MOHD SAFWAN

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EDUCATION

Indian Institute of Technology Bombay, *Mumbai, India* — Graduating in June 2022
B.Tech + M.Tech , Electrical Engineering (Communication and Signal Processing) GPA: **8.1/10**

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
. **Won** TechFest IITB's National Coding Challenge: **Enigma** from 10,000+ teams
. **Won** Capture The Flag 2020 conducted by CSE Cybersecurity Club, IITB
. **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

EXPERIENCE

Applied Scientist Intern — Amazon *Summer '21*

Built a multilingual deep learning based models to match products with search queries. Used SOTA image and text feature extractors to generate a high dimensional embedding of a product and calculated similarity with a text query. Worked with datasets with 10 million+ entries and optimized the training routine to run experiments rapidly. Achieved significant gains over text based methods.

Chief Technical Officer — Augle AI (augle.ai) *Jan '20 - Dec '20*

Ideated, developed, and deployed robust state-of-the-art Face Recognition based attendance and temperature logging system to tackle problems due to COVID 19. Optimized the inference to run on mid range Android devices smoothly. Managed a team of 10 researchers and developers to successfully develop multiple AI powered solutions.

Analysis of Preferential Voting Systems — Statistics *Spring '21*

Experimentally verified and theoretically analyzed sample complexity bounds obtained from confidence intervals using PPR Martingales for determining Probably Approximate Correct winner of Borda Elections.

Designed an algorithm to determine PAC winner of Copeland Election with limited number querys per vote, and outperformed the baseline DCB algorithm on various synthetic and real world datasets.

Parallelized Verification of Conjecture for Metric Dimension — C++, CUDA *Spring '21*

Used OpenMP, MPI, and CUDA to parallelize the C++ implementation of verification of a conjecture for metric dimension of a grid graph augmented with one edge. Achieved **200x** improvement in time which made verifying the conjecture for larger grids feasible.

Freelance Project — Finding Images/Videos of a Person from a Selfie *Summer '20*
Reels & Frames *reelsandframes.in*

Developed a solution to find all photos and videos of a person from a collection by looking at a single selfie. Tested and achieved 95%+ accuracy. Optimised GPU memory usage for arbitrary aspect ratios. Optimized the search time to a few milliseconds for 1000 images/frames. Added robust blur detection technique to filter out unwanted results. Added a GUI to use and adjust parameters in *tkinter*.

Single Image Dehazing using GAN *Autumn '20*
Prof. Biplab Bannerjee *Electrical Engineering, IIT Bombay*

Succesfully trained a generative network to remove haze using the GAN framework applied on artifically created hazy images using the NYU depth dataset with various degrees of haziness. Used a modified U-Net as generator and a patch discriminator for adversarial loss. Achieved **24+ dB SNR** (close to SOTA).

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

KEY PROJECTS

Tic Tac Toe Learning Environment — Reinforcement Learning, Web Dev [Code] *Spring '19*
Prof. Amit Sethi *Electrical Engineering, IIT Bombay*

Wrote an open source framework for testing reinforcement learning algorithms on the simple tic tac toe games using websockets communication and web GUI. Added several reference implementation of classic learning algorithms including Deep Q Networks.

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

- Implemented *ReCoNet* architecture in PyTorch to transfer artistic style to videos while preserving content
- Implemented a *Temoral Loss* by warping outputs using *Optical Flow* forcing smoothness in time domain
- Trained the network by synergic method on combination of *MPI-Sintel* and *FlyingChairs* datasets

Petyr — An Open Source Python Library [Code] *Summer '20*

- Python library for working with 2D geometric transforms with around 400 monthly downloads currently.
- Implemented multiple transforms in NumPy and wrote unit tests with complete code coverage.

DL Research Papers Reproduced in PyTorch on GitHub

- Deep Image Priors [Code]
- Auto-Encoding Variational Bayes [Code]
- Wasserstein Generative Adversarial Networks [Code]
- A Neural Algorithm of Artistic Style [Code]
- Generative Adversarial Networks [Code]

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++, Embedded C, MATLAB/Octave, Bash

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

Hardware - VHDL, Arduino, Raspberry Pi, 8051 controller

COURSES UNDERTAKEN

Key Courses - Advanced Machine Learning, Foundations of Intelligent Learning Agents, Advances in Intelligent Learning Agents, Computer Vision, Digital Image Processing, Speech Processing, Digital Signal Processing, Control Theory, Computer Programming and Utilization

Mathematics - Probability & Random Processes, Calculus, Linear Algebra, Differential Equations 1 & 2, Complex Analysis, First Course in Optimization, Introduction to Number Theory & Cryptography, Data Interpretation and Analysis

EXTRACURRICULAR ACTIVITIES

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