



Examination	University	Institute	Year	CPI/%
Graduation	IIT Bombay	IIT Bombay	2020-25	-

✉ hv4626@gmail.com Harshvardhan Harshvardhan

Pursuing **Minor in Computer Science & Engineering**

Elected as **Department General Secretary** for the Department of Electrical Engineering, IIT Bombay

(‘23-24)

Only student out of **1400+** students to have received **Organizational Color Award** in Dept. of EE

(‘22)

SCHOLASTIC ACHIEVEMENTS

- Secured an **All India Rank - 391** in **JEE-Advanced** among 0.2 million candidates (‘20)
- Secured an **All India percentile of 99.62** in **JEE-Mains** among 1.2 million candidates (‘20)

INDUSTRIAL AND RESEARCH EXPERIENCE

Carnegie Mellon University: Pittsburgh | Visiting Scholar

(Jan ‘23 - Jun ‘23)

- Collaborated on aspects of **Signal Processing** in Data storage and its applications in data mining along with noise reduction techniques, error correction coding, and equalization methods for improving data integrity in storage systems.
- Presented results in an internal conference to jury of faculty members about the developments done, incorporating the ability to analyze & interpret data patterns, identify anomalies, to develop innovative solutions for data storage challenges.

Hushh.ai | Research Engineer Intern, Machine Learning and Software Engineering Division

| Under the leadership of Sunaz Saraf at Kirkland, US

(May ‘23-July ‘23)

- Large Language Models Enhancement:** Spearheaded the development of **in-house personal knowledge models** for Large Language Models, significantly elevating the company’s model capabilities.
- Publication and Thought Leadership:** Authored and served as the **first author** for the manuscript titled "A Survey on Language Models and Related Data Privacy," a comprehensive reflection of the outcomes achieved during the period.
- Mobile Application Interface Development:** Played a key role in the **front-end development** of mobile applications for both **Android and Apple** platforms using **TensorFlow Lite** and **CoreML** framework respectively, ensuring a smooth integration of proprietary personal knowledge models into the **back-end** infrastructure.
- Technical Advocacy and Public Representation:** Presented innovative pipelines for ‘Hushh Labs and Research,’ highlighting the company’s advancements in Language Models and Delivered articulate survey reports on **Large Language Models** and **Fine-tuned Models** to the public, effectively communicating the company’s expertise and achievements in the field.

Ideaforge | Research and Development- Controls & Software Intern

(May ‘22 - Jul ‘22)

- Worked on the **Gimbal stabilization system** mounted on the UAV and **robustness of pointing accuracy** of gimbal system using both the **model-based & model-free** control system development techniques
- Explored **Advanced space-craft dynamics**, **Line of Sight** optimizations and various control optimizations such as **Fuzzy control**, **LQR**(Linear Quadratic Regulation) & **PID** to be implemented for the UAVs

TECHNICAL PROJECTS

SuperGlue Implementation : Graph Neural Network | EE769: Intro to Machine Learning

(Apr ‘23)

Prof. Amit Sethi, IIT Bombay

- Employed sophisticated feature matching techniques using Graph Neural Networks within the Tensorflow/PyTorch frameworks.
- Innovatively implemented an Optimal Matching layer, meticulously trained to excel in matching two sets of sparse image features. This specialized layer facilitates the extraction of matching features across a pair of images.
- Introduced a novel attention mechanism that dynamically adjusts the emphasis on different parts of the image, enhancing the model’s ability to capture intricate details during the feature matching process.

Signal Reception & Decoding from NOAA satellite using GNURadio | EE340: Comms. Lab (Nov ‘22)

Prof. Jayakrishanan Nair, IIT Bombay

- This proposed solution offers the possibility of decoding and processing the signals in form of .wav files to GNURadio using the signals received from satellite in form of audio file recorded directly from NOAA satellite
- Output from GNURadio is a grayscale image of a section of earth based on the recording time of signal, which is improved after image processing, The results are cross verified using a software “WXtoImg” for decoding process

Drone Swarm Network: Distributed Beam-forming | Proposed to ISRO

(June '22 - Jan'23)

Prof. Dwaipayan Mukherjee & Prof. Shashi Ranjan Kumar, IIT Bombay

- Surveying concepts on **opportunistic arrays & distributed beamforming** to be used with UAV swarms
- Exploring **swarm coordination algorithms** for UAVs to carry out tasks in a scalable & dependable way
- Developing solutions to issues on Geolocation, Synchronisation, Transmission Losses, & Range Limitations that are related to collective beamforming using concepts of **Control System & Signal Processing on FPGA**

Image Segmentation using Deep Learning | EE610: Image Processing

(Oct'22)

Prof. Amit Sethi, IIT Bombay

- Used the concepts of Deep Learning for the semantic segmentation of binary nuclei using Tensorflow/Pytorch.
- Implemented and Coded a basic UNet for the segmentation and trained it via Dice Loss and modeled the baseline architecture of UNet and used Watershed segmentation on the UNet in order to segment individual nuclei.

Image Restoration using Wavelets based Transform | EE610: Image Processing

(Sept '22)

Prof. Amit Sethi, IIT Bombay

- Made basic functions of PSNR, SSIM, Wiener filtering and denoising functions for wavelet Transforms
- Implemented the method proposed in paper "Image Denoising using Neighbouring Wavelet Coefficients" by Chen-et-al and compared with hard and soft thresholding wavelet transform

Multi-stage cycle & Pipelining on RISC-IITB | EE309 (Course Project)

(Mar '22 - May'22)

Prof. Virendra Singh

- Modelled a **multicycle** and a **6-stage pipelined** 16-bit IITB-RISC microprocessor to implement 17 instructions
- Used **Behavioral Modelling** for creating components such as register-bank and memory modules on VHDL
- Mapped out a suitable datapath with control status word and designed a **finite state machine** for implementations
- Optimized the pipelined architecture by using **hazard detection** including **Forwarding and Branch Prediction**

IIT Bombay Racing Team |

(Feb'21 - May'22)

Junior Design Engineer | Motor Controller, Controls/Electrical Division

- Worked in the **Motor Controller Designs** sub-division under the Electrical section of IITB-Racing Team
- Implemented **PID controller** for the upcoming model which will have indigenous motor controller with Field of Controls development on **SimuLink (MATLAB)** and contributed in the **design of CAN card**
- Also, explored around the three subsections under the Electrical division of the IITB Racing Team during the training period that is, **Low Voltage Safety(LV), High Voltage (HV) & Motor Controller (MC)**
- Investigated the various aspects of electric vehicles and driver-less car, its working and production

Microprocessor Lab | EE337 (Course Lab)

(Jan '22 - May'22)

Prof. S. Saravasan

- Learned **Assembly Language** and **Embedded C** coding on **ARM Keil and RealTerm** software
- Performed software experiments using an **8051 Kit** to learn its **instruction set** and hardware experiments using a development board to learn the instruction set and **assembly programming** for 8051 family of micro-controllers
- Implemented **Binary Search** using Assembly programming, Assembly language subroutine for conversion of any string to its **ASCII representation**, Matrix multiplication, **ATM simulation on Embedded C**

CS347: Operating System | Course Projects

(Jan '22 - Apr'22)

Prof. Mythili Vutukuru

- Analysed Operating Systems in four parts, namely **Processes, Memory, Concurrency, I/O and File-Systems**
- Programmed multiple **C++ algorithms** for **process classification, dynamic memory management, pthreads synchronization and file-system management** on MIT developed open-source XV6 operating system

Digital Circuits Lab | EE214 (Course Lab)

(July '21 - Nov'21)

Prof Maryam Baghini

- Learned **VHDL coding** and verified design by performing simulations on inputs by using Scanchain on Krypton
- Studied **structural and behavioural modelling** and performed **RTL and gate level simulation** on labs
- Implemented 4-bit Adder/Subtractor, Decoder, Universal Shifter, Sequential Circuits and Finite state machines

Stock Market Predictions | Summer of Code, WnCC, IIT Bombay

(May '22 - July'22)

- Explored Python and its libraries for e.g. **NumPy, Pandas, Matplotlib, Keras, sklearn** studied and implemented feature engineering like missing data and outlier with regressions and classification techniques
- Implemented Machine learning & Deep learning models like **Linear regression, LSTM, ARIMA** to model the 'closing price' target variable of Google Stocks file and attained predictability of **98.54** using ARIMA model

Special Theory of Relativity | Summer of Science, MnP Club, IIT Bombay

(May '21 - July'21)

- Studied Galileo's and Einstein's views on the understanding between space and time with the three postulates of the Special Relativity with Lorentz transformation and its derivations

- Explored the Twin Paradox theory and General Theory of Relativity as interest point of view and Made a **video presentation** explaining Michelson Morley's experiment

TECHNICAL SKILLS

Languages	Python, C++, C, Embedded C, Java, VHDL, Verilog, Assembly Language
Software	Git, L ^A T _E X, MATLAB, Simulink, GNU Radio, LTSpice, NGSpice, Eagle, Solidworks
Python Libraries	Numpy, Pandas, Matplotlib, Keras, Tensorflow, sklearn, PyTorch, OpenCV, PySpark
Development	HTML, XML, MySQL, ReactJS, NextJS

POSITIONS OF RESPONSIBILITY

Department General Secretary | *Department of Electrical Engineering, IITB* (Apr'23- Present)

- Elected as the representative of 1500+ students of the department, responsible for overseeing the students' council and representing the students at the DUGC - the apex legislative body of the department
- Proposed and ensured the implementation of academic proposals and policy changes for benefit of the student community such as UG curriculum restructuring

Coordinator | *Alumni Co-operate Engagement(ACE), EE, IITB* (May'22 - Apr'23)

- Co-working with team and **Dean(ACR)** for engagement programs for students, staff, faculty and alumni to give a Department-level platform for industry and alumni who wish to connect with Electrical Engineering
- Co-organizing a series of events for e.g. Alumni Day, Industry Day, Distinguished Alumni Talk and Lecture series
- Performing information collection with **data-basing** and **writing articles for department magazine** of alumni based on their work/research in the industry and showcasing latest research in Electrical Engineering department

Joint Secretary | *Electrical Engineering Student Association, IITB* (Mar'21 - May'22)

Council Representing 1800+ students of Electrical Engineering Department

- **Co-headed a two-tier team of 12 members** responsible for executing and managing competitions, department treks/trips, interactive sessions, placement and internship blogs for all the students of the department
- Negotiated a deal of **INR 0.52 M+** for Department merchandise and handled distribution pan India
- Organized a series of **candid interviews** and **articles** with **professors and alumni** to the department helping in providing better connections between students, professors and alumni

Class Representative | *Electrical Engineering Department, IITB* (Dec '20 - Jun '21)

- Class Representative for the batch of **182 first-year undergraduates** in Electrical engineering department
- Being the link between prof and students **addressed the academic as well as non-academic issues of the batch** to concerned authority & organizing some fun cultural/extra-curricular activities in vacations

Mentor, Summer of Science | *Special Theory of Relativity* (May'22 - Jul'22)

- Mentoring the students and getting them familiarized with the concepts of **Special & General Theory of Relativity**

COURSES UNDERTAKEN

Electrical	Digital Signal Processing, Information Theory and Coding, Image Processing, Electronic Devices & Circuits, Microprocessor & Microprocessor Lab, Analog Circuits & Analog Lab, Control System & Control Lab, Digital Systems Digital Circuits Lab, Signals & Systems, Probability and Random Processes & Power Electronics, EM Waves, Communication System-I & Lab,
Computer Science	Computer Programming and Utilisation, Operating Systems, Advanced Computer Architecture & Automata Theory
Physics	Special Theory of Relativity. Quantum Theory and its applications & Electrodynamics
Mathematics	Calculus, Linear Algebra, Differential Equation I & II, Complex Analysis
Others	Molecular Biology, Engineering Drawing, Economics, BigData Handling, WebDev & Finance
Online	Machine Learning, Deep Learning, Reinforcement Learning, Natural Language Processing, Computational Neuroscience

EXTRACURRICULAR ACTIVITIES

- Secured an **All India Rank - 14** in **Unified Cyber Olympiad** conducted by Unified Council ('17)
- Completed a year-long program by National Sports Organisation in **Guitar** at IIT Bombay ('20- '21)
- Participated in **Hult prize** and **presented startup ideas** on agriculture and aquaponics farming ('20)
- Secured an **All India Rank - 1** in **Cyber Olympiad** conducted by Humming Bird Organization ('13)
- Secured an **All India Rank - 3** in **Talent Search Olympiad** conducted by Humming Bird Organization ('13)
- **State Winner of Vodafone Quiz by Derek O'Brien** out of 30 participating schools ('13)
- **State Winner of Bharat Vikas Parishad's Bharat ko Jano** out of 50 participating schools ('13)
- **State Winner** of Jagran's Sanskarshala conducted by Dainik Jagaran, All India ('12)
- **PREFECT** for three consecutive years in school. ('12-'14)