Data Structures and Algorithms Laboratory

IIT Bombay

- Implemented core algorithm for a simplified railway planner, complete with a system for reviews and administration
- Parsed **big data** in a database management system by **hashing** user queries efficiently, logging in **AVL tree**
- Used **prefix tries** for **predictive completion**, **KMP Algorithm** for **keyword-query search** and ideated its use as a **feature extractor** of key review words for a **review classifier** model, resulting in a review score function

FastChat

Autumn '22

Guide: Prof. Kavi Arya | Course Project : Software Systems Laboratory

IIT Bombay

- Built a chat application with a **GUI** having multiple interacting clients and servers using **socket programming**
- Achieved **end-to-end encryption** using AES and RSA ciphers and parallel communication using **multi threading**
- Introduced **group messaging** and **offline message access** using **PostgreSQL** databasing with regex queries
- Implemented **load balancing** for servers and analysed metrics like throughput, latency using **bash scripting**

Learning with Quantum Computers

Winter '22

Winter in Data Science | Literature Review

Analytics Club, IIT Bombay

- Comprehensively surveyed papers about quantum computing, **quantum optimization** of various ML algorithms
- Implemented the **deutsch joza algorithm**, qubit rotation methods with basic quantum circuits on **IBM qiskit**
- Surveyed Quantum GANs, hidden markov models, decision trees, quantum pattern recognition and k-NN methods

Adversarial Attacks on Computer Vision Models

Summer '22

Seasons of Code | Implementation project

Web and Coding Club, IIT Bombay

- Surveyed papers related to **Fast Gradient Sign Method (FGSM)**, and **DeepFool attacks** on Neural Networks
- Generated **adversarial images** with both attacks on the MNIST Dataset using Numpy, with **80% misclassification**
- Designed and programmed a Deep Neural Network using the **PyTorch API** to get a model with **90+% accuracy**

Application of Number Theory in Cryptography

Summer '22

Summer of Science | Literature Review

Maths and Physics Club, IIT Bombay

- Studied **Cryptographic Primitives**, formalising notions of security and **security proofs** for cryptographic schemes
- Learned about cryptographic constructions, **stream**, **block ciphers**, concepts of perfect and semantic security
- Studied **number theoretic** applications of cryptography like **RSA** encryption, **Diffie-Hellmann** key exchange

TECHNICAL SKILLS

Programming Languages	C, C++, Python, Prolog, Java, Bash, sed, awk, Haskell, FLTK
Development	HTML, CSS, Bootstrap, Javascript, Git, Sphinx, Doxygen, L ^A T _E X, MySQL
Data Science and ML	PyTorch, TensorFlow, Matplotlib, MATLAB, NumPy, Pandas

RELEVANT COURSES

Theoretical Computer Science: Data Structures and Algorithms, Discrete Structures, Design and Analysis of Algorithms, Logic for CS, Extremal Combinatorics, Automata Theory, Applied Algorithms, Spectral Graph Theory, Approximation Algorithms, Optimization, Applied Integer Programming

Systems: Computer Programming and Utilization, Abstractions and Paradigms for Programming, Computer Networks, Digital Logic Design and Computer Architecture, Software Systems Lab, Compilers, Operating Systems, Database and Information Systems

Mathematics: Linear Algebra, Calculus-I, Calculus-II, Differential Equations, Real Analysis, General Topology, Complex Analysis, Numerical Analysis, Fourier Analysis

Machine Learning: Statistical Learning Theory, Data Analysis and Interpretation, Introduction to AI and ML

TEACHING EXPERIENCE

Popularizing higher mathematics in School

Autumn '22 & Spring '23

Guide: Prof. Rekha Santhanam | Summer Undergraduate Research Project (SURP)

IIT Bombay

- **Published a book**, introducing **Linear Algebra**, with aspects of cryptography, geometry in the theme of the story
- The story, a book of **8 chapters**, and associated **math expository sessions** have impacted **2000+ students**

Teaching Assistant

Autumn '22 & Spring '23

Dept. of Mathematics | Prof. Sanjoy Pusti, Prof. Niranjan Balachandran & Prof. Dipendra Prasad

IIT Bombay

- Worked as a **TA** for **Calculus-I (MA109)**, **Calculus-II (MA111)** & **Linear Algebra (MA106)** courses
- Conducted **weekly interactive and problem solving sessions** for 45+ 1st year UG students

EXTRACURRICULAR

- Secured team gold medal in **Chess** at the **Inter-Hostel General Championship** at IIT Bombay ('23)
- Participated in **30+ Chess Events** at the **District and State levels**, with **10+ medals** ('16-'20)
- Qualified amongst **top 50** teams in the Limestone Data Challenge conducted by Tower Capital at IIT Bombay ('23)