Saksham Rathi
Computer Science & Engineering
Indian Institute of Technology Bombay

22B1003
B.Tech.
Gender: Male
DOB: 14/01/2005

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	9.52
Intermediate	CBSE	Disha Delphi Public School	2022	99.00%
Matriculation	CBSE	Delhi Public School, Jodhpur	2020	98.60%

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	LaTeX, 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)*