Nihar Ketankumar Hingrajia | **22B1044**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 17/11/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	8.81
Intermediate	CBSE	Krishna International School	2022	96.40%
Matriculation	icse	Saint Paul's School	2020	93.60%

Pursuing Minor degrees in **Industrial Engineering & Operations Research** and in **Management Studies**

Scholastic Achievements

- Achieved **AIR of 56** in the **Joint Entrance Examination Advanced** among the 160,000+ candidates *('22)*
- Secured **All India Rank of 154** in **Joint Entrance Examination Main** among 900,000+ students *('22)*
- Awarded **Kishore Vaigyanic Protsahan Yojana SX** fellowship with **AIR 295** among 100k+ students *('22)*
- Achieved **99.99 percentile** in **GUJCET** conducted by Gujarat Education Board out of 113000+ students *('22)*

Key Projects

Tetris Playing AI *(Summer 2023)*

Institute Technical Summer Project | Institute Technical Council, IIT Bombay

- Designed and implemented a custom Tetris game from scratch, utilizing **OpenCV** library for game developement
- Trained a **Deep Q-Network** model using **PyTorch** for **reinforcement learning** of decision-making strategies
- Attained a remarkable performance by clearing a highest of **21000+ lines** & reaching an average of **1000+ lines**
- Demonstrated the remarkable potential of AI in problem-solving by leveraging reinforcement learning techniques

Data Analysis *(Autumn 2023)*

Course Project: Data Analysis & Interpretation | Guide: Prof. Ajit V. Rajwade

- Analysed signal noise reduction techniques such as **moving statistical filtering** with the help of **MATLAB**
- Performed a comparative analysis between two MRI scans of the brain and used **MATLAB** to graphically present the variation of **correlation coefficient and Quadratic Mutual Information** with shifts in those images
- Validated bandwidth choices by **quantifying Mean Squared Error** between estimated and true probability density functions, ensuring robust parameter selection and accuracy in density estimation as per the data-set

sMARToptimization *(Autumn 2023)*

Course Project: Optimization Models | Guide: Prof. Avinash Bharadwaj

- Implemented **linear optimization models** to strategically position delivery centers for a cloud gorcery business
- Utilized optimization algorithms to determine the optimal workforce at each delivery center, minimizing operational costs and delivery times and maximizing revenue and overall user experience for the cloud grocery business
- Engineered a **highly adaptable model**, adept at seamlessly adjusting to changing market demands ensuring the business can efficiently expand its services without compromising user experience or incurring additional expenses

Algorithmic Trading Simulator *(Autumn 2023)*

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

- Designed and implemented an **algorithmic trading simulator**, involving order book analysis, simulation of a virtual market and identification as well as creation of profitable **arbitrage** opportunities for maximizing profit
- Developed strategies to insert orders to create arbitrage opportunities, displaying profitability in dynamic markets
- Extended the project across **multiple simulated markets**, capitalizing on cross-market arbitrage opportunities

Stock Trading Optimization *(Summer 2023)*

Finsearch | Finance Club

- Implemented a highly sophisticated Options Trading Optimization system using **Reinforcement Learning**, utilizing a **Deep Q-Network** specifically trained on Nifty 50 data, maximizing the risk-adjusted returns
- Employed advanced feature engineering techniques, such as **variable transformations** & **interaction terms**, to meticulously enhance the state-space representation & improve model generalization on the given training data
- Conducted **performance benchmarks**, comparing the efficiency of DQN and LSTM in options trading scenarios

Other Projects

Musical chord Encoder *(Autumn 2023)*

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

- Designed **VHDL-based** musical chord encoder implementing data buffering mechanisms using **ModelSim**
- Analysed consecutive input notes for chord formation in **real-time** and catalogued in an output-array

Line-Following Mountain Cargo Bot *(Spring 2023)*

Course Project: Makerspace | Guide: Prof. Ankit Jain, Prof. Joseph John

- Created **Arduino-based 4-wheeled robot** capable of tracking & moving along a white line on a dark background using 2 IR sensors, modeled & designed in **Fusion360 & LaserCAD** ensuring its structural integrity & precision
- Capable of transporting a load of 300 grams on a **30°incline** & offload it and **back-trace** to the initial position

Library Management System *(Winter 2023)*

Self Project

- Developed the front-end of a web-app using **Angular** along with **HTMl, CSS, JavaScript** to organise and record details about books like book category, the borrower and dates of issue and return and fines in a library

Searching and Sorting in MIPS *(Autumn 2023)*

Course Project: Digital Logic Design & Computer Architecture | Guide: Prof. Biswabandhan Panda

- Implemented **Heap Sort and Binary Search** in **MIPS** to execute the program in **O(nlogn)** time complexity
- Gained insight into the core workings of a computer by writing code in the form of basic instructions in MIPS

Longest Path in IIT Bombay *(Autumn 2023)*

Course Project: Optimization Models | Guide: Prof. Avinash Bharadwaj

- Utilized a **linear programming** solver to discover the longest closed Hamiltonian path on the IIT Bombay map
- Applied **graph theory** to model and analyze the map and linear programming to optimize the path length

CricSweeper *(Spring 2023)*

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

- Created an interactive web-game using **HTML, CSS and JavaScript**, themed on a fusion of minesweeper and cricket, having a single and a multi-player mode, adding to the versatility and fun-factor of the game
- Integrated 3 difficulty levels & a time-constraint system making the game more dynamic, replayable & enjoyable

Position of Responsibility

Web & Coding Club Convener *(2023)*

Web and Coding Club, IIT Bombay

- Conducting a spectrum of tech events including engaging sessions of distinguished speakers in Competitive Programming & Blockchain Development & Hackathons to foster a culture of technological enthusiasm & innovation
- Designed assignments projects on **neural networks, recurrent neural networks, transformers & Large Language Models (LLMs)** like clustering images into pizza vs non-pizza, sentiment-analysis of movie reviews & chat-bots by fine tuning pre-trained transformers under Learner's Space course on Natural Language Processing
- Evaluated 5+ assignments in the Learner's Space course of Natural Language Processing, extensively using libraries like **Numpy, Matplotlib, PyTorch, spaCY, Pandas, TensorFlow & Hugging Face** in a team of 4 used for data prepossessing, word embeddings, defining the machine learning model & training the model

Courses Undertaken

Computer Science:	Computer Programming and Utilization, Computing and Science, Software Systems Lab, Data Structures and Algorithms (& lab), Discrete Structures, Data Analysis and Interpretation, Digital Logic Design and Computer Architecture (& lab), Design and Analysis of Algorithms*, AI/ML (& lab)*, Logic and Theory of Computation*
Mathematics:	Calculus, Linear Algebra, Differential Equations, Optimization Models
Others:	Introduction to Innovation & Entrepreneurship, Introduction to Design, Quantum Physics, Classical Physics, Makerspace, Physical Chemistry, Organic and Inorganic Chemistry, Biology, Economics, Operations Management*, Design Thinking for Innovation*

**To be completed by May 2024*

Technical Skills

- **Languages:** C++, C#, Python, AWK, MATLAB, VHDL, MIPS, x86
- **Development:** LaTeX, HTML, CSS, JavaScript, Bootstrap, Angular, Git
- **Tools:** Unity, Blender, Bash, Make, sed, Doxygen, docker, Fusion360, LaserCAD, ModelSim, Fracktory
- **Libraries:** gnuplot, NumPy, Matplotlib, PyTorch, TensorFlow, SciKit-learn, Keras, Pandas, OpenCV, spaCy

Extracurriculars

- Volunteered to teach underprivileged school children under the **NSS programme**, IIT Bombay. *(2022-23)*
- Designed & engineered an app-controlled bot using Arduino for the competition **XLR8** organised by ERC *(2023)*
- Developed & pitched business model for cloud kitchen based startup in **EnB Buzz** Business competition. *(2022)*
- Placed among the **Top 7** teams on the annual national-level business quiz conducted by InQube. *(2023)*
- Achieved 1^{st} **position** in road-race & 2^{nd} **position** in short-race & long-race in skating in the city *(2019)*
- Secured 1^{st} **position** in the Football competition during the annual sports day in Saint Paul's School *(2019)*