Garweet Sresth | **190070023**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 11/02/2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	
Intermediate	CBSE	Central Hindu Boys School	2019	90.40%
Matriculation	CBSE	Central Hindu Boys School	2017	9.8

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

Scholastic Achievements

- All India Rank **382** in JEE Main 2019 | All India Rank **625** in JEE Advanced 2019 *(2019)*
- Secured an **AP** grade for exceptional performance in Electromagnetic Waves awarded to **1 out of 169** students *(2021)*
- Awarded the Narotam Sekhsaria Foundation Undergraduate Engineering Scholarship *(2023)*
- Represented IIT Bombay as **one of two** Indian students among a diverse cohort of 100+ nationalities during an **exchange** program at Aalto University, **Finland**, fostering global collaboration and cultural exchange *(2023)*
- Achieved a perfect **10 SPI** (Semester Performance Index) during the second semester at IIT Bombay *(2020)*
- Awarded the prestigious **KVPY** fellowship by the Department of Science and Technology, Government of India *(2018)*

Publications

Unlabelled Sensing With Priors
Machine Learning and Statistics

- **Garweet Sresth**, S.Mulleti and A. Rajwade, "Unlabelled Sensing With Priors: Algorithm and Bounds" (In preparation)

Leveraging Segmentation to Improve Medical Image Registration
Deep Learning for Medical Imaging

- S. Almahfouz Nasser, M. Meena, **Garweet Sresth** and A. Sethi, "Leveraging Segmentation to Improve Medical Image Registration" (Pre-print submitted to the **IEEE** Journal of Biomedical and Health Informatics)

Micro-Doppler Parameter Estimation Using VMD With Finite Rate of Innovation

- S. Sharma, A. Girish, D. Jeff, **Garweet Sresth**, S. Bhalerao, V. M. Gadre, C. H. Srinivas Rao and P. Radhakrishna, "Micro-Doppler Parameter Estimation Using Variational Mode Decomposition With Finite Rate of Innovation," 2022 **IEEE** International Conference on Signal Processing and Communications (SPCOM), Bangalore, India, 2022, pp. 1-5

Research and Work Experience

Posterior Estimation in Node Bayesian Neural Networks
(May 2023)

Guide: Prof. Samuel Kaski and Markus Heinonen — *Probabilistic Machine Learning Group, Aalto University, Finland*

- Formulated the problem statement after analyzing the latest advancements in Variational Inference with Normalizing Flows
- Modelled the latent variable distributions within Rank-1 Node BNNs using **Normalizing Flows** for a richer description
- Derived the expression for the **Evidence Lower Bound** (ELBO) in terms of the initial distributions for efficient optimization

Segmentation of Brain MRI Volumes
(Aug-Dec 2022)

Guide: Prof. Amit Sethi — *Medical Deep Learning and AI Lab, IIT Bombay*

- Executed **5**-classes segmentation of Brain MRI volumes in the OASIS dataset by partitioning each volume into **8** non-overlapping sub-volumes and deploying independent **3D UNets** for enhanced accuracy and lesser memory requirements
- Achieved outstanding metrics, with an average **Dice score** of 0.96 on the training set and **0.95** on the validation set
- Adapted and extended the model's capabilities to handle a more complex OASIS MRI volume dataset with **35** classes

Unlabelled Sensing with Priors
(Aug 2022-Present)

Guide: Prof. Ajit Rajwade and Prof. Satish Mulleti — *B.Tech Project and Dual Degree Thesis*

- Developed an algorithm for regression vector estimation from **sparsely permuted data**, leveraging additional priors to consistently **outperform** the traditional **Robust Regression** method across diverse permutation and noise levels
- Employed advanced **concentration inequalities** from Linear Algebra to derive an upper bound on the estimation error
- Showcased the practical utility of the framework on the DCT-induced **motion estimation** problem in **Computer Vision**
- Working on devising a permutation-robust estimator for unlabelled sensing in the challenging underdetermined regime

Deep Learning for Quantitative Finance
(Sept-Nov 2022)

Guide: Prof. P. Balamurugan — *Academic Project*

- Trained a multivariate **Probabilistic Forecasting** model based on **Transformer** architecture on eight stock price series
- Conducted comprehensive experiments to assess the model's robustness and performance by analyzing the impact of varying historical input lengths and prediction horizons on the **Continuous Ranked Probability Score** (CRPS) metric

Digital Design Internship
(May 2022)

Texas Instruments Pvt. Ltd., Bengaluru, India

- Examined branch prediction algorithms for the RISC-V architecture and gained comprehension of the RISC-V codebase (Could not complete the internship due to a major health problem)

Key Projects

Automatic Speech Recognition *(Autumn 2022)*
Guide: Prof. Preeti Rao *Course Project*
- Implemented an ASR system using **Gaussian Mixture Model** with **Hidden Markov Model** to recognize **10** command words and obtained a training accuracy of 89% and a test accuracy of **82%** on the Google Speech Commands Dataset
- Outperformed the Codebook Matching Algorithm with K-Means for vector quantization, which gave **62%** test accuracy

Video Denoising *(Spring 2022)*
Guide: Prof. Ajit Rajwade *Course Project*
- Implemented a denoising algorithm capable of removing mixed noise based on the Low-Rank Matrix Completion theory
- Rigorously tested the model's capabilities on artificially degraded videos by adding Gaussian, Poisson and Impulsive noise
- Achieved an impressive average frame-wise **PSNR** of **23.63** on a synthetically-corrupted video comprising **300** frames

Video Data Compression and Recovery *(Spring 2022)*
Guide: Prof. Ajit Rajwade *Course Project*
- Implemented an algorithm capable of accurately reconstructing individual frames from a coded snapshot of video
- Performed reconstruction for each 8×8 patch using **Orthogonal Matching Pursuit** (OMP) with the 2D DCT basis
- Obtained a mean squared reconstruction error of less than **4.5%** from a coded snapshot involving upto **7** video frames

Image Segmentation *(Autumn 2022)*
Guide: Prof. P. Balamurugan *Course Project*
- Trained a UNet with a pre-trained **Resnet-50** as the encoder for segmentation on a challenging camouflaged dataset
- Obtained a Dice score of 0.85 on the training set and **0.68** on the validation set using a combination of squared loss, cross-entropy loss, and a **modified Dice loss** along with data augmentation techniques for enhanced model generalization

Reinforcement Learning *(Autumn 2021)*
Guide: Prof. Shivaram Kalyanakrishnan *Course Project*
- Implemented and compared four algorithms for sampling the arms of a stochastic **multi-armed bandit**, namely epsilon-greedy exploration, upper confidence bound, KL upper confidence bound, and Thompson sampling
- Implemented **MDP** planning algorithms- Value Iteration, Howard's Policy Iteration and Linear Programming

Interactive Bank Queue Simulator using 8051 Microcontroller *(Spring 2021)*
Guide: Prof. Rajbabu Velmurugan *Course Project*
- Coded the **8051** microcontroller along with the **UART** and **Timer** modules to create an interactive bank queue simulator
- Interfaced a dynamic LCD to show assigned customer tokens and real-time served tokens for efficient counter management

MoNuSeg Challenge *(Autumn 2022)*
Guide: Prof. Amit Sethi *Course Project*
- Trained a UNet for binary **nucleus v/s non-nucleus** segmentation on the MoNuSeg dataset and obtained a dice score of 0.81 on the training set and **0.72** on the test set, followed by watershed segmentation to segment individual nuclei

Positions of Responsibility

Placement's Interview Coordinator | Placement Cell, IIT Bombay *(Oct-Dec 2022)*
- Coordinated in a team of **250**+ members for interviews of **2000**+ students and assisted in conducting tests for **20**+ firms

Undergraduate Teaching Assistant | MA 109: Calculus 1 *(Oct-Dec 2022)*
- Conducted tutorials for a batch of **50**+ students, clearing their course-related doubts and fostering active problem-solving

Student Mentor | Maths and Physics Club, IIT Bombay *(May-July 2022)*
- Guided two students in a two-month long reading project in the field of Machine Learning and Deep Learning

Key Courses Undertaken

Mathematics	Probability and Random Processes, Linear Algebra (Basic + Advanced), Matrix Computations, Markov Chains & Queueing Systems, Calculus, Differential Equations
Machine Learning	Advanced Probabilistic Methods in Machine Learning, Deep Learning, Reinforcement Learning, Introduction to Machine Learning, Machine Learning for Remote Sensing
Computer Science	Data Structures and Algorithms, Computer Networks, Signal Processing, Logic for Computer Science, Microprocessors and Digital Systems (with lab)
Vision, Speech & NLP	Image Processing (Basic + Advanced), Speech Processing, Natural Language Processing

Technical Skills

Languages	Python, C++, MATLAB, Octave, VHDL, Verilog, Assembly
Frameworks & Libraries	PyTorch, TensorFlow, Keras, OpenCV, Pandas, CVX, LaTeX

Extracurriculars

- Explored **5**+ European countries during semester exchange program, honing adaptability and cross-cultural skills *(2023)*
- Successfully completed one year of social service under **National Service Scheme** (NSS) *(2019)*
- Participated in a field trip organized by Green Campus, IIT Bombay to gain an understanding of permaculture *(2019)*
- Attended the prestigious Vijyoshi Camp organized by the Indian Institute of Science Education and Research, Bhopal *(2018)*