

Pursuing Minor in Machine Intelligence and Data Science

SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 18** in **Joint Entrance Examination Advanced** among 250,000 selected students (2022)
- Awarded the **Institute Academic Prize** for being among the **top 20** out of 1400 students in first year (2023)
- Achieved **10** Semester Performance Index (**SPI**) by scoring a perfect grade in the Spring Semester of first year (2023)
- Recipient of the **Kishore Vaigyanik Protsahan Yojana**, a coveted fellowship by the Department of Science and Technology, Government of India by securing **All India Ranks 24** and **33** in the SX and the SA streams (2022, 2021)
- Awarded the **NTSE Scholarship** after a two-tier merit-based procedure by NCERT, Government of India (2020)
- Among the few curated students invited for the **Orientation-Cum-Selection Camp** of **International Astronomy Olympiad** (IOAA) and **International Junior Science Olympiad** (IJSO) held by **HBCSE** (2022, 2020)
- Selected among the top 300 students for the **Indian National Mathematics Olympiad**, HBCSE (2018)
- Received **Advanced Performer** (AP) grade for being in the **top 1%** students in a Calculus Course (2023)

WORK EXPERIENCE

Applied Scientist

(May 2024 - July 2024)

Amazon Bangalore | Summer Internship

- Worked on Amazon's Large Language Model **Olympus** and improved its instruction following ability
- Implemented **Classifier-free Guidance** method to enhance focus on key parts of user queries and system prompts, optimizing the balance between conditional and unconditional probabilities using a hyper-parameter
- Evaluated the performance of **Olympus** and some open source models on various single and multi-turn datasets

KEY PROJECTS

Algorithmic Trading

(August 2023 - November 2023)

Guide: Prof. Ashutosh Gupta | Course Project: Data Structures and Algorithms

IIT Bombay

- Devised trading strategies utilizing **sockets** and **threads** to enhance market responsiveness and execution efficiency
- Developed a **dynamic market** platform that intelligently matches traders based on optimal prices, enhancing overall market performance and has robust measures to identify and prevent **arbitrage** opportunities
- Implemented **median trading** and **statistical arbitrage**, to exploit market anomalies and drive consistent returns

Economics Meets Machine Learning

(June 2023 - July 2023)

Web and Coding Club | Seasons of Code

IIT Bombay

- Formulated and implemented various economic problems as **Markov Decision Processes** in the Gym framework
- Employed a combination of **Bandit** algorithms and **Reinforcement Learning** algorithms, known for their adaptability and learning capabilities, to address complex matching markets, auction dynamics, and allocation problems
- Modeled **stock exchange** as a **double auction**, which incorporated market sentiment and the individual objectives of users and conducted simulations involving a diverse group of over **100** participants to assess the model's efficacy

Computer Architecture Implementation

(August 2023 - November 2023)

Guide: Prof. Biswabandan Panda | Course Project: Digital Logic and Computer Architecture

IIT Bombay

- Utilized the **champsim** simulator to implement and analyze **stream** and **IP stride prefetchers**, while evaluating the effectiveness of **LRU**, **FIFO**, **LFU** and **BIP** replacement policies based on IPC and accuracy metrics
- Designed a **VHDL** circuit which encodes **musical chords**, achieving conversion of 8-bit binary notes into chords
- Implemented **Heap Sort**, **Merge Sort** and Binary Search algorithms in the **MIPS** and **x86** Assembly Language

Mathematics of Derivative Pricing

(May 2024 - Present)

Maths and Physics Club | Summer of Science

IIT Bombay

- Achieved proficiency in **mathematical models** used in derivative pricing through comprehensive coursework
- Acquired knowledge about Derivatives such as **Futures** and **Options**, with a focus on trading strategies
- Gained in-depth understanding of **Black-Scholes model**, **Binomial model**, and **Greeks** for risk management

Image Segmentation

(March 2024 - April 2024)

Guide: Prof. Suyash Awate | Course Project: Medical Image Computing

IIT Bombay

- Implemented **Gaussian Mixture Model** (GMM) with **Saliency Map** for accurate image segmentation
- Achieved better accuracy and reduced computational cost over Markov Random Field and mean template based GMM

OTHER PROJECTS

Option Pricing Models

(June 2023 - July 2023)

Finance Club | Finsearch

IIT Bombay

- Engaged in **Stock Markets** and **Options Trading**, with a focus on understanding diverse Option Strategies
- Implemented the **Black-Scholes** model, the **Binomial** model, and **Monte Carlo** simulations using Python libraries
- Evaluated the precision and **performance** of the Black-Scholes Model by applying it to **real-world** data sourced from the National Stock Exchange (NSE) markets and achieved a high accuracy by optimizations

Reinforcement Learning

(June 2023 - July 2023)

Maths and Physics Club | Summer of Science

IIT Bombay

- Completed an extensive **reading project** on Reinforcement Learning (main reference: **Sutton & Barto**)
- Investigated Dynamic Programming, Monte Carlo Methods, n-step bootstrapping, **Temporal Difference** learning and **on-policy** methods with their applications and **implemented** all the algorithms in Python

Python Web Crawler

(May 2023 - June 2023)

Guide: Prof. Kameswari Chebrolu | Course Project: Software Systems Lab

IIT Bombay

- Designed a sophisticated Web Crawler equipped with the ability to **recursively extract** all the hyperlinks of a webpage and generating a comprehensive **graph** showcasing various link types, with user-defined recursion levels
- Harnessed the power of **Python libraries** to visualize this wealth of data, resulting in an interpretable representation

Alien Invasion Game

(December 2022)

Self Project

IIT Bombay

- Developed a **customized** version of Alien Invasion Game with **pygame** aiming for an engaging gameplay experience
- Added layers of excitement and depth to the gaming experience by allowing the players to shoot advancing extraterrestrial invaders, encountering three **unique types**, each with individually tailored point rewards
- Enhanced gameplay by introducing escalating difficulty **levels**, with each new level increasing game speed and point rewards for aliens and implemented a **high-score** tracking system that saved and retrieved player high scores

SKILLS

Programming Languages	C++, Python, HTML, CSS, Git, JavaScript, VHDL, MIPS, Sed, Awk, Shell, Bash
Software Tools	L ^A T _E X, Qiskit, GitHub, Autodesk Fusion 360, Arduino, Pygame
Data Science	Matplotlib, MATLAB, NumPy, Keras, TensorFlow, PyTorch, SciPy, Pandas
Verbal	Debate, Group Discussion

POSITIONS OF RESPONSIBILITY

Teaching Assistant | Software Systems Lab

(2024)

- Instructed a cohort of 50 freshman students, offering guidance and support both during **tutorial** and **lab** hours
- Collaborated with the professor in creating **labs**, **exams**, **autograders**, quizzes, practice problems and tutorial notes

Department Academic Mentor | Student Mentorship Programme

(June 2024 - Present)

- Selected via a rigorous procedure of SoP, Peer Reviews and Interviews to be part of a team of 37 out of 90 applicants
- Guiding sophomores on academic and extra-curricular decisions and helping them navigate their curriculum

Mentor | Seasons of Code

(May 2024 - Present)

- Instructed a group of **25** students for **Competitive Programming** and provided them the appropriate resources and problems for Dynamic Programming, Sorting, Greedy, Graphs, Trees, Range and String Algorithms

COURSES UNDERTAKEN

Computer Science	[†] Data Structures and Algorithms, Discrete Structures, Design and Analysis of Algorithms, [†] Digital Logic Design and Computer Architecture, [†] Computer Networks*, [†] Programming Paradigms*, [†] Implementation of Programming Languages**, [†] Database and Information Systems**, Logic and theory for Computation, [†] Operating Systems, [†] Software Systems Lab
Data Science	[†] Artificial Intelligence and Machine Learning*, Medical Image Computing*, Data Analysis and Interpretation, Optimization in Machine Learning
Mathematics	Calculus, Linear Algebra, Differential Equations, Mathematical Structures for Control

[†]Course has corresponding lab

*to be completed by November 2024

**to be completed by April 2025

EXTRACURRICULAR ACHIEVEMENTS

- Received the **Excellence in CSE Teaching Assistantship** Award for the Software Systems Lab course (2024)
- Finished in the **top 60** teams at Limestone Data Challenge conducted by **Tower Research Capital** (2024)
- Engineered a manually controlled **robot**, imbued with the ability to navigate through a diverse array of obstacles while participating in the prestigious **XLR8** Competition, the Robotics Club of IIT Bombay (2023)
- Secured **third rank** in Rajmata Gayatri Devi National Inter-School **Verbattle Debate** Competition (2019)
- Appointed as the **Prime Minister** during a **Model United Nations** session, which serves as a platform aimed at fostering political discourse and encouraging the exchange of thoughtful ideas of international affairs (2019)
- Completed a one-year course in **Weightlifting** under National Sports Organization, IIT Bombay (2023)
- Secured **First Rank** in **Science Quiz** organised by Defence Laboratory, Jodhpur on National Science Day (2019)