Chaudhary Jay Ghemarbhai | **210070022**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 05/10/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	9.43
Intermediate	GSHEB	S.S. Divine School	2021	90.60%
Matriculation	GSEB	Shri Vividhlaxi Vidyamandir	2019	95.00%

Pursuing a **Minor degree** in **Artificial Intelligence and Data Science** from **CMInDS, IIT Bombay**

Scholastic Achievements

- Awarded with **Advanced Performer Grade** in the course
  - **EE204: Analog Circuits :** Awarded to 2 out of 210 students [2022]
- Secured **All India Rank 262** in **Joint Entrance Exam (Advanced)** out of **0.15 million** aspirants [2021]
- Attained a percentile of **99.956%** in **Joint Entrance Exam (Mains)** among **1 million** candidates [2021]
- Ranked among the state **Top 1%** in the **Indian Olympiad Qualifiers in Chemistry (IOQC)** [2021]
- Awarded **Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship** by Govt. of India [2021]

Professional Experience

Explainable AI for Multi-property Optimization | *Research Intern* [May'24 - Jul'24]
Agency for Science, Technology and Research | Singapore

- Enhanced **state-of-the-art** single property geometric diffusion techniques for **multi-property** molecular optimization
- Proposed and implemented **spectral normalization** and new molecular constraints to stabilize the training process
- Developed an architecture for optimizing **multiple molecular properties**, integrating **GNNShap** for **ante-hoc** explainable AI to ensure interpretability and transparency in model training and prediction processes

Fan Detection and Classification using YOLO and ViT | *Machine Learning Intern* [Dec'23 - Jan'24]
Atomberg Technologies Private Limited

- Implemented **YOLO** for high-precision fan detection, optimizing parameters for real-time performance. Evaluated different versions, including **YOLOv5** and **YOLOv7**, to achieve excellent detection metrics through extensive testing
- Employed **ViT** for robust fan model classification, fine-tuning the model on an extensive dataset for improved accuracy
- Developed an integrated **pipeline** combining YOLO and ViT, incorporating data preprocessing and augmentation

Key Projects

Semi-Supervised Object Detection with CAGE Pseudo-Labeling [Jan'24 - Apr'24]
Course Project: CS769 Optimization in Machine Learning | Instructor: Prof. Ganesh Ramakrishnan

- Trained multiple CNN models on the **MSCOCO** dataset, creating labeling functions adapted from the **CAGE**
- Engineered labeling functions that return a class label or **ABSTAIN** based on predictions and specific conditions
- Used pseudo-labeled data, generated by these functions, to train a **Faster R-CNN** model and enhance its performance

Image Generation Using Diffusion Models [Nov'22]
Course Project: EE782 Advanced Topic in Machine Learning | Instructor: Prof. Amit Sethi

- Implemented diffusion models, trained on **MNIST, FashionMNIST,** and **CIFAR10** generating good-quality images
- Enhanced performance by adjusting **U-Net** complexity, using schedulers and optimizers, and tuning hyperparameters
- Implemented stable diffusion models, enhancing image generation stability and maintaining high-quality outputs

Automatic Speech Recognition [Jan'24 - Apr'24]
Course Work | Instructor: Prof. Preethi Jyoti

- Enhanced **Grad-TTS** by replacing convolutions with **depthwise separable** ones and adding **cosine noise scheduling**
- Enhanced **Conformer** model with improved conv module and **CTC**, reducing **WER** on **Librispeech** from **0.74** to **0.68**
- Optimized **OpenAI's Whisper** for **Hinglish speech recognition** using **Greedy** and **Beam search** decoding algorithms

Movie Genre Prediction from Poster [Mar'23 - Apr'23]
Course Project: CS419 Introduction to Machine Learning | Instructor: Prof. Abir de

- Utilized the **VGG16** model and compared its performance with a scaled-down version of the **Inception v4** model
- Applied data augmentation techniques (rescaling, rotation) to reduce bias, conducted **cross-validation** to evaluate model generalization and minimize overfitting, and assessed performance using **accuracy** and **F1-score** metrics

Other Projects

Conditional GAN for Person Identification and Image Diversification [Sept'23 - Oct'23]

Course Project: EE782 Advanced Topics in Machine Learning | Instructor: Prof. Amit Sethi

- Created a **Conditional GAN** framework to generate diverse images of the same individual by employing advanced data augmentation techniques, enhancing model robustness and capturing variations in pose, expression,and lighting
- Implemented a **Siamese network** for precise person re-identification, enhancing training stability and convergence

Image Captioning with Custom Encoder-Decoder Architecture | *Self Project* [Jun'23]

- Developed an **Encoder-Decoder model** for image captioning, utilizing text features from **Sequence Feature Layers (SFLs)** and image features from a **Pre-Trained VGG16** and fine-tuned the model on the **Flickr8K dataset**
- Evaluated the model using **BLEU1** and **BLEU2** metrics, achieving scores of **0.54** and **0.36**, respectively

Stock Price Prediction [Aug '23-Sep '23]

Course Project: EE782 Advanced Topics in Machine Learning | Instructor Prof. Amit Sethi

- Designed and implemented stock price prediction model based on **LSTM** architecture using time-series analysis
- Devised a trading module to buy, hold and sell stock based on the current, past stock prices and risk management

Covid 19 Trend Analysis [Mar'23 - Apr'23]

Course Project: DS203 Programming for Data Science | Instructor: Prof. Amit Sethi

- Analyzed the impact of **COVID**-19 on countries using parameters like GDP, age, and health, and also assessed its effect on students' lives, classifying mental illness with **Support Vector, Random Forest,** and **K Neighbors Classifiers**
- Predicted future disease trends using Support Vector Regressor, K Nearest Neighbors Regressor, and Random Forest Regressor, with extensive hyperparameter tuning and also applied **ARIMA** modeling for trend period predictions

Pipelined RISC Processor [Apr'23 - May'23]

Course Project: EE309 Microprocessors | Instructor: Prof. Virendra Singh

- Designed a 6-stage pipelined **RISC 16-bit** processor in **VHDL**, achieving a **CPI** close to 1 for 26 instructions
- Incorporated hazard mitigation with forwarding logic and a stalling unit, and constructed **ALU**, pipeline registers, register file, instruction decoders, forwarding unit, hazard detection unit, stalling units, branch predictor and memory
- Performed extensive debugging to detect and resolve the issues and tested the design by implementing it on **FPGA**

Wireless Vibration Sensing Nodes for SHM [Jan'24 - Apr'24]

Course Work: EE344 Electronic Design Lab | Instructor: Prof. Siddarth Tallur

- Developed a vibration sensor with data logging and wireless transmission using **ESP-32** for real-time monitoring
- Built a **GUI** to visualize key parameters and conduct frequency analysis on data obtained from various locations

Bubble Trouble - Game Development in C++ [Jan'22 - Feb'22]

Course Project: CS101 Computer Programming and Utilization | Instructor: Prof. Parag Chaudhuri

- Applied **Object Oriented Programming** principles to ideate and implement classes enabling desired behaviour of dynamic shooter and bubble objects with well defined shooter controls and projectile motion of bubbles in the game
- Implemented multiple new features in the game including **3 progressive levels** with **dynamically increasing speed, size** and **quantity** of bubbles as well as additional graphic features to make the game more interactive and user-friendly

Technical Skills

Languages	C, C++, Python, VHDL, Embedded C, Assembly
Python Libraries	Tensorflow, PyTorch, Numpy, Pandas, Matplotlib, Seaborn, Plotly, Scipy
Other Tools/Software	Intel Quartus, Keil IDE, Atmel Flip, Jupyter Notebook, LaTeX, MATLAB, KiCAD

Key Courses Undertaken

AI/ML	Programming for Data Science, Introduction to Machine Learning, Advanced Topics in Machine Learning, Optimization in Machine Learning, Automatic Speech Recognition, Learning and Inference in High Dimensions*
Mathematics and CS	Calculus, Linear Algebra, Differential Equations, Complex Analysis, Probability, Markov Chains and Queuing Systems, Games and Information, Computer Programming and Utilization

Extra-Curricular Activities

**To be completed by Nov'24*

- Participated in the national-level **Bharat Ko Jano** quiz competition organized by **Bharat Vikas Parishad** [2017]
- Formulated and pitched a **business model** for **EnB Buzz competition** organized by **E-Cell** [2021]
- Completed a year-long athletics training program under the National Sports Organization (**NSO**) [2021]
- Participated in an **RC Plane** competition organized by the **Aeromodelling Club** [2022]
- Hobbies: Cooking, Photography, Volleyball, Hiking, Video Games