Mithilesh Vaidya   **17D070011**

Electrical Engineering   **Dual Degree (B.Tech. + M.Tech.)**

Indian Institute of Technology, Bombay   **Gender: Male**

Specialization: Communication & Signal Processing   **DOB: 07-08-1999**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2022	9.41
Intermediate	Maharashtra State Board	PACE Junior Science College, Andheri	2017	88.00%
Matriculation	Maharashtra State Board	Nirmala Convent High School	2015	95.20%

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

RESEARCH EXPERIENCE

Prominence Detection in Children's Speech   *Jan'21 - Present*
Guide: Prof. Preeti Rao, IIT Bombay   *Research Project*

- Replaced a Random Forest Classifier baseline with various deep models such as GRU and Transformers for predicting the degree of prominence for **each word** in children's speech and attained a **Pearson** correlation of **0.7**
- Experimented with inputs at various levels: raw waveforms, acoustic contours and word-level aggregates
- Used various **NLP** embeddings such as **GloVe** and **BERT** and boosted the Pearson correlation to **0.78**

Comprehensibility Rating for Children's Speech   *May'21 - Present*
Guide: Prof. Preeti Rao, IIT Bombay   *Dual Degree Project*

- Extracted acoustic features from **raw waveforms** using various deep convolutional architectures
- Experimenting with **transfer learning** by using pre-trained models trained on Emotion Recognition datasets
- Exploring Attention mechanisms for **fusing** lexical and acoustic features

Character Animation from Video for Blender   *July'21 - Present*
Guide: Prof. Parag Chaudhari, IIT Bombay   *Research Project*

- Working on a Blender plugin consisting of an **integrated pipeline** for extracting **3D human pose** from a video using various ML techniques and **retargeting** it to a rigged character in Blender
- Used an available implementation of VIBE, a deep neural network, as the pose extraction backend

SIRD Dynamics   *Aug'20 - Dec'20*
Guide: Prof. Sharayu Moharir, IIT Bombay   *Supervised Research Exposition*

- Studied the **SIRD** model which is widely used for studying the outbreak of epidemics
- Simulated the model with various underlying **network topologies** in place of random mixing
- Formulated multiple mathematical models for calculation of **precise dynamics**

PROFESSIONAL EXPERIENCE

Verification of FPGA-based High Frequency Trading Platform   *Apr'20 - June'20*
APT Portfolio Pvt. Ltd. — Guide: Mr. Vivek Pannikar, Senior Verification Engineer   *Internship*

- Implemented **DPI**, a protocol for exchanging data between SystemVerilog and other languages, for **speeding up verification** of testbenches using Cocotb, Quartus and Riviera
- Used Python **metaclasses** for automatically generating Python, SystemVerilog and C DPI header and implementation files from high-level JSON inputs
- **Speeded** up verification of certain transaction types by **upto 3x**

Autonise AI   *Sep'18 - May'19*
Co-Founder   *Machine Learning Startup*

- Implemented **PixelLink** and a GRU for word-level text detection, **invariant** to font size, colour, orientation, etc. and demonstrated an accuracy of **74%** on a proprietary dataset of documents like Aadhar Card, Passport, etc.
- Implemented a robust model with a **UNet** backbone for **segmenting** out spots, patches and wrinkles in selfies and exposed it through **AWS for demonstration**

SCHOLASTIC ACHIEVEMENTS

- Ranked **3rd** in Electrical Engineering Dual Degree Programme among **61 students**   [2021]
- Awarded **AP grade** in **Control Systems** course for **exceptional performance**   [2020]
- Secured an **All India Rank of 388** in JEE Advanced 2017 among 2,00,000 candidates   [2017]
- Awarded Certificate of Merit for being among the state **top 1%** in **NSEA** and **NSEP**, organised by India Association of Physics Teachers   [2016]
- Awarded the **Kishore Vaigyanik Protsahan Yojana (KVPY)** Fellowship by Govt. of India   [2015]
- Recipient of the prestigious **National Talent Search Examination (NTSE)** scholarship by National Council of Educational Research and Training (NCERT), Government of India   [2015]
- **Silver medal** in Homi Bhabha Young Scientist Examination   [2011]

Key Projects

Legendre Memory Unit   *Jan'21 - May'21*
Instructor: Prof. Sunita Sarawagi   *Course Project: Advanced Machine Learning*
- Implemented and analysed the performance of Legendre Memory Units (LMU), **an improved sequential model**, on various tasks and datasets such as JSB Chorales, Mackey-Glass dynamics, etc.
- Suggested modifications to the **core equations** by studying various **basis** functions

Audio Steganography   *Jan'21 - May'21*
Instructor: Prof. Preethi Jyothi   *Course Project: Automatic Speech Recognition*
- Exploited **adversarial attacks** on ASR systems for hiding any given sequence of tokens in any audio file
- Analysed performance as a function of various token sequence properties such as **length and perplexity**
- Demonstrated **high PESQ scores** which indicate low perceptibility of deviation from original audio

Video Toonification   *Aug'20 - Dec'20*
Instructor: Prof. Ajit Rajwade & Prof. Suyash Awate   *Course Project: Digital Image Processing*
- Used **Mean Shift Segmentation** across both time and spatial dimensions for toonification of videos
- Benchmarked results with standard techniques such as Bilateral Filtering

Auction Theory   *Aug'20 - Dec'20*
Instructor: Prof. Ankur Kulkarni   *Course Project: Game Theory*
- Studied various models in Auction Theory such as **Vickrey Auction** and **First Price Sealed Bid** Auctions

FMX Rendering and Animation   *Nov'20 - Dec'20*
Instructor: Prof. Parag Chaudhari   *Course Project: Computer Graphics*
- Designed and rendered an FMX track with obstacles of varying shapes such as **cylinders and ramps**
- Designed, rendered and animated a rider and a motorbike on the track using **keyframing**
- Employed **Phong Shading, Texture Mapping** and used a **Skybox** for a realistic look

Pipelined RISC Processor   *Oct'19 - Nov'19*
Instructor: Prof. Virendra Singh   *Course Project: Microprocessors*
- Designed a 16-bit, 8-register, 6-stage **Pipelined** RISC processor in VHDL
- Tested it on an FPGA using a custom testbench covering all corner cases
- Employed **Branch Prediction** and **Hazard Mitigation** techniques for optimizing the performance

FindIt   *May'19 - June'19*
Audio Fingerprinting   *Self Project*
- FindIt is a Python program for identifying a song given a **short noisy segment**, similar to Shazam
- An **audio fingerprint** consisting of constellations of major time-frequency peaks is stored in a hash table
- The music discovery program has **30+ stars** on GitHub

Technical Skills

Programming	Python, C++, C, Bash, Verilog, VHDL, OpenGL
Data Science	PyTorch, Pandas, Numpy, OpenCV, TensorFlow, MATLAB
Softwares	Matlab, Arduino, LaTeX, Blender, VHDL, AutoCad, Solidworks, Android Studio

Positions of Responsibility

Editorial Board Member, Insight   *Apr'21 - Present*
Insight is IIT Bombay's student media body with over 10,000+ readers
- Surveyed the **effectiveness** of the Faculty Advisor program by taking inputs from both students and faculty and **suggested various reforms**
- Initiated a series on **startups from research labs** at IIT Bombay as part of the **LinkedIn** team
- Interviewed authorities and current international students for understanding the causes behind **poor international representation** at IITB and suggested **remedies** for the same

Miscellaneous
- **Department Academic Mentor**: Selected as part of a 35-member team on the basis of ethics, peer-reviews and an interview for **mentoring** 6 sophomores in academic and co-curricular activities
- **Teaching Assistant** for a graduate-level course on Speech Processing; assisting the instructor in course evaluation and responding to queries of **60+** enrolled students on discussion forum

Extracurriculars

- National-level quarter-finalist at Bournvita Quiz Contest; appeared on **National TV** for the same
- **Won 2nd prize** in **Android app development** competition organised by Web and Coding Club
- Successfully completed a 12-month **Lawn Tennis** course under National Sports Organisation and represented Hostel 4 in inter-hostel tournaments
- Awarded **Best Outgoing Student** of the year 2014-15 by Nirmala Convent High School