Sarthak Raj | **20D180031**
Civil Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 17-03-2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	8.31
Intermediate	CBSE	Delhi Public School, Patna	2020	95.40%
Matriculation	CBSE	Delhi Public School, Patna	2018	90.83%

Technical Skills

Programming: C, C++, Python, HTML, CSS, Arduino, MATLAB
Environments: Jupyter Notebook, PyCharm, Visual Studio Code, Arduino
Softwares(Electronics): Autodesk Eagle (PCB Designing), BQStudios, LTSpice
Softwares(General): LaTeX, Git, AutoCAD, GNU Octave, MATLAB

Relevant Links

LinkedIn: https://www.linkedin.com/in/sarthak–raj/
GitHub: https://github.com/SarthakRaj1703

Major Projects

Matsya, Autonomous Underwater Vehicle (AUV)

Jan '21 - Present
Prof. Leena Vachhani — *RoboNation*

- AUV-IITB is a multi-disciplinary, all students team of 55 members working on the **design** and **development** of an **Autonomous Underwater Vehicle**, Matsya, capable of performing **realistic naval missions**
- Achieved **2nd position** in Video Presentation, **4th position** in Technical Design Report, and **6th position** in website out of **54 International** teams in **RoboSub '21** (online), organised by **RoboNation**
- Awarded the highly reputed **Young Researcher's Prize** by **IEEE-OES(Ocean Engineering Society)(2020)** at **Underwater Technology Competition** (University of Tokyo) with teams from over **18+ Countries**
- Achieved **7th overall** and **3rd position** in Video Presentation out of **33 International** teams in **RoboSub '20** (online), organised by **RoboNation** and held annually at San Diego, California

Battery Management System | Electrical Sub-Division of AUV-IITB

Jun '21 - Present

- Designed a **Battery Management System** to measure the **State of Charge (SOC), State of Health (SOH)** and **implement Passive Cell Balancing** and **Battery Redundancy**
- Configured the **BQ76952 Battery Monitoring IC** using **BQStudio** to monitor **4S LiPo Batteries**
- Programmed the **ATMega328P Microcontroller IC** using **C/C++** in the **Arduino** environment
- Established communication between microcontroller and Battery Monitoring IC using **400 kHz I2C**
- Simulated a **Battery Redundancy** circuit on **LTSpice** and observed **10 μs** switching time

Voyager(Gripper) | Electrical Sub-Division of AUV-IITB

Jun '21 - Present

- Designed a **1 degree of freedom gripper** connected with a **3 degrees of freedom** armature that can each be **autonomously controlled** to grip objects of various dimensions underwater in **naval missions**
- Created a PCB capable of **CAN, USB** and **RS-485** communication at **10 Mbps** baud rate to control an **H-Bridge Motor Driver** using **PWM Signals** up to a range of **20 kHz** for rotational speed control
- Programming **ATMega328P** using **C/C++** to detect current surges up to **30A** to identify gripping of load

Development Work | Electrical Sub-Division of AUV-IITB

Jan '21 - May '21

- Acquired knowledge, training and hands-on experience of **Controller Area Network** (CAN), **Arduino**, **PCB designing**, and various **serial communication protocols** like **UART**, **SPI** and **I2C**
- **Designed** and analysed the **electrical schematics and boards** and various other components of the vehicle

Industrial Collaboration

Underwater Remotely Operated Vehicle for Inspection and Surveillance *Jan '21 - Present*
Principal Investigator – Prof. Leena Vachhani *Department of Systems and Control Engineering*

- **Key member** of a team working under Prof. Leena Vachhani to develop a **Class-1 ROV**
- The project is a joint effort by **IIT Bombay and Larsen & Toubro Limited,** under the **IMPRINT II.C Scheme**, a technology development Initiative by MHRD, Government of India
- Currently ready for fabrication; the ROV is aimed to be deployed in Sea waters for scanning and maintenance

Academic/Other Projects

Lasso Based Coin Collection Game - Course Project *Feb '21*
Prof. Bhaskaran Raman *Computer Programming and Utilization*

- Programmed a videogame using the **Simplecpp** library to catch coins and avoid enemy projectiles
- Implemented **throw, catch, loop** functionalities for the Lasso, as well as **Speed up, Speed down, Increase Angle and Decrease Angle** as user controls, along with a **500 second** timer to impose a **Time limit**
- Added **market** feature and allowed user to **buy and sell upgrades** with coins as currency

Animatronic Hand | *SkyFi Labs* *Aug '19*

- Developed an **Animatronic Hand** to mimic motions of the hand using **5 flex sensors**
- Programmed **Servo Motors** to move **5** fingers when flexure was detected by the **Arduino Microcontroller**
- Engineered the Animatronic Hand to be **Remote Controlled** upto **10m** using a **5V IR Sensor**

Refractory Telescope for Solar Projection and Observation *Aug '19*

- Built a **Refractory Telescope** to safely project the **real, inverted image** of the sun at a distance of **15 cm** from the telescope on a screen during daytime for observation, experiments and calculations using geometry
- Estimated the **Angular Diameter** of the Sun to be **0.5 degrees** or **0.008726 radians** from Earth
- Calibrated the telescope and observed the **Annular Solar Eclipse** on **26-12-2019** at **0926** hours

Scholastic Achievements

- Attained **Department Rank 2** in the **Department of Civil Engineering**, batch of 2024
- Pursuing a minor degree in **Computer Science and Engineering**, IIT Bombay
- Awarded a **Change of Branch** to **Dept. of Civil Engineering** (**1** out of **1300+** freshmen) *(2021)*
- Secured **All India Rank 4874** in **Joint Entrance Exam-Advanced** out of **150 thousand** candidates further shortlisted from 1.1 million candidates in **Joint Entrance Exam-Main** *(2020)*
- Awarded **Certificate of High Distinction** for scoring in the **top 1 percentile** among candidates from **23 Countries** in the senior division in the **Australian National Chemistry Quiz** *(2019)*
- Earned **Certificate of High Distinction** among students from **23 Countries** in **ANCQ - Junior** *(2017)*

Key Courses Undertaken

Computer Science:	Computer Programming and Utilization, Computer Networks*
Mathematics:	Calculus - I & II, Linear Algebra, Differential Equations - I&II*
Civil Engineering:	Solid Mechanics*, Fluid Mechanics*, Water Quality Management
Electrical Engineering:	Introduction to Electronics and Electrical Engineering*
Physics:	Quantum Physics and Applications, Classical Electrodynamics
Others:	Economics, Engineering Drawing, Chemistry (Physical, Organic and Inorganic)

**To be completed by November '21*

Extracurricular Activities

- Participated in **techfests** and **science exhibitions and competitions** organized regionally *(2019)*
- Engineered a **Paper Recycling Workstation** for **CBSE Regional Science Exhibition** *(2019)*
- Participated in the **Rural Immersion Programme** and lived in rural areas to **understand** problems faced by rural India including **sanitation**, **women empowerment** and **small-scale industries** *(2018)*
- Worked for **Le Benevolat** and **organized** events to **revive** the **Khadi Industry** of the country *(2016-17)*