Sourabh Patil | **183079002**
Electrical Engineering | **M.Tech.**
Indian Institute of Technology, Bombay | **Gender: Male**
Specialization: Communications Engineering | **DOB: 27-04-1995**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2021	8.95
Graduation	DBATU	DBATU, Lonere	2016	7.83
Graduation Specialization: Electronics and Telecommunication Engineering				
Intermediate	HSC	Junior College, Rahimatupur	2012	74.00%
Matriculation	SSC	New English School, Satara	2010	96.18%

AREAS OF INTEREST

- Machine Learning, Deep Learning, Image Processing, Computer Vision, Speech Processing

MAJOR PROJECTS AND SEMINAR

- **Deformable Convolution based Video Super-Resolution and Brain MRI Super-Resolution**
  Guide: Prof. Amit Sethi, EE Dept., IIT Bombay | *M.Tech Project* *Jul'20 - till date*
  - **Objective:** Develop a **deep learning**-based method capable of reconstructing **4x upsampled** version of low resolution **Video** and **brain MRI** data
  - **Ongoing Work:**
    - Training a **Deformable ConvLSTM** based deep neural network on **Vimeo-90K** dataset consisting of **91,707 7 frame sequences** to achieve results, without loosing **textural and global details**, which are close to the ground truth in terms of **PSNR and SSIM**
    - For super resolving of MRI task using Brain MRIs of 5 subjects released by **King's College London** under **CDMRI'20** challenge to perform **isotropic** Super-Resolution
  - **Future Work:**
    - Perform **anisotropic** Super-Resolution on Brain MRI
    - Try integrating an **Attention Module** in Video Super-Resolution task

- **Wavelet-based Deep Neural Network for Face Super-Resolution**
  Guide: Prof. Amit Sethi, EE Dept., IIT Bombay | *R & D Project* *Jan'20 - May'20*
  - **Objective:** Design a **wavelet**-based Deep Neural network to reconstruct HR counterpart from LR one which captures both global topology information and local **texture** details of **human faces**
  - **Approach:** Trained the wavelet-based model on the **Celeb-A** dataset comprised of **200,000** celebrity faces. The network should predict **wavelet coefficients** of the HR image by taking the LR image
  - **Results:** For **4x** upsampling, got the avg **SSIM of 0.90** and **PSNR of 31.57 dB** where on the other hand we would get an avg **SSIM of 0.78** and **PSNR of 25.19 dB** for **bicubic** upsampling

- **Sound Source Localization using SVD**
  Guide: Prof. Rajbabu Velmurugan, EE Dept., IIT Bombay | *Seminar* *Jul'19 - Nov'19*
  - Studied the sound source localization techniques like **GCC-PHAT, SRP-PHAT, and SVD-PHAT**
  - Used **Pyroomacoustics API** to conduct experiments on different sized rooms and produced results for GCC-PHAT and SRP-PHAT for the task of **2D sound source localization**

KEY ACADEMIC PROJECTS

- **Neural Style Transfer to obtain IHC stained images from H&E stained images**
  Guide: Prof. Amit Sethi, EE Dept., IIT Bombay | *Advanced Machine Learning* *Jul'19 - Nov'19*
  - Implemented the neural style transfer algorithm using a pre-trained **VGG network**
  - Experimented with various settings of **content and style loss** to generate realistic IHC images
  - Perceptually similar **IHC stained images (costlier)** were generated from **H&E stained images (cheaper)**

- **Artificial Neural Network from scratch using Numpy**
  Guide: Prof. Amit Sethi, EE Dept., IIT Bombay | *Advanced Machine Learning* *Jul'19 - Sept'19*
  - Designed and trained an ANN having the **flexibility** to take **variable-sized input and hidden layers**
  - **ReLU**, as well as **Softmax** activations, were included in the design along with the **Crossentropy loss**
  - On **CIFAR-10** dataset, attained the accuracy of **87.34% for binary** and **67.34% for 5 class classification**

- **Stock Price Prediction**
  Guide: Prof. Biplab Banerjee, CSRE Dept., IIT Bombay | Machine Learning *Jan'19 - Apr'19*
  – **E**xtracted features namely **RSI, MFI, EMA**, etc. from the raw data of NSE scraped from **Yahoo Finance**
  – Used **linear regression, support vector regression and ANN** to predict NIFTY index and Stock Prices
  – Achieved an error rate as low as **1.29%, 0.64%, 0.70%** using LR, SVR, ANN resp. on NIFTY index

- **SVM and Softmax Classifier Implementation**
  Guide: Prof. Biplab Banerjee, CSRE Dept., IIT Bombay | Machine Learning *Feb'19 - Mar'19*
  – Implemented **Support Vector Machine(SVM)** for detecting the fraudulent Credit card transactions on the **Kaggle dataset** and achieved an **accuracy of 86%**
  – Developed a model to label Hyperspectral Images using **Softmax classifier** to classify Indian Pines data-set with 200 channels into 17 different categories and achieved **accuracy of 90%**

- **Predicting the behavior of vehicular traffic in the City of Sao Paulo**
  Guide: Prof. Biplab Banerjee, CSRE Dept., IIT Bombay | Machine Learning *Jan'19 - Feb'19*
  – Events such as Broken truck, accident victim, fire, etc. were considered to predict **slowness (%) of the traffic**
  – **Ridge regression** and **Normal equation** were coded in Python using Numpy and got **MSE of 2.96 and 3.52**

- **Clustering Images using Metric Learning**
  Guide: Prof. Sharat Chandran, CSE Dept., IIT Bombay | Computer Vision *Feb'20 - Mar'20*
  – Trained a **Siamese network** with **Contrastive Loss** to get separable 2D embeddings of MNIST dataset
  – Enhanced the robustness of the model towards **Euclidean transformed MNIST** digits by data augmentation

- **Document Scanner using OpenCV**
  Guide: Prof. Sharat Chandran, CSE Dept., IIT Bombay | Computer Vision *Jan'20 - Feb'20*
  – Automatically detected **largest convex quadrilateral** and fed it to the algorithm to get its **clear top view**
  – **Canny Edge detection** algorithm, **contour detection**, and **perspective transformation** were implemented

- **Application of Augmented Reality**
  Guide: Prof. Sharat Chandran, CSE Dept., IIT Bombay | Computer Vision *Feb'20 - Mar'20*
  – Applied a basic AR algorithm to augment a **virtual book** (3D structure) in the image of a wall
  – **Projected 3D points** on 2D image plane followed by **perspective transformation** and **mask generation**

- **Automatic Word Recognition**
  Guide: Prof. Preeti Rao, EE Dept., IIT Bombay | Speech Processing *Oct'19 - Nov'19*
  – Preprocessing such as speech end-pointing, pre-emphasis and **MFCC feature extraction** were performed
  – Bag of frames algorithm was used and for **32, 64 centroids, observed accuracies of 72.1 and 73.7 %** resp

RELEVANT COURSES UNDERTAKEN

- Advanced Machine Learning
- Statistical Signal Analysis
- Speech Processing
- Machine Learning
- Digital Signal Processing
- Wavelets
- Computer Vision
- Advanced Topics in Signal Processing
- Natural Language Processing (Audit | Ongoing)

TECHNICAL PROFICIENCY

- **Programming Languages:** C, C++, Python, MATLAB
- **Packages & Frameworks:** PyTorch, Scikit-Learn, OpenCV, SciPy, Matplotlib, Seaborn, Pandas, NumPy

POSITION OF RESPONSIBILITY

- **Research Assistant | Wadhwani Electronics Lab, IIT Bombay** *Jul'18 - till date*
  – **Mentored and assessed** 50+ undergraduate students during the **Communication and Electronics Design Lab**
  – Assisted the lab instructors in designing the **lab experiments, quizzes** as well as **semester examinations**

- **Company Coordinator | Placement Cell, IIT Bombay** *May'18 - Jun'19*
  – Impeccably handled **50+** companies as an individual, out of **47** CCs, for the recruitment of **1600+** students
  – Worked in the management team of **14** members to handle **100+** coordinators for Phase 1 interviews

- **Student Companion | Institute Student Companion Program, IIT Bombay** *Apr'18 - May'19*
  – Responsible for **guiding 8 freshmen** focusing on their academic and holistic development
  – Was part of the organizing team of Institute Orientation for **1800+** students

EXTRACURRICULARS

- Won the **Silver** Medal in UG Football League, DBATU among **10** teams *Apr'16*
- Volunteered in **Powai Lake Mega Clean-Up Campaign** *Jun'19*
- Coordinated the Autobots event (Line Follower Bot) Cynosure DBATU 2k15 *Mar'16*
- **Hobbies:** Playing football, analyzing football strategies, playing FIFA, trekking