Madhav Gupta	21D070043
Electrical Engineering	**Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology Bombay	**Gender: Male**
Specialization: Communication & Signal Processing	**DOB: 06/08/2003**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	
Intermediate	CBSE	St. Edmunds School	2021	98.60%
Matriculation	CBSE	Maheshwari Public School	2019	96.80%

Pursuing Minor degree in **Artificial Intelligence and Data Science** offered by CMInDS, IIT Bombay

SCHOLASTIC ACHIEVEMENTS

- Secured All India Rank **164** out of 1 million candidates who appeared for **JEE Main** examination *[2021]*
- Secured All India Rank **724** out of 150 thousand candidates who appeared for **JEE Advanced** examination *[2021]*
- Recipient of Kishore Vaigyanik Protsahan Yojana **(KVPY)** Fellowship organised by, **IISc Bangalore** *[2021]*
- Recipient of the prestigious National Talent Search Examination **(NTSE)** scholarship *[2019]*

TECHNICAL EXPERIENCE

IIT Bombay Racing - Driverless

Part of a team of 70+ students working on the design and fabrication of formula-type driverless electric race cars for competing in the driverless version of Formula Student International Engineering Competition held in Germany/UK"

Formula Student AI 2023 | Representing the Team at Silverstone   *[Jun '23 - July '23]*

- Part of the **First ever contingent** of the only Indian team to participate in **FS-AI 2023** at the Silverstone Circuit
- Established **CAN**(Controller Area Network) interface between **AI** unit and vehicle control unit of **Driverless Car**
- Successfully coded **Static Inspection** and **Autonomous Demo** codes, crucial prerequisites prior to **dynamic events**.

Design Engineer | System Integration   *[Jun '23 - Present]*

- Developing a **mock VCU Node** to seamlessly interface with the CAN node in **ROS** to simulate real car scenarios
- Developing a robust **CAN framework** in **C++** for seamless integration of the racecar with the Autonomous algorithms
- Creating an interactive **Terminal User Interface** in Linux for CAN communication & integrate with Driverless Car
- Providing **mentorship** to a group of 12 junior students, equipping them with in-depth knowledge of subsystem

Junior Design Engineer | System Integration   *[Aug '22 - Jun '23]*

- Developed **API** to decode & manipulate **CAN messages** captured from **car's run** from raw **MDF** file with DBC file & converted it to **Data Acquisition Terminal** compatible format using **asammdf, pandas** & **tkinter** library in Python
- Using **PyQt5** library, designed a new python-based interactive **GUI** for the car which displays critical parameters to monitor the **battery status** in car and tested serial communication between **Arduino IDE** and GUI using Python
- Optimally transformed C codebase for **CAN interface** by utilizing **ctypes** library to create **Python wrappers** for **API**
- Implemented **Virtual CAN** interface in **Linux** for Car's CAN signals using DBC file and **Cantools** library in Python.

KEY PROJECTS

Musify- Music Implementation using Artificial Intelligence   *[April '22 - July '22]*
Seasons of Code | Web and Coding Club, IIT Bombay

- Analyzed & filtered notes of piano above a **threshold frequency** from a MIDI file using music21 library in Python
- Implemented the **sliding window** approach on filtered notes to generate a series of input-output pairs as data
- Built model with 2 stacked **LSTM** layers incorporating **dropouts** & a fully connected layer with softmax activation
- Trained the model & generated **dynamic music notes** using a **random test input sequence** to predict output note following which the input sequence was updated with newly created note & used for **further generation of notes**

Limestone Data Challenge | Algorithmic Trading Hackathon   *[Mar '23 - Apr '23]*
*Organised by **Finance & Analytics Club**, IIT Bombay in association with **Tower Research Capital***

- Implemented **K-means algorithm** to group stocks into clusters based on similarities in **variance & mean of returns**
- Using various **regression models** on stocks of a given sector, predicted returns of indices to achieve **high correlation**
- Classified indices into known sectors of stocks with **maximum correlation** of predicted and actual indices returns
- Stood among the **top 58 teams** earning an **exclusive invitation** to a closed session with the **Tower Research Team**

Algorithmic Trading   *[Ongoing]*
Summer of Science | Maths & Physics Club, IIT Bombay

- Understood the basics of **algorithmic trading** and how it differs from **quantitative trading** and **automated trading**
- Analyzed trading strategies such as **mean reversion**, **momentum effect**, **paired switching**, and breakout strategy
- Implemented a research paper on **CNN-LSTM-based model** for accurate stock price forecasting of TATA Motors

Machine Learning [April '22 - July '22]
Summer of Science | Maths & Physics Club, IIT Bombay

- Developed a strong foundational knowledge of **Supervised** and **Unsupervised** learning models and their applications
- Researched about **data collection**, **pre-processing** & mathematics required for **M.L.** using the datasets on Kaggle
- Conducted extensive literature survey regarding loss functions and optimizers used in machine learning and ML algorithms such as **K-means clustering, gradient descent, PCA, SVM, decision trees, regression & classification**

Image classification and augmentation | Course Project [Mar '23 - Apr '23]
Guide: Prof. Biplab Banerjee | DS303 - Introduction to Machine Learning

- Implemented a research paper on Image classification using **Convolutional Neural Networks** on **CIFAR-10** dataset
- Incorporated **one-hot encoding** to combine multiple classes and perform binary or ternary classification of images
- Applied **image augmentation** techniques to **UC-Merced dataset**, enhancing the size and diversity of training data
- Enhanced the neural network with more **CNN layers**, **fine-tuning** them for a test accuracy of **88%** (previously 76%)

Denoising of synthetically noised images | Course Project [Oct '22 - Dec '22]
Guide: Prof. Amit Sethi | DS203 - Programming for Data Science

- Loaded **images** using MNIST dataset, followed by adding **noises** using **Gaussian** and **Exponential** distributions
- Implemented algorithms to **denoise** these images using **Convolutional Auto-Encoder**, **CNNs**(Convolutional Neural Network) and finally compiled using various **M.L. optimizers** to train a model which creates final denoised images
- Assessed the effectiveness of various algorithms by utilizing suitable **cost functions** and **accuracy metrics** on the test dataset and fine-tuned the parameters to achieve improved resolution and accuracy for the denoised image

Hands on Reinforcement Learning [Dec '22 - Feb '23]
Winter in Data Science | Analytics Club, IIT Bombay

- Studied the basics of R.L. such as the **n-arm bandit** problem, **Markov Decision Processes**, Value & Policy iteration
- Implemented optimization algorithms like **epsilon-greedy**, **UCB** and **Thompson Sampling** to realize the bandits

AlgoSwarm | Algorithmic Trading Hackathon [May '23]
*Organised by **Finance Club**, IIT Bombay in association with **QuantHive***

- Attended workshops covering topics such as **financial markets** and **automated trading strategy** development
- Secured **2nd rank** nationwide in a team of 4, outperforming 700 participating teams, and won a cash prize
- Backtested multiple trading strategies using the **Blueshift platform** to incorporate diverse **technical indicators**

POSITION OF RESPONSIBILITY

Interview Coordinator | Placement Office, IIT Bombay [Aug '22 - Dec '22]
- Coordinated with a team of **250+** members to interview 2000+ students during the **placement season** of 2022-23
- Assisted in conducting Interviews for **20+** firms, handling **student queries**, and maintaining interview records

Event Coordinator | Impulse, Electrical Engineering Student Association's Annual Fest [Mar '23]
- Acted as a **point of contact** (POC) for top management from companies like **Samsung, Mercedes & Reliance Jio**
- Got a chance to interact with them, fostering **valuable connections** and enhancing the **reputation** of our institution.

Web Coordinator | Zephyr, IIT Bombay's Annual Aviation Fest [Dec '22 - Apr '23]
- Explored and worked on **backend** functionalities using **Django** framework along with **Git** for Version Control
- Created a seamless **Django email framework** for user registration confirmation, complemented by a demo webpage

TECHNICAL PROFICIENCY
- **Languages** : Python, VHDL, C++, HTML, CSS, Embedded C, Assembly
- **Softwares** : Quartus, SQL, Excel, EAGLE, LTspice, TinkerCad, Arduino IDE, GitHub, ROS, Keil, LATEX
- **Libraries** : NumPy, Pandas, Matplotlib, PyTorch, Tensorflow, Tkinter, keras, PyQt5, asammdf, seaborn

KEY COURSES UNDERTAKEN

Core	**Digital Circuits(with Lab)**, Microprocessors(with lab), **Signal Processing – I**, **Control Systems**, **Probability and Random Processes**, Power Electronics-II
Miscellaneous	Computer Programming and Utilization, Organic and Inorganic Chemistry, Physical Chemistry, Biology, **Programming in Data Science**, **Introduction to Machine Learning**

EXTRA CURRICULAR ACTIVITIES
- Participated in Finsearch, stood among **top 15 teams** out of 250+ teams, got a chance to present our presentation on the topic of **trading currencies & commodities** in front of **industry professionals** & won a cash prize *[Aug '22]*
- Mentoring 4 teams in FinSearch on topic of **understanding credit score algorithms** using Machine learning *[Jul '23]*
- Successfully completed the **Learner's Space** courses on **Game Theory**, **Big Data Handling** & **LaTeX** *[July '22]*
- Secured **zonal rank 1** in International Maths Olympiad(IMO) & received gold medal along with a cash prize *[2020]*
- Analyzed the impact & risks involved in various **financial assets** required to create a portfolio in Finsearch*[Ongoing]*