Nivesh Aggarwal | **22B0912**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 09/04/2004

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	9.37
Intermediate	CBSE	Sri Guru Harkrishan public school	2022	97.00%
Matriculation	CBSE	St. Anne's Convent School	2020	97.20%

Scholastic Achievements

- Awarded **AP (Advance Performer)** grade for excellent performance in **Computer Programming and Utilization** and **Calculus I** both awarded to **top 1% out of** 1400+ **students** at IIT Bombay *(2023)*
- Achieved **All India Rank of 60** in Joint Entrance Examination Advanced among 150,000+ students *(2022)*
- Achieved **All India Rank of 121** in Joint Entrance Examination Main among 1,000,000+ students *(2022)*
- Awarded the prestigious **Kishore Vaigyanik Protsahan Yojana (KVPY)** scholarship given by Govt of India and IISc achieving **All India rank of 9 in SX stream** and **32 in SA stream** *(2020, 2021)*
- Receiving **National Talent Search (NTSE)** scholarship by NCERT, Government of India *(2020)*

Olympiads

- Won **Silver medal** at the 54^{th} *IChO* ranking **43^{rd} globally** and **1^{st} in the Indian contingent** *(2022)*
- Ranked in **top 6** in **Indian National Maths Olympiad (INMO)** and **shortlisted for IMO** team *(2022)*
- Cleared **Indian National Physics Olympiad (INPHO)**, ranking among the **top 39** students in India *(2022)*
- Among the **top 102** students to clear **Indian National Astronomy Olympiad (INAO).** *(2021)*
- Cleared National Standard Examination in Junior Science **(NSEJS)** ranking in the **top 1% nationally** *(2019)*

Work Experience

Improving Trading Models
(Summer 2025)

Intern: Quantitative Researcher — *Graviton Research Capital*

- Worked on **improving non linear model training pipeline** by **normalizing the input features** given.
- **Optimised loss function** used in model training resulting in **improvement of 2 percent** across markets
- Explored and **identified additional areas with potential for improvement**, conducting brief proof-of-concept experiments that yielded **improvements of 1-2 percent** and documented the findings for future reference
- Worked on a **simulator for testing** models, allowing us to compare them faster and provide more flexibility

Research Experience

Timed Seperations
(January 2025 - Present)

Guide: Prof. Chetan Kamath | R&D Project — *IIT Bombay*

- Studied two new cryptographic primitives - **Time Lock Puzzles(TLPs)** and **Verifiable Delay Functions(VDFs)** and explored the currently done research on the existence and properties of these primitives and their relationship
- Worked on a proposed construction of VDFs from TLPs and **proved that black box reductions will not work**
- Working on **Designing a set of oracles** w.r.t which TLPs exist but VDFs do not exist in a black box manner

Revenue Maximization in Network Auctions
(April 2025 - Present)

Guide: Prof. Swaprava Nath | R&D Project — *IIT Bombay*

- Modeled scenarios like **real estate purchase** by directed weighted graphs called **Intermediary Network Auction**
- Designed **truthful, rational** mechanism for real world networks to maximize revenue in **Bayesian** settings
- Reduced the well-studied **Unit Demand Auction** to our network setting proving that our **general case is hard**

Projects

P2P Blockchain Simulation
(Spring 2025)

Guide: Prof. Vinay J. Ribeiro | Course Project: Introduction to Blockchains, Cryptocurrencies and Smart Contracts

- Made a **discrete event simulator** for **Proof of Work P2P blockchains** simulating transaction generation, block mining and verification, forwarding, forks and timeouts and **modelling variables** like propagation delays
- Simulated **selfish mining** and **eclipse attacks** by creating a group of **coordinated malicious nodes** that communicate via a dedicated overlay network and **designed and implemented mitigations** for these attacks
- Made DEX via an **automated market maker** and a smart contract that exploits **arbitrage** opportunities on Solidity

Compiler for Subset of C
(Spring 2025)

Guide: Prof. Uday Khedkar | Course Project: Implementation of Programming Languages Laboratory

- Designed and implemented a compiler for a **C like high-level language** with support for **fundamental functionalities** like conditionals, loops, function calls, and nested scopes, along with **robust error handling**
- Developed **complete compilation pipeline** including lexical analysis, code parsing, semantic analysis, generation of multiple intermediate representations(AST, TAC, RTL) and **generation of final MIPS assembly** code

MangoDB: An Improved IMDB *(Spring 2025)*

Guide: Prof. S. Sudarshan & Prof. Suraj Shetiya | Course Project: Database and Information Systems Lab

- Developed an IMDb-like platform using **PostgreSQL, React.js & REST APIs** offering optimized advanced search, personalized recommendations and features to follow other users and see their reviews and ratings
- Implemented a **secure signup with email** verification and **rate limiting** for protecting against DOS attacks
- Implemented a review system **integrating a pretrained language model** for review summarization and designed a **weighted recommendation algorithm** leveraging genre, decade, cast and ratings to enhance user engagement

Basics of Operating systems *(Spring 2024)*

Guide: Prof. Mythili Vutukuru | Course Project: Operating Systems

- Improved xv6 OS by incorporating **advanced system calls**, **copy-on-write fork**, implementing a **weighted round robin scheduler** and page fault handler and built a simple shell to execute user commands like bash shell
- Implemented a **file system** with all basic functions like reading, opening and deleting files on an emulated disk.

Sound Based Network *(Autumn 2024)*

Guide: Prof. Vinay J. Ribeiro |Course Project: Computer Networks Lab

- Implemented a **sound-based link layer protocol** using **4-bit** encoding with **RZ signaling** for transmission
- Designed an error control system using a custom CRC-k algorithm with Hamming distance 5 and Welch's method for signal denoising; integrated CSMA/CA with RTS/CTS and dynamic backoff to efficiently manage collisions

Algorithmic Trader *(Autumn 2023)*

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

- Implemented market and maintained order book in **C++** to **match buy and sell** orders. Used **median filtering** and **detecting arbitrage** opportunities in the market in asymptotically polynomial time to make a profit.
- Used **OOPS** and implemented **customised data structures** in **C++** to make our algorithms more efficient.

Cryptography in Practice *(Spring 2024)*

Guide: Prof. Manoj Prabhakaran |Course Project: Cryptography and Network Security

- Implemented various cryptographic encoding, Hashing, Signature, Certification and commitment schemes.
- Used various attacks like **timing based side channel attack**, **Length extension attacks** and various faults in implementation like **key repurposing, Nonce Reuse**, etc. to break various modern cryptographic schemes.

Technical Skills

Languages:	C/C++, Python, LaTeX, Bash, JavaScript(Node.js, React.js), MIPS, x86 assembly, HTML
Software:	MATLAB, Git, PostgreSQL, Fusion360, Arduino-IDE, WireShark, Doxygen, Spreadsheet
Libraries:	NumPy, Pandas, Tensorflow, Networkx, Matplotlib, Z3, scipy, Pytorch, Scikit, PySpark

Position of Responsibility

Mentor-Brain tumor detection using CNN | Winter in Data Science 2023 *(Winter 2023)*

- Guiding students in mastering **Convolutional Neural Networks (CNNs)** and hands-on implementation using **PyTorch** for robust **Brain Tumor Detection** models that can detect tumor upto the accuracy of 89%
- Taught fundamentals of **Neural Networks**, emphasizing the **Linear algebra** and **Calculus** involved

Teaching Assistant | CS783: Theoretical Foundations of Cryptography *(Autumn 2024)*

- Helped in making solutions for quizzes and grading them. Also conducted paper-solving sessions for all the exams

Relevant Courses

Computer Science	†Computer Architecture, †DSA, †AI/ML, Data Analysis and Interpretation, System Software Lab, Design and Analysis of Algorithms, †OS, Logic and Theory of Computation, Geometric Algorithms, Cryptography, †Programming Paradigms, †DBIS, Computer Graphics*, †Networks, †Implementation of Programming Languages, Mechanism Design, Blockchains
Mathematics	Discrete Structures, Optimization Models, Calculus, Linear Algebra, Differential Equations
Others	Economics, Management, Makerspace, Operations Analysis, Combinatorial Game Theory

† The course has a corresponding lab *Ongoing

Extracurriculars

- Selected among the top 50 students from India for **Jane Street's SEE IIT Program** in Hong Kong *(2023)*
- **Represented India** as an adjudicator in **United Asian Debating Championship, Malaysia** *(2023)*
- Awarded **Best Design Award** in **XLR8** for the development of a **Wi-Fi controlled bot** using **ESP32** *(2022)*
- Created a **Business Model Report** on **Infosys** using **SWOT analysis** and understanding their strategies *(2022)*
- Completed an year long **National Sports Organisation (NSO) programme** in **Guitar** at IIT Bombay *(2023)*
- **Ranked first** in **Chemenigma** conducted by India's largest SciTech Cultural festival **Pravega, IISc** *(2023)*