

Pursuing a Minor in **Artificial Intelligence and Data Science** at IIT Bombay

Scholastic Achievements

- Secured All India Rank **123** in JEE Advanced among over 150 thousand candidates (2020)
- Achieved a score of **426** marks out of **450** in BITSAT entrance test conducted by BITS (2020)

Projects Undertaken

Student Satellite Program

(May'21 - present)

A 70+ member student team with the vision of making IITB a centre of excellence in space technology

Star Tracker-based Attitude Determination System(STADS) | Electrical Subsystem

A CubeSat-compatible Star Tracker-based Attitude Determination System to be tested on the PS4-OP

- Contributed to development, optimization and implementation of **algorithms** constituting a three-stage operation to determine the **attitude** of a satellite using images from its optical field of view
- Tested algorithms and verified results on an **FPGA-based emulator** system of **AJIT**, one of India's first indigenously developed microprocessors, under a collaboration with Prof Madhav Desai, IITB
- Interfacing the sensor Python480 with the AJIT microprocessor through a control bus, using VHDL

International Conference on Small Satellites | Society for Small Satellite Systems (SSSS)

- **Presented** the Star Tracker-based Attitude Determination System (STADS) and compiled a **comprehensive system report** including system hardware design, simulation frameworks, algorithms
- Secured **third prize** in the Student Project Competition for presenting STADS to ISRO members

Stellar astrophysics and exotic particles | Research Project

(Nov'21 - present)

Guide: Prof Vikram Rentala, IIT Bombay

- Gained proficiency in concepts in **astrophysics** such as internal stellar structures, stellar evolution, stellar pulsation, the distance ladder, Hubble Tension by conducting thorough **literature reviews**
- Learnt about **astronomical observation techniques** like Redshift measurements, parallax, spectra, to measure attributes like velocities, distances, temperatures and masses of distant celestial objects
- Exploring the **MESA** (Modules for Experiments in Stellar Astrophysics) python package by simulating intricate and **astronomically accurate** stellar environments and stellar pulsations
- Studied common research practices like problem statement selection, a **5-point analysis** including pros, opportunities, innovation, new thinking, and issues, for shortlisting research ideas

Distributed Beamforming using Drone Swarm network | Research Project (Jun'22 - Present)

Guides: Prof Dwaipayan Mukherjee, Prof Shashi Ranjan Kumar, IIT Bombay

- Performed Literature reviews on **beamforming**, **opportunistic arrays**, **UAV swarm control**, and their applications in fields like electronic warfare, disaster management and communication
- Implementing particle swarm optimization algorithms like the **bee colony** algorithm, the **wolf swarm** algorithm and the **firefly** algorithm for cooperative control in UAV swarm systems
- Proposed the group project to **ISRO** under the **Respond Basket 2022** programme

IITB RISC Microprocessor design | Course project

(Apr'22)

EE309 | Guide: Prof Virendra Singh, IIT Bombay

- Designed a 16-bit Reduced instruction set architecture **multi-cycle microprocessor** by implementing a **Finite State Machine** model, in a modular structure using VHDL and Xilinx vivado
- Implemented **17 instructions** categorized into 4 instruction types, and designed and optimized hardware flowcharts to achieve **minimal number of distinct states** for the microprocessor
- Constructed key digital components such as an ALU, buses, registers, memories and sign extenders

Occupancy detection using IR sensors | Research project

(Jun'22 - Present)

Guide: Prof Anupama Kowli, IIT Bombay

- Designing a system to detect **human occupancy** in a region, using **Passive Infrared Sensors** coupled with **Thermal imaging**, to minimize energy consumption by using the obtained data
- Working on component selection, circuit design, and data collection and handling for the system

Prediction of Cardiovascular diseases | Course project

(Nov'21)

DS203 | Guides: Prof Amit Sethi, Prof Manjesh Hanawal, IIT Bombay

- Applied **Exploratory Data analysis** on datasets of patients related to cardiovascular diseases
- Implemented random forest classifiers, neural networks, serial vector classifiers and regression
- Determined health patterns and factors affecting presence of cardiovascular diseases in individuals

Key courses undertaken

Electrical Engineering Analog Circuits, Digital Systems, Signal Processing-I, Control Systems, Microprocessors, Electronic devices and circuits

Data Science Programming in Data Science, Introduction to Machine learning

Positions of Responsibility

Subsystem Head | Electrical Subsystem

(May'21 - present)

Student Satellite Program, IITB

- **Headed** a group of 9 students to design, test, verify algorithms, and design electrical architecture
- Selected 6 out of 48 applicants, by a **3-phase recruitment process** including written tests, interviews and projects, to assess their technical prowess, practical approach and interpersonal skills

Department Academic Mentor (Electrical)

(Jun'22 - present)

- Selected amongst 46 mentors out of 100+ applicants based on **rigorous interviews** and peer reviews
- Mentoring **6** sophomores on managing academic, social and other concerns on a personal level
- Maintaining course reviews, course segregation, and management of other course resources

Teaching Assistant

(Jan'22 - Jul'22)

- Selected as a TA for **three courses** from the mathematics department, namely **MA106**: Linear algebra, **MA111**: Calculus-II and **MA108**: Differential equations, based on academic proficiency
- Conducted weekly **problem solving** and **doubt solving** sessions for a group of 40+ students

Extracurricular Activities

- Volunteered for 80+ hours for **Green campus** under the **National Service Scheme (NSS)** which involved conducting surveys and performing literature reviews & presentations (2020-21)
- Completed a **python** course by the Web and Coding Club under Learners' space (Jul'21)
- Built a glider in a **glider making workshop** organised by Aeromodelling club (Dec'20)
- Constructed and tested a Line follower bot which functions by using **IR proximity sensors** and an L239D motor driver as a part of its driving internal circuitry (Sept'21)
- Designed an **RC plane** with a BLDC motor, propellers, and incorporated **aerodynamic aspects** of the body, and tested the plane by flying it (Sept'21)