Nilesh Gopaji Sonune | **16D070004**
Electrical Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology, Bombay | **Gender: Male**
Specialization: Communication & Signal Processing | **DOB: 12-03-1999**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2021	
Intermediate	Maharashtra State Board	M. H. High School, Thane	2016	82.92%
Matriculation	Maharashtra State Board	Dr. Bedekar Vidya Mandir, Thane	2014	96.20%

Scholastic Achievements

- Secured **92.69** percentile in JEE-Advanced and **98.96** percentile in JEE-Mains among all aspirants across India *['16]*
- Achieved **All India Rank 748** in MHT-CET among **0.14 million** candidates, conducted by Govt. of Maharashtra *['16]*
- Honored with the **Letter Of Appreciation** from **Minister for School Education**, Mr. Rajendra Darda of Maharashtra State for excellence in the SSC examination *['14]*

Professional & Research Experience

TransUnion CIBIL | **Data Science Intern** | Data Innovation and Research Team *[May '19 - July '19]*
Credit Information company maintaining 800 million+ individual records and 50 million+ businesses records *Mumbai*

- Processed **850+ million** records using **Hive** and **Spark** to map commercial entities with their individual associates
- Identified **47.8% overlap** between individual loans and commercial entities using a **data filtration** strategy
- Analyzed trends in NPA rate, Balance Share across **20 loan types** for **correlation analysis** of the MSME sector
- Investigated **3 years** of Repayment behaviour of borrowers for **accurate risk assessment** of the market
- Developed a **Dynamic Dashboard** in **Tableau** to show quarterly trends on market insights for **Commercial Bureau**

Joint Audio-Visual Speech Recognition | Supervised Research Exposition *[Jan '20 - July '20]*
Guide: Prof. Rajbabu Velmurugan | Department of Electrical Engineering *IIT Bombay*

- Deployed a novel audio-visual dataset generation pipeline to process **7.5 hr** of video content in **1 hr** to generate **1100+** samples
- Automated the AV dataset creation using **HOG-SVM** based **Face Detector** and **68-point Facial Landmark Detector** from dlib
- Utilized **FFmpeg** to control frame rate, audio channels and sampling rate of the output clips, **RegEx** for processing transcript
- Reviewed papers on **AVSR systems**, studied use of **visemes** in the video along with audio for speech-to-text conversion
- Identified accent related flaws in **Transformer** based **TM-CTC** model and **improved** its **WER by 30%** after fine-tuning

Multi Speaker Simultaneous Speech Recognition | Master's Thesis *[Aug '20 - Present]*
Guide: Prof. Rajbabu Velmurugan | Department of Electrical Engineering *IIT Bombay*

- Investigating the problem of speech recognition using audio & visual modality in a multi-speaker simultaneous speech scenario
- Future work involves using **Active Speaker Detection** to build an end-to-end model for multi-speaker speech recognition

Key Course Projects

Land Cover Classification using CNN and Random Forest *[Jan'20 - Apr'20]*
Guide: Prof. B. K. Mohan | Centre of Studies in Resource Engineering *Advanced Satellite Image Processing*

- Tackled Land Cover Classification on **EuroSAT** dataset with **27000** hyperspectral images in **13** spectral bands across **10** classes
- Implemented **Decision Tree, Random Forest Classifier** from scratch in **Python** and achieved **62.74% accuracy** on test set
- Improved test accuracy to **97.72%** by fine-tuning the dataset on different CNN models from **ResNet, VGG** series in **Keras**

Image Compression with Modified LZW Encoding *[July'19 - Nov'19]*
Guide: Prof. Shabbir Merchant | Department of Electrical Engineering *Image Processing*

- Achieved **2x faster** near lossless image compression with $>$**51dB PSNR** across different benchmark images
- Realized image compression by **Clustering Correlated Pixels** followed by LZW encoding from a research paper
- Implemented **RLE, Huffman** and **LZW** compression schemes in MATLAB to prove algorithm's spatial & temporal efficiency

System Modelling and Simulation *[Jan'19 - Apr'19]*
Guide: Prof. P. S. V. Nataraj | Department of Systems & Control Engineering *System Modelling & Simulation*

- Achieved **0.76** test MSE on a FeedForward Neural Network model in Keras for DC motor **Steady-State Modelling**
- Obtained **1.03** test MSE for a multi-input multi-output **(MIMO) time series LSTM model** with hybrid two tank system

Automatic Speech Recognition System *[July'19 - Nov'19]*
Guide: Prof. Preeti Rao | Department of Electrical Engineering *Speech Processing*

- Built a **Word Recognition** system using vector quantized **Codebook Matching**, MFCC feature extraction & end-pointing
- Achieved **75.89%** accuracy on clean set and **47.65%** accuracy on noisy set of Google Speech Commands dataset

Digital Hearing Aid System *[Jan'19 - Apr'19]*
Guide: Prof. Vikram Gadre | Department of Electrical Engineering *Digital Signal Processing*

- Developed code for **Sound Manipulation Algorithm** in MATLAB to simulate a digital hearing aid system
- Implemented **Wavelet Denoising Filter**, Amplitude & Frequency Shaper to process **audiogram** of the patient to tune the audio

Long Distance Polymer Optical Fiber Link *[Jan'19 - Apr'19]*
Guide: Prof. Joseph John | Department of Electrical Engineering *Electronics Design Lab*

- Developed the **Transceiver Module** for reliable duplex communication via POF with potential use in **FTTH** (Fiber to the Home)
- Achieved datarate up to **2 Mbps** over **50m** long POF cable from a prototype of LED based optical fiber communication link
- Tested the fabricated PCB with CPLD board using VHDL logic for text transmission and achieved **10^{-8} Bit Error Rate**

Speech Enhancement Using Adaptive Kalman Filter *[July'19 - Nov'19]*
Guide: Prof. Debraj Chakraborty | Department of Electrical Engineering *Estimation & Identification*

- Implemented an Adaptive Kalman Filtering algorithm in MATLAB to denoise a speech signal by constantly estimating the background noise from the observation data resulting in **3dB increment in SNR**

DPLL based SAT Solver *[July'18 - Nov'18]*
Guide: Prof. Virendra Singh | Department of Electrical Engineering *Foundation of VLSI CAD*

- Implemented DPLL, a **Backtracking based search** algorithm to solve **Boolean Satisfiability** problem in **Python**
- Applied Unit Clause Propagation & Pure Literal Elimination before recursive literal assignment to **speed up program**

FM Reciever *[Jan'18 - Apr'18]*
Guide: Prof. Siddharth Tallur | Department of Electrical Engineering *Analog Lab*

- Implemented a **BJT-based circuit** to filter, **demodulate** and amplify the input Frequency Modulated (FM) Wave
- Designed the circuit to filter desired **FM wave frequencies** using variable frequency **Colpitts Resonator**

IITB RISC Microprocessor Design *[July'18 - Nov'18]*
Guide: Prof. Virendra Singh | Department of Electrical Engineering *Microprocessors*

- Designed 8-bit Register, **16-bit** microprocessor on **VHDL** to execute an ISA of **14 instructions** based on Multicycle design
- Used **6-stage Pipelining** for consecutive instructions with simultaneous and efficient utilization of the Datapath elements

Relevant Coursework

Data Analysis	Data Analysis and Interpretation, Probability and Random Processes, Operations Analysis*, Estimation & Identification, System Modelling and Simulation, Linear Algebra
Machine Learning	Machine Learning, Advanced Topics in Machine Learning*, Machine Learning with Big Data†
Deep Learning	Deep Learning, Image Processing, Speech Processing, Deep Learning Specialization†
Big Data	Intro to Big Data†, Big Data Modelling & Management†, Big Data Integration and Processing†
Communication Systems	Communication Networks, Error Correcting Codes, Information and Coding Theory, Network Security, Communication Systems, Digital Signal Processing, Radiating Systems

*† Coursera, * To be completed by Dec'20*

Positions of Responsibility

Graduate Teaching Assistant | EE679: Speech Processing, IIT Bombay *[Aug'20 - Present]*

- Responsible for managing **online logistics** and assisting the professor in ensuring smooth functioning of the course
- Assisting in evaluation of answer scripts, designing assignments and conducting tutorials for a batch of **50+** students

Services Coordinator | Mood Indigo *[Jun'17 - Dec'17]*
Asia's largest college cultural festival | 141,000+ footfall | 210+ events at IIT Bombay

- Spearheaded a team of **20+ organizers** for managing VIP events of authors like Ravinder Singh, Yahya Bootwala
- Negotiated and bought products and services for events at best deal and **optimized overall budget** of the festival
- Assisted in **Choreonite**, India's largest inter college stage thematic and non-thematic dance competition with **4000+ crowd**

Interview Coordinator | Institute Placement Team, IIT Bombay *[Nov'17 - Dec'17]*

- Coordinated with a team of **250+ members** for interviews of **1600+ students**
- Assisted in conducting Pre-placement Talks and Tests for **15+ firms**

Technical Skills

Data Analysis & ML/DL	PyTorch, Tensorflow, Keras, OpenCV, Numpy, Pandas, Matplotlib, Scikit-Learn
Softwares & Tools	Git, Tableau, Hive, Spark, Arduino, GNURadio, ADS, Eagle, Altera Quartus, ngSPICE
Programming Languages	Python, C++, C, MATLAB/Scilab, SQL, VHDL, LaTeX

Extra-Curriculars

Technical	• Completed **Competitive Programming** under Season Of Code; Solved **DSA** Problems	*[Apr'20 - Jun'20]*
	• Attended **Analytics and Machine Learning** bootcamp organized by Career Cell, IIT Bombay	*[Jun'18]*
Culturals	• Secured **2nd position** in the Ad-Making Competition held under Freshiezza 2016	*[Aug'16]*
	• Received **Special Mention** in Spoof-a-Scene Competition held under Freshiezza 2016	*[Aug'16]*
	• Completed **Public Speaking Skills** course under experts in Summer School of Cultural	*[May'17 - Jun'17]*
Sports	• Selected in **Kho-Kho** team under National Sports Organization **(NSO)** for two semesters	*['16]*
	• Completed Badminton and Swimming training camps under **Summer School of Sports**	*[May'18 - Jul'18]*

Scholastic achievements and extracurricular activities are not verified by the Placement Cell