Aakash Gupta
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Examination	University	Institute	Year	CPI/%
Graduation	IIT Bombay	IIT Bombay	2027	11
Intermediate	CBSE	Gyankalash International School	2023	98.2%
Matriculation	CBSE	Gyankalash International School	2021	99.2%

Pursuing **Double Minor** in **Centre for Machine Intelligence and Data Science** & **Bioscience and Bioengineering**

Scholastic Achievements

- Secured **All India Rank 28** in **Joint Entrance Examination (Advanced)** among **160,000**+ candidates *(2023)*
- Secured **99.76** percentile in prestigious **Medical Entrance Test, NEET-UG** among **2M**+ appeared *(2023)*
- Recipient of Kishore Vaigyanik Protsahan Yojana **(KVPY) fellowship** by achieving **All India Rank 138** *(2021)*
- Achieved **99.86** percentile in **JEE Mains** with **100** percentile in **Maths** among **1.1M**+ students appeared *(2023)*
- Qualified prestigious **National Talent Search Examination (NTSE) Stage 1** conducted by **NCERT** *(2021)*

Olympiads

- Conferred with **National Gold Medal** and attended **OCSC camp** for selection of Indian team for the **54th International Chemistry Olympiad (IChO)** after being in **Top 44** in **INChO** conducted by **HBCSE** *(2023)*
- Among the **Top 33** students in India who qualifed for **OCSC camp** in **Astronomy and Astrophysics** *(2023)*
- Secured a **Top 450** position in **IOQM** and qualified for **INMO** (Indian National Mathematics Olympiad) *(2023)*
- Was among **Top 300** students selected to appear in **Indian National Olympiad** in **Biology** and **Physics** *(2022)*
- Awarded **Certificate of Distinction** in **American Mathematics Competition** conducted by Mathematics Association of America and qualified for **American Invitational Mathematics Competition** (AIME) *(2022)*

Contests and Competitions

Citadel India Terminal | *Citadel and Citadel Securities* *(April 2025)*

- Finished as **First Runners Up (2nd place)** among **30,000**+ participants across the nation with a prize money of 1000 USD in the AI programming contest involving **strategy-based defense game** in single-elimination matchups

Researcher, iGEM IIT Bombay | *Paris, France* *(Oct 2024)*

- Won IIT Bombay's first-ever **Gold** at iGEM among **400**+ teams; nominated for **Best Climate Crisis Project**
- Engineered **lipidome** and **calcification** pathways in **E. Huxleyi** for enhanced carbon capture using genetic tools

Experiences

Summer Research Internship | *Technical University of Munich, Germany* *(May 2025 - Present)*

- Designed RL pipelines with **Q-learning** and **Actor-Critic** to learn ϵ-optimal strategies in black and grey-box
- Implemented **PAC**-based model checking for **MDPs** and **SMGs** using **Stormpy** for unbounded reachability
- Evaluated **convergence**, policy performance, and error guarantees across **PRISM benchmark models**

Jane Street SEE IIT | *Hong Kong SAR* *(Dec 2024)*

- Learnt **OCaml**, Jane Street's favored programming language, along with the ins and outs of functional programming
- Created a modern version of the **classic snake game** by implementing **trie data structure** in **ocaml**

Key Projects

Operating Systems Enhancements | *Course project* *(Jan 2025 - May 2025)*

Course: Operating Systems Labs, Instructor: Prof. Mythili Vutukuru

- Extended the **xv6 OS** with a **weighted round-robin scheduler**, **demand paging**, and **copy-on-write** fork
- Built a Unix shell from scratch with foreground/background execution,**signal handling**, **parallel/serial** execution, process groups; **concurrency primitives** (threads, semaphores) and **IPC** via shared memory, pipes, and sockets

MinNetSim: Network Simulator | *Seasons of Code* *(May 2025 - Present)*

Web and Coding Club, IIT Bombay

- Implemented a **OOPS**-based discrete event network simulator with dynamic scheduling and packet routing logic
- Designed UML-based architecture using **smart pointers** to support **IP**/**TCP** for congestion-aware topologies
- Simulated network scenarios with variable **link delays**, **queueing**, and routing dynamics to analyze performance

Top-k Selection & Range-Query | *RnD Course Project - Prof. Sujoy Bhore* *(Jan 2025 - April 2025)*

- Studied **approximation** algorithms for **bicriteria top-k** selection with **diversity**–**utility** trade-offs in **O(n+klogk)**
- Implemented **Max-Sum** and **Min-Max** diversification algorithms using ϵ-**net** constructions and greedy methods

Plagiarism Checker | *Course project* *(Aug 2024 - Nov 2024)*

Course: Data Structure & Algorithms Lab, Instructor: Prof. Ashutosh Gupta

- Implemented efficient algorithm for **exact** and **approximate** string matching leveraging **Lavenshtein's algorithm**
- Designed modular **APIs** for integrating student, professor and submission objects using **queues** and **sets**
- Implemented **multithreading** using mutex locks and condition variables for efficient real-time submission handling

Other Projects

Predictive Analytics and Time series Analysis | *Course project* *(Aug 2024 - Nov 2024)*

Course: Data Analysis and Interpretation, Instructor: Prof. Sunita Sarawagi

- Conducted comprehensive time series analysis analysing stationarity through **ACF, PACF** and **Dicky Fuller test**
- Developed fraud detection model using **KDE(Epanechnikov kernel)** by identifying low-probability transaction
- Implemented Nadaraya-Watson kernel regression for estimation and reduced dimensions using **PCA** and **tSNE**

Image Processing and Reconstruction | *Course project* *(Jan 2025 - May 2025)*

Course: Medical Image Computing, Instructor: Prof. Suyash Awate

- Bayesian MR **denoising** using gradient MAP with 4-neighbour **MRF priors** and **sparse dictionary learning**
- Developed CT **Radon -FBP -ART** pipelines and MR brain segmentation via **fuzzy-C-means** and **GMM-MRF**
- Reconstructed histopathological images for **breast cancer detection** using **Generative Adversarial Networks**

Price Moment forecasting using Double Ensemble | *Course project* *(Jan 2025 - May 2025)*

Course: Machine Learning, Instructor: Prof. Pushpak Bhattacharya

- Developed **ensemble** learning techniques using multiple baseline models like **gradient boosting** and **random forest** with a dynamic decay-factor in **sample-reweighting** trajectories and optimized via stacking (meta-learner)
- Engineered a robust **feature-selection** pipeline by fusing correlation, information-gain, and shuffle-based importance

Maximising Returns in Stock Trading using Deep RL | *Finsearch* *(May 2024 - July 2024)*

Finance Club, IIT Bombay

- Developed a **Deep-Q Network (DQN)** model for **CartPole v1**, gaining hands-on experience in RL algorithms
- Analyzed **Nifty100** data with ARIMA and LSTM models, achieving a **Sharpe Ratio** of 1.71 based on **ROI**

Bash-Grader with Version Control | *Course project* *(Jan 2024 - April 2024)*

Course: Software System Labs, Instructor: Prof. Kameswari Chebrolu

- Implemented automated **Gaussian Distribution-based relative grading**, comprehensive performance analysis with detailed statistical breakdowns and incorporated **spelling correction** using **Levenshtein's Algorithm**
- Generated **individualized report cards** with **personalized performance** and incorporated **git VCS**

Karatsuba Multiplier Algorithm & sorting in MIPS | *Course Project* *(Aug 2024 - Nov 2024)*

Course: Digital Logic & Computer Architecture, Instructor: Prof. Bhaskaran Raman

- Designed a **16-bit Binary Multiplier** using **Karatsuba algorithm** in **Verilog HDL** and furthur optimized it for **32-bit binary** using Karatsuba multiplier by **sequential** circuit thereby making the algorithm more efficient
- Implemented **Heap Sort**, **Merge Sort** and **Binary Search** algorithms in **MIPS 32** Assembly language

String Algorithms | *Course project* *(Aug 2024 - Nov 2024)*

Course: Data Structure & Algorithms Lab, Instructor: Prof. Ashutosh Gupta

- Designed an **autocomplete** recommendation using **tries** based on scores on **user text history** and **word context**
- Implemented the **Knuth-Morris-Pratt** search algorithm and various data structures for storing textual data efficiently including **tries** and **suffix trees** from scratch and benchmarked their performance for runtime efficiency

Position of Responsibility

Dept. Academic Mentor, SMP | Selected among **70+** applicants to mentor sophomores *(May 2025 – Present)*
Council Member, CSEA | Design nominee; created graphics and merchandise *(Jul 2024 – April 2025)*
Mentor, Learnerspace | Mentored **50+ students**; created Synthetic Biology content *(May 2024 – Jul 2024)*
Mentor, WiDS | Created content on Twitter Sentiment Analysis using NLP *(Dec 2024 – Jan 2025)*

Courses Undertaken

Computer Science Software Systems Lab, Discrete Structures, Data Structures & Algorithms †, Digital Logic Design & Computer Architecture †, Data Analysis & Interpretation, Logic for CS , Game Theory & Algorithmic Mechanism Design, Artificial Intelligence & Machine Learning †, Operating Systems †, Design & Analysis of Algorithms, Medical Image Computing, Computer Networks†*, Abstraction & Paradigms of Languages†*, Automata Theory*

Mathematics Calculus, Linear Algebra & Differential Equations

† *Course with corresponding Lab * To be completed by Dec 2025*

Extracurricular Activities

- **First Runners Up** in the **XLR8 Competition, ERC club IIT Bombay** by engineering a robot *(2023)*
- Top 16 finallist in **CodeWars v4**, **Wncc IITB** involving maximum space-spanning algorithm in **pygame** *(2024)*
- Proficient in pencil shading, water colour and drawing still life in **Fine Arts**, **National Sports Organization** *(2023)*
- Performed solo and group dances in **Annual Insync Dance Show, CSE Trad day** and **freshers night** *(2023,2024)*