Jay Tukaram Sawant | **18D070050**
Electrical Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology Bombay | **Gender: Male**
Specialization: Communication & Signal Processing | **DOB: 06/01/2001**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	8.86
Intermediate	Maharashtra HSC	Modern College	2018	93.69%
Matriculation	Maharashtra SSC	Sant Sai High School	2016	93.60%

PROFESSIONAL EXPERIENCE

Qure.ai | *Deep Learning in Healthcare* | *AI Scientist Intern* [*May'22 - Aug'22*]

- Worked with Medical Imaging data to improve a classification model for detecting a common abnormality on Chest X-rays
- Trained a Vanilla classification model of **ResNet50** on **1.2 million+** Chest X-rays using supervised training to identify the presence of **Opacity** in an X-ray and achieved an AUC score of **0.80** on the test set consisting of more than **280K** Chest X-rays
- Experimented with and tweaked multiple **Self-Supervised Learning** architectures and trained baseline models for further use
- **Outperformed** the Vanilla classification baseline by using the backbone trained using the **Supervised Contrastive Learning**
- Achieved an AUC Score of **0.84** using the above model on the same test set along with a jump of Val AUC to **0.9** from **0.86**

Qualcomm India | *Machine Learning* | *Summer Internship* [*May'21 - Jul'21*]

- Performed literature review on **Static Timing Analysis** and Graph-based Placement techniques for chip designing process
- Predicted the **Timing Path** delays given a Netlist design for **1.8 ns** clock period using various Machine Learning algorithms
- Generalized a **Linear model** across various Netlist designs to achieve MAE of Path delay less than **10%** of the clock period

RESEARCH PROJECTS

Quality Control of Histological Images | *M.Tech Thesis* | *Tata Memorial Centre, ACTREC* [*Jul'22 - Present*]

- **Objective**: Build a model for **Quality Control** of scanned WSI images and to segregate WSIs in various pathology-related ROIs
- Prepared a labelled data with iterative clustering approach of patches of WSI images by making use of the **shallow features**
- **Future Work**: Open sourcing of the data preparation pipeline and trained models by having planned a publication in the Journal of Medical Imaging; Development of a multilabel classification and segmentation model using **MIL** and **Grad-CAM**

Semi-Supervised Learning | *Deep learning* | *Prof. Amit Sethi* [*Aug'21 - Dec'21*]

- Compared the Semi-Supervised Learning methods of Ladder Networks, Pi Model and Mean teacher by literature review
- Implemented the **Mean Teacher** SSL method on the **NIH-Chest Xray** dataset using a pretrained **DenseNet121** architecture
- Achieved a maximum AUC score of **0.76** using only **10%** labelled data as compared to the **0.81** AUC by the baseline model

TECHNICAL PROJECTS

Brain MRI Tumour Segmentation | *Medical Image Computing* | *Course Project* [*Feb'22 - April'22*]

- Trained a **U-Net** architecture for segmentation of the **tumour** region using a softer version of the **Dice Loss** in MRI slices
- Used a Dataset consisting of around **4K** MRI slices from **110** patients in **TCGA** collection from The Cancer Imaging Archive
- Achieved an average **IOU** of **0.77** between the predicted and the true segmentation masks of tumour positive MRI slices
- Achieved an accuracy of **96.8%** on the binary classification of presence of Tumour in Brain MRI slices from validation set

Identity Aware Portrait Generation | *Advanced Machine Learning* | *Course Project* [*Feb'22 - April'22*]

- Utilized the **Cycle-GAN** model in Image translation to generate portraits that preserve the facial features of human faces
- Proposed an additional perceptual loss that uses **FaceNet** embeddings to guide the generators to preserve facial features
- Achieved an average **SSIM** of **0.98** using our proposed approach between the human faces and their respective portraits
- Generated visually more appealing portraits even after the SSIM metric of our model being close to the baseline model

Blind Super-Resolution | *Digital Image Processing* | *Course Project* [*Aug'20 - Nov'20*]

- Trained an **SFTMD** Network which outputs a High-resolution image by taking a low-resolution image and a kernel as input
- Built a separate **Predictor** Network for the Kernel prediction and a **Corrector** Network for fine-tuning the predicted kernel
- Low-resolution images were created by blurring HR images by a Gaussian kernel and then downscaling by a factor of four

Adversarial Attacks on ASR Systems | *Automatic Speech Recognition* | *Course Project* [*Feb'21-May'21*]

- Performed literature review on targeted, imperceptible, white-box and black-box adversarial attacks on the ASR systems
- Trained a **Bidirectional-RNN** CTC-based Network on the **SpeechCommands** dataset with a Word Error Rate (WER) of **16%**
- Implemented Gradient-descent based Adversarial Attack achieving a **0%** classification accuracy along with a SNR of **30dB**
- Investigated **Psycho-Acoustic** hiding method for better imperceptibility and possible extensions to the Indian Languages

Iris-based Biometric Security System | *Institute Technical Council, IITB* [*Mar'19 - Jul'19*]

Awarded Special Mention Certificate out of 50+ teams for extraordinary performance at the ITSP 2019 Expo

- Designed a working model using a **Raspberry Pi 3B+** module, Infrared LED and High-Resolution 5 MP **NoIR** filter Camera
- Achieved an accuracy of more than **95%** by successfully testing the device on **100+** individuals during the ITSP Expo 2019
- Used an IR LED of a wavelength not less than **810 nm** for **safety** of the **human eye** and better illumination of Iris patterns
- Explored different concepts and image processing techniques like localization of object, Segmentation, Feature Encoding

Temperature Monitoring Using Pt-51 | *Microprocessor Lab* | *Course Project* [*Mar'21 – May'21*]

- Used a **10-bit ADC** MCP3008 as an interface between the **LM35** temperature sensor and the **Pt-51** microcontroller board
- Displayed the real-time temperature on an LCD screen along with the average of past **10** measurements every new second
- Built an **alarm system** with LEDs and a speaker to buzz when the temperature goes **2^{o} C** away from average temperature
- Used **embedded C** language to create a flash-able HEX file onto the **Pt-51** microcontroller using the **Keil** software by **ARM**

SCHOLASTIC ACHIEVEMENTS

- Achieved a percentile score of **99.00** in the **JEE Advanced** Examination among **0.23 million+** candidates [*'18*]
- Secured **1st** place in the **Maharashtra HSC Board** Examination among all the streams at the **Institute level** [*'18*]
- Excelled by securing **Rank 4** at the **State Level** in the **NSTSE** Examination held by the Unified Council, India [*'18*]
- Awarded Urban Special Prize for Meritorious performance in the Maharashtra Talent Search Examination [*'18*]

TECHNICAL PROFICIENCIES

Programming Languages	Python, C++, Bash, MATLAB, VHDL
Frameworks and Libraries	PyTorch, PyTorch-Lightning, Tensorflow, Numpy, Pandas, Sklearn, Conda
Softwares and Circuit Boards	GNU Radio, Quartus, AutoCAD, SolidWorks, Eagle, Raspberry Pi, LaTeX

KEY COURSES UNDERTAKEN

Machine Learning	Machine Learning, Advanced Machine Learning, Advanced Image Processing, Automatic Speech Recognition, Deep Learning Specialization (Coursera), Medical Image Computing
Probability and Statistics	Data Analysis, Probability and Random Process, Markov Chains and Queuing System
Computer Science	Data Structure and Analysis, Computer Programming and Utilization

POSITION OF RESPONSIBILITIES

IIT Bombay Racing | *Junior Design Engineer* | *Accumulator Subsystem* [*Jul'19 - Dec'19*]

- Assisted in designing the components of a **400V** carbon fibre Kevlar-covered accumulator container by iterative design process consisting of **96 lithium-ion** pouch cells having a high energy capacity of **7.8kWh** using a High Voltage Safety Kit
- Prepared questions for the **Trainee Selection** process, invigilated the test and graded the answer sheets of the same

Aavhan Sports Head - Table Tennis | *Revive Sports League 2022* [*Mar'22 - April'22*]

*Annual Sports festival of IIT Bombay, witnessing a footfall of **6000+** athletes engaging in 18 sports*

- Planned and executed a League-cum-Knockout **Table Tennis** tournament with **80+** players and **6** managers as part of RSL

Teaching Assistant | *EE610: Image Processing* | *Prof. Amit Sethi* [*Jul'22 - Present*]

- Assisting the instructor of **Image Processing** course in conducting the tutorial, grading and invigilation of **200+** students

EXTRACURRICULAR ACTIVITIES

Sports	• Secured **Silver Medal** for Hostel 15/16 team and a Bronze Medal for Hostel 3 team in the **Table Tennis General Championship** held at IIT Bombay in 2018 and 2019 respectively • Bagged **Bronze Medals** in both Men's Singles and Doubles Event in **Table Tennis** Tournament of 2019 held by the Electrical Engineering Students Association (EESA) of IIT Bombay • Secured **Bronze Medal** in Badminton Mixed Doubles tournament conducted by EESA, IITB
Technical	• Designed working obstacle manoeuvring **Bluetooth controlled Bot** using HC05 module and L293D Motor Driver Module, completing all the **tasks** in the **XLR8** Competition • Ranked **58** in the Flipkart Grid 2.0 Robotics Challenge (Level 1) with **6000+** participants
Cultural	• Represented Hostel 3 in the **Gyrations** 2019 (Inter-Hostel Dance General Championship)
Miscellaneous	• Nominated for an **exchange semester** to **Czech Technical University** in Prague • Recipient of '**Best Student**' Award for Scholastic achievements at High School • Awarded as the '**Best Manager**' in the **Institute Table Tennis League 2019** • Passed the **Intermediate** Grade Drawing Examination (State Govt.) with a Grade B