Tec Narayan Brahmachari | **22B0982**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 06/01/2005

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	8.62

Pursuing **Minor** in department of **Mathematics**

Scholastic Achievements

- Secured **100 percentile** in Joint Entrance Examination Mains in **Physics** among **1 million candidates** *2022*
- Ranked among the **top 55 teams** in the **Tower Research Limestone Data Science Challenge** *2024*
- Achieved a **top-230** ranking out of 7970 participants in the **Indian Olympiad Qualifier in Astronomy** *2022*
- Ranked in the **top 1 percent** in the **Joint Entrance Exam** (Advanced) among $\sim$ **150,000** candidates *2022*
- Cleared **PRMO** from Maharashtra-Goa Region and appeared for **Regional Mathematics Olympaid** *2020*
- Secured **All India Rank 5** in IPM (Institute for Promotion of Mathematics) among **1200 candidates** *2022*
- Received the prestigious **KVPY fellowship** with **All India Rank 630 in SA and 760 in SX** *2021, 22*

Research Experience

Automata Tutor - Problem Generation — Summer '24

Prof. Jan Křetínský, Masaryk University (project with Technical University of Munich) — *Research Internship*

- Implemented a **PDA equivalence checker** using **probabilistic methods** by random testing on strings of various length
- Developed a **CFG problem generator**, implemented conversion to **CNF**, and used **CYK** for CFG membership problem
- Implemented **DFA equivalence checker**, utilizing **indistinguishability relations** and **state minimization algorithm**
- Worked on code to find **symmetric differences** in student **DFAs**, detecting **deviations**, **extra states**, and **wrong languages**

Key Projects

Image Captioning — Summer '23

Web and Coding Club, IITB — *Summer Project*

- Developed an advanced Image Caption Generator using **CNN** for feature extraction, **LSTM** for sequence modeling, **Transfer Learning**, and **NLP techniques**, integrating pretrained **ResNet** and **word embeddings** for enhanced performance
- Implemented various architectures and techniques, including **beam search** and explored **dot-product attention** in RNN

Geometric Algorithms — Spring '24

Prof. Sujoy Bhore, IITB — *Course Project*

- Implemented **Fortune's Algorithm** for **Voronoi Diagrams**, **Trapezoidal Maps** for point location, and used **DCEL**
- Reviewed and delivered a detailed presentation on a research paper **No-Dimensional Tverberg Theorems and Algorithms**

Algorithmic Trading — Autumn '23

Prof. Ashutosh Gupta, IITB — *Course Project*

- Executed **trading strategies**, including **arbitrage** and **median filter**, while managing the order book through **self-customised data structures** to store and retrieve data efficiently, to match compatible stocks **optimizing trade execution**
- Developed a market simulation with diverse traders, and created an autotrader achieving **profitability in polynomial time**

1-player and 2-player Games — Summer '23

IITB — *Self Project*

- Developed **Chess** and **Othello engines** in **C++** with **minimax** and **alpha-beta pruning**, and created an advanced **Chess engine** using **Monte Carlo Tree Search (MCTS)** and **Upper Confidence Bound (UCB)** for efficient node expansion
- Developed **Sudoku solver** using backtracking and **Wordle solver** leveraging probabilistic methods to win under 4 moves

Cache Replacement Policies and Prefetchers — Autumn '23

Prof. Biswabandan Panda, IITB — *Course Project*

- Implemented and compared **cache replacement policies** (LRU, FIFO, LFU, BIP) for **L2C cache** using ChampSim
- Developed a **Stream Prefetcher** at **L2 level**, implementing monitoring regions and the **LRU eviction policy**

Snakes using Reinforcement Learning — Summer '23

Maths and Physics Club, IITB — *Summer Project*

- Developed the classic **Snakes** game in Python using **Pygame**, incorporating AI gameplay utilizing **Deep Q-Networks (DQN)** and **CNNs** to optimize performance, implemented the **DDQN** network to stabilize and improve the training phase

Extracurricular Activities

- **2nd Prize** in **Rubick's Cube** Competition at **Freshita IITB** with **best solve time of 14.59 seconds** *2023*
- Completed the year-long rigorous training camp conducted by **National Cadet Corps (NCC)** at **IIT Bombay** *2022-23*
- Participated in **XLR8** and **successfully built** a **RC-car** that completed a **stunt track** at **IIT Bombay** *2022*