Anubhav Goel | **170040043**
Electrical Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology, Bombay | **Gender: Male**
Specialization: Communication & Signal Processing | **DOB: 26-04-1999**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2022	9.39
Intermediate	CBSE	Summer Fields School, Gurugram	2017	93.80%
Matriculation	CBSE	Summer Fields School, Gurugram	2015	10

Pursuing a **Minor** in Computer Science and Engineering

Scholastic Achievements

- **Department Rank 4** in Electrical Dual Degree batch among 61 students [2021]
- Awarded the **Erasmus Scholarship** as a part of funding for a Semester Exchange Program to **Technical University Denmark (DTU)** based on exceptional academic performance [2021]
- Awarded **Change of Branch** for exceptional academic performance in first year [2018]
- Secured **All India Rank 1263** in **JEE Advanced** amongst 200,000 candidates [2017]
- Secured **All India Rank 438** in **JEE Main** among 1.2 million candidates [2017]
- Awarded **Kishore Vaigyanik Protsahan Yojana (KVPY)** Fellowship with **All India Rank 264** [2017]
- Recipient of the **National Talent Search Examination (NTSE)** scholarship by NCERT [2015]
- Awarded **Certificate of Merit** for being in the National Top 1% of **National Standard Examination in Physics (NSEP)** by Indian Association of Physics Teachers (IAPT) [2017]
- Awarded **Certificate of Merit** for outstanding academic performance and being among the top 0.1% candidates in **Chemistry** and **Physics** All India Senior Secondary Examination by CBSE [2017]

Internships and Projects

Deep Learning Strategies for Reconstructing Undersampled RS fMRI *Aug'20-Dec'20*
Guide: Prof. Suyash Awate, IIT Bombay

- Performed extensive literature survey and prepared detailed documentation consisting of state-of-the-art Deep Learning techniques used for reconstructing **Resting State Functional MRI** images in the 2D Fourier Domain
- Integrated **Bayesian Framework** to model **Epistemic and Aleatoric Uncertainty** with existing Deep Learning techniques and applied it to DC-CNN and U-Net architectures
- Implemented a three-stage architecture with end-to-end learning which performs reconstruction in k-space and performs quality enhancement in the spatiotemporal domain using **multiple cascaded CNNs**

Corporate and Investment Banking Analytics *May'20-Aug'20*
McKinsey & Co.

- Worked in the development of an analytics tool, part of a **big data processing** pipeline used for generating critical insights about the performance of leading global banks and develop future investment strategies
- Worked with teams across different countries and backgrounds to successfully automate strategy analysis methods across equity and debt products, significantly reducing the time and effort required for analysis
- Used **VBA and Python programming along with SQL framework** to develop the back end for the analytics tool and integrated it with the existing front end to improve its speed and add more functionality

3D Scene Reconstruction Using Multiple-View Geometry *Feb'21-May'21*
Guide: Prof. Anders Dahl and Prof. Vedrana Dahl, Technical University Denmark

- Applied the Zhang model to perform camera calibration using checkerboard images to enable working with handheld devices with unknown intrinsic camera parameters and non-standard datasets in OpenCV
- Extracted **SIFT features** from multiple views and performed feature matching by implementing the **FLANN matcher** to establish a Homography using the **RANSAC algorithm** for outlier removal
- Used Linear algorithms to calculate Essential and Projection Matrices and applied **Triangulation** along with **K-means Clustering** to calculate the final 3D coordinates of the points in space

Deep Reinforcement Learning *June'21-Present*
Guide: Prof. Vivek Borkar, IIT Bombay

- Implementing a policy gradient based reinforcement learning scheme using Deep Neural Networks to parametrize policies that will be applied to the problem of opportunistic scheduling in fading channels
- Used a Markov Decision Process framework to model probabilistic constraints as Risk Sensitive loss and a novel Primal Dual scheme to minimize the average cost while ensuring non-violation of probabilistic constraints

One Class Classification *June'21-Present*

Guide: Prof. Suyash Awate, IIT Bombay

- Implemented a Deep Robust One Class Classification network motivated by the fact that typical data lies on a low dimensional manifold, by adaptively generating the most effective adversarial points using gradient ascent
- Applying a DNN-based learning framework for semi-supervised non-linear generative mixture modeling for Anomaly Detection with a min-max learning scheme that increases likelihood using a tight variational bound

Neural Net Engine *May'19-July'19*

Guide: Prof. Virendra Singh, IIT Bombay

- Worked on the design for a Neural Net Engine to be used for the purpose of **Face Detection in a Video Surveillance system** to be implemented on a **Field Programmable Gate Array (FPGA)** board
- Implemented a **Multi-tasked Cascaded Convolutional Neural Network (MTCNN)** and analyzed memory and hardware requirements to evaluate its use in resource-constrained environments

Transaction Advisory Services *Nov'18-Jan'18*

Ernst & Young LLP

- Analysed **the current fiscal and economic status** including the infrastructure development in Indian states
- Studied economic parameters indicating the quality of life and their comparison amongst states to develop an **Infrastructure Investment Plan** for the respective state governments

Financial Appraisal of Infrastructure Projects *May'18-July'18*

RITES Limited

- Developed an **Annuity model** for a railway project including profit and loss account, balance sheet and cash flow statement to evaluate the financial viability of the project in terms of **Return on Equity**
- Studied the sensitivity of the model to costing variables and other financial parameters including debt-equity ratio, depreciation, tax and financing fee and projected traffic during the life of the project

Conditional Style GAN *Autumn'20*

Prof. Amit Sethi *Course Project: Advanced Machine Learning*

- Implemented a conditional variant of StyleGAN and performed style transfer on FFHQ and LSUN Cats datasets
- Performed a mapping of Speech Commands dataset to MEL spectrograms and used conditional StyleGAN to perform style transfer in the audio domain and evaluated its performance quantitatively using FID scores

Rendering and Animation using OpenGL *Autumn'20*

Prof. Parag Chaudhuri *Course Project: Computer Graphics*

- Used Phong lighting model and texture mapping to generate realistic objects in a multiple camera setup
- Used Keyframing and Interpolation in a Hierarchical modeling framework to create a 30 second animation film

Other Academic Projects

- **Non-Photorealistic Rendering:** Used edge detection along with line extraction and mean shift segmentation with cel shading to obtain toonified images
- **Packet Transfer at Link layer:** Implemented the distributed spanning tree algorithm and the algorithm for learning forwarding tables in bridges according to IEEE 802.1D standards
- **IITB Processor:** Designed a 6-stage pipelined microprocessor with forwarding, hazard control and branch prediction and implemented a CISC processor (subset of 8085 ISA) using VHDL on Altera FPGA board
- **15 Puzzle:** Implemented the A* algorithm to solve Path Traversal problem in graphs in least number of steps

Technical Skills

Programming	C++, C, Bash, Python, Java, CMake, OpenGL, VHDL
Software	PyTorch, Matplotlib, TensorFlow, R, MATLAB, VBA, Vagrant, Git, LaTeX, OpenCV

Positions of Responsibility

- **Department Academic Mentor:** Mentored **6 sophomores** on a one-to-one basis to ensure a smooth transition to the department as well as assisted on numerous aspects including academics and extracurriculars
- **Teaching Assistant for EE610 Image Processing:** Served as an undergraduate teaching assistant for a batch of 200 students assisting the professor with smooth functioning of the course, contributing to the content matter and course resources as well as assisting in conducting the evaluation of the course
- **Teaching Assistant for MA207 Differential Equations II:** Served as an undergraduate teaching assistant for a batch of 20 sophomores, conducting weekly tutorial sessions, doubt sessions and grading answer sheets

Extracurriculars

- Completed an Exchange Semester at **Technical University Denmark** during which interacted with people of various nationalities and backgrounds as a part of academic projects as well as social programs [2021]
- Completed the **Finanicial Engineering and Risk Management** course offered by Columbia University and studied the mathematics underlying the Black Scholes formula and Mortgage-Backed Securities [2019]
- Completed **80 hours of community service** educating underprivileged children about the implementation of sustainable technologies under the Vikas department of National Service Scheme, IIT Bombay [2018]
- Secured the **Third Position** in MUN Arcade held at IIT Bombay [2017]