MOHD SAFWAN

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EDUCATION

Indian Institute of Technology Bombay, *Mumbai, India*
Dual Degree, B.Tech + M.Tech in Electrical Engineering
Minor in Computer Science and Engineering

ACHIEVEMENTS

. Secured *All India Rank* **457**/ **Top 0.23%** in JEE Advanced 2017 out of *200,000* students
. Ranked in **Top 0.12%** in JEE Main 2017 out of *1.2 million* students
. Was placed in Statewise **Top 1%** in NSEA (Astronomy Olympiad) and selected for INAO
. Winner of TechFest IITB's National Coding Challenge: **Enigma** from **10,000+** teams
. *Won* Scratch Day, coding competition organized by Web and Coding Club, IIT Bombay in '17
. **2 Time National Winner**, IPL Auction Competition '18 & '19 by Entrepreneurship Cell, IIT Bombay
. Secured **3rd** place in annual Jigyasa: Science Quiz 2017 held by University of Mumbai
. **City Winner** of Vodafone Derek's Faster Smarter Better Challenge **Twice in '13, '14**

EXPERIENCE

Summer Internship — Computer Vision Team, Augle AI (augle.ai) *May - July '19*

· **Scene Text Recognition** for alphanumeric text on metal surface in unstable lighting. Used Histogram Equalization and Erosion to enhance images. Used a **Spatial Rectifier Network** to rectify the perspective of text images and a **Bidirectional LSTM with Attention** mechanism to recognize scene text.

· **Person Identification** using Face and Palm-print images. Developed an object detection framework for edge devices. Developed pipeline for recognition which included *object detection, instance segmentation, pose estimation, and feature encoding*. Used a **Siamese Network** with **Soft Triplet Loss** as the encoder. Implemented hard negative mining for better training.

· **Crowd Counting** Used **YOLOv3** detector and **DeepSORT** to track people and calculate crowd flow.

Research Project — Measurement of Fetal Head in Ultrasound Images *Spring '19*
Prof. Amit Sethi *Electrical Engineering, IIT Bombay*

Used PyTorch to implement **U-Net** architecture with a modified ResNet as encoder network. Implemented *elliptical weight map for loss* according to the bounding ellipse to get smoother boundary. Used **Dense Conditional Random Fields** post-processing for removing noise from segmentation mask

Research Project — Role of Reviews & Reviewer on Consumer Decisions *Summer '18*
Prof. Arti D. Kalro *SJM School of Management, IIT Bombay*

Scraped previous year's online reviews on *Zomato* using *Selenium* for *Automated* Web Scraping. For each restaurant, the reviews' content, likes, comments, photos, management responses and reviewer's total reviews, followers, images posted & other profile variables were extracted

KEY PROJECTS

Realtime Coherent Style Transfer for Videos — Deep Learning, Computer Vision *Spring '19*
Prof. Arjun Jain *Computer Science & Engineering, IIT Bombay*

· Implemented *"ReCoNet: Real-time Coherent Video Style Transfer Network"* architecture in PyTorch
· Used pretrained *VGG19* for loss as described in *"Perceptual Losses for Real-Time Style Transfer"*
· Implemented a *Temoral Loss* by warping outputs using *Optical Flow* forcing smoothness in time domain

Chord Sequence Extraction from Music — Machine Learning *Summer '18*
Institute Technical Summer Project *IIT Bombay*

· Processed the music data to extract $\mathbb{R}^{12}$ *Pitch Class Profile* vectors using optimized *Fourier Transform*
· Achieved above **98%** test accuracy with *Additive* χ^2 *kernel* and *SVM Classifier*

DL Research Papers Reproduced in PyTorch on GitHub *Summer '19*
Self Learning Project

· Auto-Encoding Variational Bayes [Code] — *Diederik P Kingma, et al - ICLR 2014*
· Wasserstein Generative Adversarial Networks [Code] — *Martin Arjovsky, et al - ICML 2017*
· A Neural Algorithm of Artistic Style [Code] — *Leon A. Gatys, et al - Journal of Vision*
· Generative Adversarial Networks [Code] — *Ian Goodfellow, et al - NIPS 2014*

OTHER PROJECTS

Panoramic Image Stitching — Computer Vision *Spring '19*
Prof. Arjun Jain *Computer Science & Engineering, IIT Bombay*

Normalized brightness in images using *Histogram Equalization* and then extracted *SURF* feature points. Matched the feature points using *RANSAC* and stitched the images by computing *Homography Matrices*

16-bit RISC Microprocessor Design *Soring '19*
Prof. Virendra Singh *Electrical Engineering, IIT Bombay*

Designed and implemented a multicycle processor with RISC architecture using VHDL.The architecture was augmented with hazard mitigation techniques and data forwarding.

Walking Stick for Blind People *Jul'17 - Mar'18*
National Innovation Club *National Service Scheme, Govt. of India*

Manufactured a cost-effective walking stick for blind people that can detect obstacles and alert the user by programming an Arduino to use ultrasonic sensors for detection

InstiApp — Open Source App Development *Autumn '18*
Developer Community *IIT Bombay*

Part of *10+* membered team of developers involved in making an Open Source *Android App* for the residents of IIT Bombay. Solved many *UI/UX* as well as *core bugs* and also implemented various new features

Realtime Facial Emotion Recognition *Autumn '18*
Learning Project

Detected faces using Viola-Jones Algorithm, reduced dimensionality using PCA, trained a LeNet CNN model to replicate State of the Art accuracy in emotion detection

Crypt Hunt Discord ChatBot *Autumn '18*
Web and Coding Club *Institute Technical Council, IIT Bombay*

Made a smart Discord Chatbot for conducting a QnA type treasure hunt for freshmen

POSITIONS OF RESPONSIBILITY

Convener — Web and Coding Club, IITB *Apr '18 - Mar'19*

Organized and conducted various boot-camps, events, competitions while managing the club′s resources with a long term goal of creating a thriving programming community in the institute

Mentor — School of Science, Maths & Physics Club, IITB *Summer '19*

Mentored 4 freshmen during summers to study and implement basic DL algorithms from scratch

Instructor — Technical Summer School, Career Cell, IITB *Summer '19*

Taught 100+ students to program in Python and concepts of Object Oriented Programming

TECHNICAL SKILLS

Programming - Python, C/C++, Java, MATLAB/Octave, Bash, VHDL

Frameworks/Libraries - PyTorch, TensorFlow 2.0, Keras, OpenCV, Scipy, Jupyter

Softwares - Vim, Git, GitHub, Android Studio, LaTeX, AutoCAD, SolidWorks, Blender

Hardware - Arduino, Raspberry Pi, Beaglebone Black

COURSES UNDERTAKEN

Key Courses - Deep Learning - Theory & Practice*, Computer Vision, Digital Image Processing*, Digital Signal Processing, Machine Learning for Remote Sensing, Control Theory*, Probability & Random Processes*, Computer Programming and Utilization, Signals and Systems, Data Interpretation and Analysis

Electrical - Microprocessors*, Communication Systems*, Digital Communication*, Microelectronics, Analog Systems, Electronic Devices, Network Theory, Digital Systems, Analog Systems

Mathematics - Calculus, Linear Algebra, Differential Equations 1 & 2, Complex Analysis

**(to be completed in 3rd year)*

EXTRACURRICULAR ACTIVITIES

- Volunteered in NSS to teach Mathematics to underprivileged school kids
- *Active player* in Indian *Rainbow Six Siege* community
- Mentored a team for *XLR8 2018* Robotics Competition who went on to win the **2nd prize**