Nikhil Manjrekar | **200050088**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 6/11/2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	
Intermediate	CBSE	Indore Public School	2020	91.40%
Matriculation	CBSE	Chameli Devi Public School	2018	92.20%

Scholastic Achievements

- Secured an **All India Rank 267** in **JEE Mains** among **1.1 million** candidates *('20)*
- Secured an **All India Rank 200** in **JEE Advanced** among **2.5 lakh** registered candidates *('20)*
- Awarded the **Kishore Vaigyanik Protsahan Yojana (KVPY)** fellowship for **AIR 716** *('20)*
- Ranked among the **National Top 1%** to clear **NSEA** and **NSEC** organised by IAPT *('19)*

Professional Experience

NLP Data Pipeline | *Summer Internship* *(June'22-July'22)*

Babblebots.ai

- Developed an **Annotator** application with **Django backend** for manual tagging of outputs from **ML models**
- Developed the **pipeline** to inject the data periodically from **PostGres** database into annotator automatically
- Implemented model wise **segregation** of Data from cloud storage to facilitate model training after manual tagging
- Worked on automation of **deployment** of newly trained model, based on its performance on a **validation set**

Key Projects

P2P File Transfer Network | *Course Project* *(Feb'22-April'22)*

Guide: Prof. Kameshwari Cherbrolu, Department of Computer Science and Engineering, IIT Bombay

- Developed a clone of **GNU gnutella** using **Socket Programming** in **C++**, for peer-to-peer file transfer
- Implemented **Multithreading** to handle all **TCP connections** for a node that acts as both a Client and Server
- Scrutinized possible **Deadlocks** and worked out solutions by setting appropriate concurrency **primitives** in place
- Enabled file search and transfer within the network from the immediate as well as next-hop neighbors using **BFS**

Music Generator | *Institute Technical Summer Project* *(April '21-July '21)*

Institute Technical Council, IIT Bombay

- Successfully trained and fine tuned **Neural Networks** to generate novel and melodic music from initial **seed**
- Formalised the problem of **Generating Music** as **next-note prediction** problem which uses recurrence-based language models that are used in **NLP** like **LSTM** because of their ability to retain **long-term dependencies**
- Utilized **Music21** library to preprocess and convert raw audio in **MIDI** format into **musical notes and chords**
- Implemented **Attention** based **bidirectional LSTM** along with **Embedding layer** for dimensionality reduction using PyTorch to produce instrument based (piano) music with rehashed melodic structures

Float Moodle | *Course Project* *(Sept '21- Nov '21)*

Guide: Prof. Amitabh Sanyal, Department of Computer Science and Engineering, IIT Bombay

- Collaborated in a **team of 4** to design and build an interactive **Modular Dynamic Learning Environment** to provide an efficient platform for distributing course material and managing assignments submissions of users
- Added **Discussion Forums** and **Direct messaging** feature for users to interact with instructors and ask doubts.
- Integrated a **command line interface** for downloading course material, deploying courses etc. and used **Django Rest Framework** to create **API endpoints**, enabling easy access with appropriate user authentication

Scotland Yard | *Course Project* *(Oct '21)*

Guide: Prof. Amitabh Sanyal, Department of Computer Science and Engineering, IIT Bombay

- Refined the **Java based Client-Server Architecture Model** allowing users to play famous **Scotland Yard**
- Designed and built a **Moderator** for the game, capable of handling **client** threads and updating game's state
- Incorporated **Multithreading** to handle multiple player joining and leaving the game and carefully examined and handled **critical section** through **synchronization primitives** and **locks** governed by the moderator

Semantic Segmentation | *Self Project* *(May'22)*

- Implemented model for **pixel-wise** classification of images in **Oxford IIIT-Pet** dataset of pets of **37** categories
- Implemented the **GPU** optimized **U-Net** architecture in **PyTorch** that was optimized using **Adam** optimizer

16-Bit RISC based processor | *Course Project* *(April'22-May'22)*

Guide: Prof. Virendra Singh, Department of Electrical Engineering, IIT Bombay

- Devised an efficient 25 state **finite-state automaton** for implementing a reduced instruction based CPU with 16 bit instruction, 8-registers and 4MB of RAM and synthesised the processor components using **Quartus Prime**
- Using **VHDL** programmed the processor capable of performing basic arithmetic and memory read/write operations
- Created a **Python based Assembler** for translating assembly into machine code which is executed on CPU

Rush Hour Game | *Course Project* *(Feb'22)*

Guide: Prof. Ashutosh Gupta, Department of Computer Science and Engineering, IIT Bombay

- Implemented a **SAT solver** using **z3py** library in Python to encode the solution for famous **Rush Hour** game
- Implemented **DPLL** algorithm based on backtracking to find a valid solution within specified number of moves

Github Profiles | *Course Project* *(Aug '21-Sept '21)*

Guide: Prof. Amitabh Sanyal, Department of Computer Science and Engineering, IIT Bombay

- Developed a web application using **Django** backend-framework for users to view github profiles of other users
- Securely deployed the application on **Heroku** server while taking care of **Environment variable privatisation**
- Incorporated facility to make calls to **API endpoints** of User's github profile with **extensive exception handling** to provide uninterrupted and seamless experience to users

Other Projects

Image Generation using VAE | *Self Project* *(May'22)*

- Trained a **Variational AutoEncoder (VAE)** that uses multiple layers of **ConvNet** in the **Encoder** part to generate **mean** and **variance** vectors of **Gaussian** distribution later used by **Linear Decoder** for **sampling**

Statistical Stock Market Analysis | *Summer of Codes* *(May'22)*

Web and Coding Club, IIT Bombay

- Programmed and designed a **Markov Decision Process** to trade in a **State and Action** dependant market and used **Dynamic Programming** algorithm to iteratively optimize the **Bellman's Equation**

Mandelbrot Zoom | *Course Project* *(Oct '21-Nov '21)*

Guide: Prof. Bhaskaran Raman, Department of Computer Science and Engineering, IIT Bombay

- Created visual representation of a **Mandelbrot set** upto an arbitary level of detail using C++ and **SDL** graphic library to make it more **Dynamic and Interactive** by adding features like zoom-in and zoom-out.

Study Planner Android Application | *Course Project* *(Dec '21)*

Guide: Prof. Amitabh Sanyal, Department of Computer Science and Engineering, IIT Bombay

- Created a **study planner** android application with the use of **Java framework** in **Android Studio**
- Designed interface to create events for daily schedule that are displayed in tabular format category wise

Bash Autograder | *Course Project* *(Aug'21)*

Guide: Prof. Amitabh Sanyal, Department of Computer Science and Engineering, IIT Bombay

- Built an autograder using **Bash** for organizing and evaluating **C++** coding assignments submitted on a website

Technical Skills

Languages	Proficient in C++, Python | Familiar with: Java, MATLAB, VHDL, Bash, AWK, Sed
Development	HTML, CSS, JavaScript, Bootstrap, PostgreSQL, Django, Angular, MySQL
Software	Docker, Git, LaTeX, Quartus, Wireshark, NS3
Packages	Numpy, pandas, matplotlib, FLTK, PyTorch

Relevant Courses

- **Mathematics and Science:** Calculus, Linear Algebra, Differential Equations,
- **Computer Science:** Data Structures and Algorithms, Design and Analysis of Algorithms, Discrete Structures, Data Analysis and Interpretation, Logic for Computer Science, Computer Networks, Software Systems Lab, Computer Architecture, Automata Theory*, AI and ML*, Operating Systems*,
- **Others:** Quantum Physics and Application, Electrical and Electronic Circuits, Economics

Extracurricular Activities

- Completed a year long **National Sports Organisation (NSO)** programme in **Badminton** at IITB
- Attended and succesfully completed **LaTeX bootcamp** by **Technical Summer School** at IIT Bombay
- Mentored a group of students in high school, helped them in their preparation for **JEE Mains & Advanced**
- Actively participated and won several **Fine Arts Competitions** in middle school