Pursuing a minor in **Department for Computer Science and Engineering**, IIT Bombay

Scholastic Achievements

- Secured **All India Rank 371** out of 140K students in **JEE Advanced 2021** *(2021)*
- Secured **All India Rank 117** out of 1M students in **JEE Mains 2021** *(2021)*
- Obtained a score of **411 out of 450** on the BITS Admission Test **(BITSAT)** *(2021)*
- Qualified for **INPhO** (Indian National Physics Olympiad) among the **top 1%** in the **nation** *(2021)*
- Maharashtra **state topper** (top 1%) in **IOQC** (Indian Olympiad Qualifier in Chemistry) *(2021)*
- Awarded the prestigious **Kishore Vaigyanic Protsahan Yojana** (KVPY) fellowship by **Govt. of India** in SX stream by securing **All India Rank 507** among 100K candidates *(2020)*

Professional Experience

Human Machine Interface (HMI) Device Programming

Embedded Systems Designer | Yantralaya Electronics *(Summer '23)*

- Developed an intuitive and visually engaging **10" display interface** showcasing **live train parameters**. Leveraged a combination of **graphical programming** and **embedded C** to create a seamless user experience
- Implemented a high-speed **SPI**-based **communication** library, enabling the host dual core **ARM M0+ MCU** to transmit **vector graphics** commands to the embedded video engine, ensuring real-time and smooth rendering
- Programmed a state-of-the-art, resource-efficient **Human-Machine Interface (HMI)** operated via **UART**, specifically designed for integration into **3-wheeler electric vehicles**. This HMI seamlessly aggregated **real-time data** from the BMS and motor controller via **CANBus**, enhancing vehicle performance and accessibility.

Key Projects Undertaken

IITB Student Satellite Program (GNC Subsystem) *(Dec '22 - Present)*

- **B-Dot Controller | Ongoing Project**
  - Studied and understood **control systems**, the preliminary mathematics, system functionings and stability criteria
  - Coded a **B-Dot controller** for the **CubeSat** for **detumbling** (reducing angular velocity) upon initial deployment
  - **Simulated detumbling** of a **high angular velocity satellite** on **Matlab** with the **B-Dot algorithm** I coded
  - **PCB designing** and **testing** for the B-Dot controller to be implemented on the **3U CubeSat** being developed
- **Closed Loop Simulation**
  - Did a **Closed Loop Simulation** for the functioning **Propagator**, **Estimator** and **Controller** blocks in **Matlab**
- **Propagator and Rigid Body Dynamics | Mini Projects**
  - **Determined the motion** of a 3-Dimensional free rigid body of a given moment of inertia by the **RK-4 method**

IITB CPU | Pipelined Architecture Processor

Course Project | Microprocessors (EE309) | Guide: Professor Virendra Singh *(Nov - Dec '22)*

- Designed a **16 - bit Reduced Instruction Set Architecture Pipelined Microprocessor** in a modular structure using VHDL, with complete **hazard mitigation** including **pipeline stalling** and **data forwarding**
- Implemented **26 instructions**, each divided into different categories, each going through **6 stages** of **pipeline**
- Designed **Decoders** (including **Instruction decoder**) to generate each **control signal** for various hardware components and a **Hazard Detector** for detecting various hazards during execution of **multiple instructions**
- **Simulated** the CPU using various instructions, **checking each** of its **units** (e.g. memory) after every instruction

Microprocessor Coding using Assembly and Embedded C

Course Labs | Digital Circuits Lab | Guide: Prof Nikhil Karamchandani *(Sept '22)*

- Implemented various **basic algorithms** in **assembly** language for **8051 microcontroller** using **Keil** software
- Programmed an **LCD**, coded **timers**, intefaced a keypad with **Pt-51 board** using **embedded C** and assembly
- Established **UART communicatio**n between Pt-51 board and computer and **received data** using **Realterm**

Digital Design using VHSIC Hardware Description Language

Course Labs | Digital Circuits Lab | Guide: Prof Maryam Baghini *(Sept '22)*

- Designed several **digital circuits** using **VHDL**'s structural and behavioural description on **Quartus** Software
- **Circuits**: 4 - bit adder and subtractor, ALU, Clock Divider, Tone Generator, Sequence Generator and Detector.
- Implemented the **hardware** design using **Scanchain** environment on the **Xen-10 board** for testing all test cases

Simulation and implementation of Analog Circuits

Course Labs | Digital Circuits Lab | Guide: Prof Maryam Baghini *(Sept '22)*

- Created **analog circuits** like BJT, logarithmic and instrumentation amplifiers, active and passive low and high-pass filters, Schmitt trigger, astable and monostable multivibrators, etc. and **simulated** them using **NGSpice**
- **Implemented** the designed circuits on a **breadboard** to **test** the results using various ICs and other components

Analysing Impact of World Events on Tech Stocks

Course Project | Programming for Data Science (DS203) | Guide: Prof Amit Sethi *(Nov - Dec '22)*

- Performed basic **Exploratory Data Analysis** on the data of **25** of the leading **Big Tech Companies' stocks**
- Associated the **trends of the stocks** in various periods to the **internal and external events** during that time
- Predicted the **behavior** of the stocks using this model during such **unexpected** and **uncommon world events**

Algorithmic Trading using Reinforcement Learning

Winter in Data Science (WIDS) Project | Analytics Club, IIT Bombay *(Dec '22 - Jan '23)*

- Learnt **Reinforcement Learning** and read various **research papers** for the same to understand the algorithm
- **Modelled a trading algorithm** with a team after **reading** and **understanding** a basic **reference model**

Bubble Trouble (Game Designing in SimpleCPP)

Course Assignment | Computer Programming and Utilization (CS101) | Guide: Prof Parag Chaudhari *(Jan '22)*

- Developed a user interactive game, modelled and rendered using **simplecpp**, a graphics library in **C++** language
- Included features like **gravity**, **timers**, **scores**, **health**, **different sized bubbles** etc., with a large code base
- Used **Object Oriented Programming**, **inheritance**, and **event handling** to add user interaction in the game

Other Projects

- **Markov Chains**: (Reading Project) Done as an **SoS** offered by **MnP club**, IIT Bombay *(May - Jul '23)*
- **Game Arcade**: (School Project) Designed various games playable as a user, with ticket system *(Jan '19)*

Technical Skills

Languages	C, Embedded C, C++, Assembly, VHDL, Python, Java, HTML, CSS, JS
Python Libraries	Matplotlib, Pandas, Seaborn, NumPy, SciPy
Other softwares	Quartus, Keil, Matlab, Simulink, Eve & DGUS Screen Designers, LaTeX, AutoCAD, Git.

Positions of Responsibility

• Mathematics Course Teaching Associate | Maths Department *(Nov - Dec '22)*
Selected as a TA for **three mathematics courses**, namely MA109: **Calculus I**, MA111: **Calculus II**, and MA108: **Differential equations**, where I conducted weekly **problem-solving** and **doubt-solving sessions** for **40+ students**

• Subsystem Head | GNC Subsystem | IITB Student Satellite Program *(Apr '23 - Present)*
Executed a **three stage recruitment** process by designing a **recruitment test** and taking **interview** to select students for the Guidance, Navigation and Controls **subsystem** evaluating their technical skills and critical thinking

Key Courses Undertaken

Electrical Engineering	Analog Circuits, Digital Systems, Signal Processing, Probability and Random Processes, Introduction to Electrical Engineering Practice, Power Engineering-I, Electronic Devices, Micro Processors, Control Systems, Power Engineering-II, Communication Systems*, Electro-Magnetic Waves*
Laboratories	Digital Lab, Analog Lab, Microprocessor Lab, Power Engineering Lab, Control Systems Lab*, Electronic Devices Lab*, Communication Systems Lab*
Computer Science	Computer Programming and Utilization, Data Science, Data Structures and Algorithms
Maths and Physics	Calculus I & II, Linear Algebra, Ordinary and Partial Differential Equations, Complex Analysis, Basics of Electricity and Magnetism, Quantum Physics and Application

** To be Completed by Dec '23*

Extra Curriculars

- Actively participating in **Competitive Programming** on CodeChef (**three-star** coder) *(2022-23)*
- Represented Vasant Vihar Club in **table tennis** at the district level and school in AISM and DSO *(2017-19)*
- Completed a year-long **NSO (National Sports Organization) Badminton** camp at **IIT Bombay** *(2021-22)*
- Completed a two-month **Personality Development** course at Spark Personality Development *(2022)*
- Completed all the eight levels of **Abacus** and all the three levels of **Vedic Mathematics** *(2013-15)*
- Secured B grade in **Elementary Drawing** exam and C grade in **Intermediade Drawing** exam *(2016-17)*
- Cleared **Praveshika Poorna** level in **singing** and **Praveshika Pratham** level in **synthesizer** *(2010-13)*