Tejas Amritkar   20D070081
Electrical Engineering   **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology Bombay   **Gender: Male**
Specialization: Electronic Systems   **DOB: 29/10/2002**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	
Intermediate	HSC	Mhalsakant Vidyalaya	2020	
Matriculation	SSC	Prerana High School	2018	

Pursuing a **Minor Degree** in **Computer Science** and **Engineering**, IIT Bombay

SCHOLASTIC ACHIEVEMENTS

- Secured **98.76** percentile in *IIT-JEE Advanced* examination among **0.15 million** candidates across India *(2020)*
- Achieved **99.96** percentile in *MHT-CET* entrance examination among **0.26 million** candidates *(2020)*
- Among the **Top 44** candidates all over India in *Indian Statistical Institute (ISI)* entrance examination *(2020)*
- Secured **99.08** percentile in *JEE Main* examination among **1.1 million** candidates across India *(2020)*
- Scored **100** in **Mathematics** and secured **top 1%** in *HSC Class XII* among **1.43 million** aspirants *(2020)*
- Achieved an **All India Rank of 86** in *IQube* All India Open Intelligence Scholarship examination *(2016)*

PROFESSIONAL EXPERIENCE

Design of HLS-based Robotics Application   *(Jun'22 - July'22)*
eYSIP | e-Yantra Summer Internship Programme

- Modelled the system at a higher level using **C/Aa** (Algorithmic Assembly) language and used **AHIR** toolchain (A Hardware Intermediate Representation) to generate the low-level description of the system
- Built a line follower bot using **DE0-Nano** board having **Altera Cyclone IV FPGA** coded in **Verilog**
- Designed **device drivers** for Motors and Sensors and **Control modules** for **ADC** and **UART** protocol
- Optimised the performance of the robotics system using **HLS** (High-level synthesis) with **AHIR** tool chain and concluded that C/Aa code with HLS give better results compared to Verilog code in software simulation

KEY PROJECTS

Functional Weeder   *(Nov'21 - Feb'22)*
eYRC | e-Yantra Robotics Competition 2021-2022

- Created algorithm for multiple robots to explore an unknown arena with capabilities of **autonomous** navigation, obstacle avoidance, **shortest path**, multiple destinations using **Elixir-Functional Programming**
- Developed **Web Interface** with **Phoenix** and used **Ngrok** service to host robot actions on the remote computer
- Designed an **arm mechanism** mounted on the robot for sowing seed objects and weeding plant stalks

Stock Market Predictor   *(Apr'22)*
Guide: Prof. Abir De | Course Project

- Built a model to predict the future closing prices of stocks using Long-Short Term Memory (**LSTM**) network
- Improved the mean square error from **0.0115** to **0.0034** after optimising the parameters for the model by increasing the **batch size** from **1** to **512**, **epochs** from **1** to **20** and adding the **Dropout** of **0.2** at each layer of LSTM
- Trained the dataset with **Keras-Tensorflow** library using closing prices and trading volume as training parameters

3-D Mapping Robot   *(Apr'21 - Jun'21)*
Institute Technical Summer Project | IIT Bombay

- Designed and Implemented **3D mapping** using a Ground Automated Robot in **ROS-Gazebo Simulator**
- Constructed the **Wall Following Algorithm** to move the robot autonomously in the unknown area
- Worked on Real-Time-Appearance-Based Mapping (**RTAB-Map**) package in ROS for implementing **SLAM**

Multicycle RISC Processor   *(Apr'22)*
Guide: Prof. Virendra Singh | Course Project

- Designed an 8-register, 16-bit, multicycle **Reduced Instruction Set Computer** (RISC) in **VHDL** capable of executing 17 general purpose machine-code instructions in the Intel Quartus Prime Software
- Modelled the system as a **Finite State Machine** and optimised it to reduce the total number of states
- Designed the 16-bit **ALU** (Arithmetic Logic Unit), **Memory Unit**, FSM controller and data path in VHDL
- Simulated and verified the design in **ModelSim-Altera** with a custom **testbench** spanning all instructions

OTHER PROJECTS

Image Processing | *Maths and Physics Club | IIT Bombay* *(Apr'22 - Jun'22)*
- Surveyed the literature on the basic principles of image processing like Image Sampling and Quantisation, Intensity transformation, Histogram processing, Spatial Filtering, Blurring, Morphology, **Image Segmentation**
- Implemented an **Invisibility Cloak** by extracting static background frame and masking using **OpenCV**

Maze Solver | *Electronics and Robotics Club* | IIT Bombay *(Dec'21)*
- Solved the maze with autonomous navigation detecting **ArUco** markers by integrating **ROS** and **OpenCV**
- Constructed a **PointCloud** in **RViz** for visualizing objects in Gazebo Simulator detected by the TurtleBot3

8051 Microcontroller programming *(Feb'22 - Apr'22)*
Guide: Prof. Saravanan Vijayakumaran | Course Project
- Implemented an **ATM** Simulator by displaying instructions on the **LCD** using **Embedded C** language
- Worked on **8051** microcontroller and exploited its various specifications of 4-level **Interrupt** system, 16-bit **Timers** and full duplex Universal Asynchronous Receiver-Transmitter (**UART**) with **Assembly** language

Digital Logic Design in VHDL *(Sept'21 - Oct'21)*
Guide: Prof. Maryam Baghini | Course Project
- Developed 4-bit comparator combinational circuit, string detector and tested it on the **Krypton CPLD** board
- Designed **Frequency Scaling** and Pulse Width Modulation block to generate **PWM** signal of variable duty cycle
- Implemented **Universal shift register** with capabilities of bidirectional shifting and parallel load provision

Game Theory | *Summer of Science | Maths and Physics Club* *(Apr'21 - Jun'21)*
- Studied the basic principles of Game Theory and **Mechanism Design** and surveyed the literature
- Gained insights on popular concepts like **Nash Equilibrium**, Common knowledge, Max min, Min-max strategies

TECHNICAL SKILLS

Programming	C, C++, Python, Elixir, VHDL, Verilog, Embedded C, Assembly, MATLAB
Libraries	Numpy, Pandas, Matplotlib, OpenCV, Pygame, Phoenix, TensorFlow, Keras
Softwares	Quartus, Keil uVision, GNURadio, ROS, AutoCAD, Blender, ArduinoIDE, Git, LaTeX, Eagle

POSITIONS OF RESPONSIBILITY

Manager | *Electronics and Robotics Club | IIT Bombay* *(May'22 - Present)*
- Nominated to lead an **8-member team** to organise **20+** events, competitions and hackathons and cater to **5000+** electronics and robotics enthusiasts with an annual budget of over **INR 300,000**
- **Head** of All IIT Robotics Association(**AIITRA**), a collaboration between robotics club of **Top 5 IITs** to conduct **country-wide hackathons** sponsored by renowned corporations, with a reach of **50,000+** students
- Collaborating with **IITB Research Park** to connect industries and academia to solve real-world problems
- Coordinated the **Institute Technical Summer Project** (ITSP), an opportunity for freshmen to learn the latest technologies, identify problems and implement solutions that have a real impact, with **500+** participants

Core-Team Member | *Electronics and Robotics Club* *(May'21 - Apr'22)*
- Conducted club's flagship event **XLR8**, **Arduino Bootacmp** which had the participation of **400+** students
- Mentored **150+** students in a 4-week course on the basics of **Control-Theory** where **Pygame** and **MATLAB** was used for modelling and simulating systems like a **Line follower** and **Inverted Pendulum**

KEY COURSES UNDERTAKEN

CS and Math	Machine Learning | Computer Programming (C++) | Linear Algebra | Calculus | Differential Equations | Complex Analysis | Probability and Random Processes
Electrical	Microprocessors(Theory+Lab) | Digital Systems(Theroy+Lab) | Signal Processing | Analog Circuits(Theory+Lab) | Power Engineering | Control Systems | Communication systems(Theory+Lab)* | Electronic Devices

*To be completed by Nov'22

EXTRA CURRICULAR ACTIVITIES

- Successfully completed **DST-INSPIRE** Science Internship Camp organised at **IISER Pune** *(2018)*
- Completed year-long **Volleyball** training under the **National Sports Organization**, IIT Bombay *(2021)*
- Bagged the **Design Award** among **160+** students who participated in XLR8, a bot-making competition *(2021)*
- Co-authored **Freshers' Newsletter 8.3**, INSIGHT, IIT Bombay in the article **Life of an Online TA** *(2021)*
- **Captain** of the winning team of **Volleyball** for School competition in **3** consecutive years *(2015, 2016, 2017)*
- Member of the **Animation** team for **Showstopper'21**, the flagship event of **StyleUp**, IIT Bombay *(2021)*
- Qualified both Elementary and **Intermediate** state level **Drawing** Grade examinations *(2015, 2016)*
- Qualified 1 **Shastriya Sangeet** exam and 2 **Sugam Sangeet** exams with the **Distinction grade** *(2013)*