Aditya Nemiwal
Computer Science & Engineering
Indian Institute of Technology Bombay

210050004
B.Tech.
Gender: Male
DOB: 08/01/2004

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	
Intermediate	CBSE	St. Anselm's Pink City Sr Sec School	2021	96.40%
Matriculation	CBSE	St. Anselm's Pink City Sr Sec School	2019	96.40%

Scholastic Achievements

- Secured **All India Rank 29** in **Joint Entrance Examination (Advanced)** among 1,40,000+ students *(2021)*
- Acquired **All India Rank 89** in **Joint Entrance Examination (Main)** among 9,00,000+ students *(2021)*
- Awarded with the **KVPY Fellowship** twice with **AIR 167** and **AIR 364** in the SA and SX streams *(2019,2020)*
- Selected for the **Mathematical Olympiad Orientation Camp** conducted by **HBCSE** through **INMO** *(2021)*

Technical Experience

User-specific Advertisement Generation *Summer 2023*
Data Science Intern *Octro Inc*

- Designed a pipeline which uses **audio-video processing** and **encoder-decoder** based models trained with **specialised loss functions** to customise a part of an advertisement by modifying the audio content and lip movements of a speaker
- Conducted an extensive literature review on state-of-the-art approaches pertaining to **voice cloning, voice conversion** and **lip synchronisation**, followed by rigorous testing of various implementations to analyze performance
- Tweaked the recent Lip-Synchronisation networks to integrate **face enhancing** models to improve the output quality
- **Fine-tuned** the Voice Conversion model on a single speaker dataset in order to achieve significantly better results

Key Projects

Cache Hierarchy Optimisation for SAT Solvers *Spring 2023*
Course Project: Computer Architecture and Logic Design | Prof. Biswabandan Panda *IIT Bombay*

- Achieved significant improvement in the **IPCs** for multiple SAT solver traces studied using the **Champsim** simulator
- Implemented and investigated various **LLC (Last Level Cache)** replacement policies, including **MRU, LRU, Random, and Re-Reference Interval Prediction**, to optimize cache performance and minimize cache misses
- Explored different **cache inclusion policies**, such as **Inclusive**, **Exclusive**, and **NINE** (Non-Inclusive Non-Exclusive)
- Evaluated the effects of block size on cache performance by modifying the number of **sets and ways** while keeping the **ratio, product, or associativity** constant, effectively managing memory utilization and maximizing cache efficiency

Encrypted Databases | Reading Project *Spring 2023*
Course Project: Cryptography and Network Security - I | Prof. Manoj Prabhakaran *IIT Bombay*

- Thoroughly studied **CryptDB**, exploring the concept of encrypted databases and their implications for data security
- Developed a detailed project report summarizing methodologies of the CryptDB framework, like **layers of encryption** and **query based encryption**, which rely on various other schemes like **Order Preserving Encryption**

Railway Planner *Autumn 2022*
Course Project: Data Structures and Algorithms Lab | Prof. Supratik Chakraborty *IIT Bombay*

- Implemented a simplified version of a **Railway Planner** with the use of various **Data Structures** and **Algorithms**
- Developed an **Auto-Complete System** using **Tries**, facilitating search for railway stations while planning a journey
- Implemented the **Knuth-Morris-Pratt** algorithm to search for reviews which include a key word or phrase
- Using graph traversal algorithms like **BFS and DFS**, developed a journey searching algorithm to search for routes with a maximum number of given stops between a provided source station and a destination station

Service Rating Website (API Wrapper) *Autumn 2022*
Course Project: Software Systems Lab | Prof. Kavi Arya *IIT Bombay*

- Created a **full-stack website** for displaying the ratings and reviews of different hotels, restaurants, and movies
- Employed the python framework **Django** for back-end implementation and **Django-REST** for building web APIs
- Developed front-end UI in JavaScript library **ReactJS** and used online **APIs** for retrieving data for search results
- Developed features such as sorting the results based on average rating, prices for hotels or runtime for movies

Object Tracking and Detection using Deep Learning *Winter 2022*
Winter in Data Science *Analytics Club, IIT Bombay*

- Performed image data preparation using **OpenCV** and **PIL** on real-world datasets labelled using **Roboflow**
- Constructed an **object detection model** with a custom dataset and a tracker to aid in object counting, and to improve outcomes significantly by doing image **augmenting** and **pre processing**
- Trained **YOLOv4** on the **COCO dataset** to achieve high accuracy in person, vehicle, and object detection

Other Projects

Image Analysis and Processing via PCA *Autumn 2022*
Course Project: Data Analysis and Interpretation | Prof. Suyash Awate *IIT Bombay*

- Analysed the **principal modes of variation** for images of handwritten digits from the MNIST database using PCA and calculated the **eigenvalues** of the **covariance matrix** for all the images of a single digit
- Applied PCA on 28×28 pixel images from the MNIST database to **reconstruct** the image to an 84-dimensional basis such that the new 84-dimensional hyperplane **maximises the dispersion** of the original data within the hyperplane
- Used PCA to **approximate** a **linear relation** between two random variables from a given 2 dimensional distribution
- Generated a **representative** image of a fruit in a fruit data set using the **top 4 eigenvectors** and the mean image

Sliding Puzzle program using SAT Solvers *Spring 2023*
Course Project: Logic for Computer Science | Prof. Ashutosh Gupta *IIT Bombay*

- Converted a variant of the sliding puzzle to a **boolean satisfiability** problem using **First Order Logic**
- Implemented a python program using **Z3 Library** to check for an assignment which satisfies the boolean expression

Neural Network for Classification *Autumn 2022*
Course Project: Machine Learning for Remote Sensing - II | Prof. Biplab Banerjee *IIT Bombay*

- Implemented a three layer **Neural Network** from scratch in **Python** using **NumPy** to determine which Gaussian Distribution was more likely to generate a given point in a 2-dimensional plane
- Used **hyperbolic tangent activation** function for hidden layer and **softmax activation** for output layer

Competitive Coding | Learning Project *Summer 2022*
Summer Project: Seasons of Code *Web and Coding Club, IIT Bombay*

- Solved multiple algorithmic problems and participated in **over 20 CP contests** on various platforms like Codeforces
- Studied various paradigms such as **Dynamic Programming, Divide and Conquer, and Greedy Algorithms**
- Studied about **Graphs** and related algorithms like **DFS, BFS, Dijkstra's** algorithm and **Bellman-Ford** algorithm
- Explored various **algorithms** including `sort`, `lower_bound`, `find`, `binary_search` and **Containers** of **C++ Standard Template Library** such as `set`, `map`, `vector`, `stack`, `queue` along with the use of **iterators** in **STL**

Ludo Game *Spring 2022*
Course Project: Programming Paradigms Laboratory | Prof. Rushikesh Joshi *IIT Bombay*

- Implemented the multiplayer strategy game of Ludo in **C++** using **FLTK (Fast Light Toolkit)** Widget Library
- Used **Object Oriented** features such as multiple level inheritance, virtual classes and functions, class pointers
- Using **vectors and class pointers**, added multiple over the board features such as capturing others' pieces, breaking out of jail on rolls of 1 and 6, safe squares where a piece cannot be captured, and repeated turns

Technical Skills

Programming Languages	C/C++, Python, Java, JavaScript, Prolog, Sed, Awk, BASH
Softwares	LaTeX, Git, Doxygen, Sphinx
Data Science	MATLAB, PyTorch, NumPy, Matplotlib, OpenCV, SciKit
Development	HTML, CSS, JavaScript, Bootstrap, ReactJS, Django

Key Courses Undertaken

Computer Science	Data Structures and Algorithms†, Software Systems Lab, Discrete Structures, Design and Analysis of Algorithms, Abstractions & Paradigms in Programming†, Cryptography and Network Security - I, Logic for Computer Science, Computer Networks†, Computer Architecture†, Operating Systems*†, Automata Theory*
Data Science and AI	Machine Learning for Remote Sensing II, Data Analysis and Interpretation, Artificial Intelligence and Machine Learning*†
Miscellaneous	Calculus, Linear Algebra, Differential Equations, Quantum Physics and Application, Introduction to Electricity and Magnetism, Electrical and Electronic Circuits

† *Theory and Lab* * *To be completed by November 2023*

Extracurricular Activities

- Actively engaged in **Competitive Programming**, with maximum rating of **1772 on Codeforces** *(2022)*
- Completed a **year-long NSO** (National Sports Organisation) course on **Chess** during first year *(2021-22)*
- **Second** among 70+ participants in **Freshies Rapid Open** organised by **Dark Knight Chess Club IITB** *(2022)*
- Finished **second** in **CSEA Chess Tournament** conducted by **CSE Association, IIT Bombay** *(2022)*
- Trained for **4 years** in a **Hindustani Classical Music** course taught through Synthesizer *(till 2016)*
- Ranked **top 50** all over India in World Cube Association Rankings in **3x3x3 Cube Blindfolded** Solving (Mean of 3), **top 100** in **3x3x3 Cube Blindfolded** (Single Solve), and **top 500** in 2x2, 3x3, and 4x4 speed solving