Nishant Mittal | **190070038**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology, Bombay | **Gender: Male**
DOB: 18-08-2001

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	null
Intermediate	CBSE	NCRD's Nalanda English Medium School, Pune	2019	93.40%
Matriculation	CBSE	Indira National School	2017	10

Pursuing a Minor Degree in **Systems and Control** with a **minor CPI of 10**

Scholastic Achievements

- Currently ranked **2nd** in the Department of Electrical Engineering amongst 164 students [2021]
- Received the **AP** (Advanced Performance) grade in Analog Circuits, Digital Systems and 3 other courses [2019, 2020]
- Secured an **All India Rank of 275** in **JEE Advanced** and an **All India Rank of 1130** in **JEE Mains** [2019]
- Recipient of the prestigious **KVPY fellowship** with an All India Rank **266** [2019]
- Scored 1510/1600 in **SAT** and 800/800 in **SAT subject** for each Physics, Chemistry and Math [2019]

Work Experience

IITB Rocket Team
[Jun'21 - Present]
Avionics and Control Subsystem *(IIT Bombay)*

- Designed an avionics **flight computer** to interface sensors, perform data logging, communication and deploy parachutes
- Studied flight requirements for preliminary 3km launch and identified hardware, including IMU's & barometric sensors
- Interface was designed in **Eagle** based off a **Rpi4 B hat** using **I2C** to interface sensors and **SPI** for data logging
- Working on flight software for sensor fusion, apogee detection, parachute deployment, data logging & communication

IITB Mars Rover Team
[Jun'20 - Present]
Electrical and Hardware Subsystem *(IIT Bombay)*

- Performed **risk analysis** of potential fail points and developed the **subsystem overview report** for **ERC 2021**
- Investigated cause of failure of main onboard computer and proposed solutions to **overcome current ripple effects**
- Analysed performance of various **DC-DC converters** to select **optimal converter** for powering the onboard circuit
- Working on main **PCB design** to reduce electrical footprint, streamline the system and make it robust and shockproof

Data Science Engineering Intern
[Apr'20 - Jul'20]
Cormentis Design Corporation, USA *(Remote)*

- Used **Natural Language Processing** and other AI/ML services to identify keywords, relevant information and extract a structured data set from a wide variety of unstructured data gathered from multiple web and social platforms
- Implemented **data scrapping** algorithms to **retrieve targeted data** from various platforms to cross-link web profiles
- Automated and deployed **data retrieval algorithms** to a backend AWS server for integration with a front end UI

Research Projects

Digital Correlator for GPS Acquisition (IRNSS/NavIC Program)
[May'21 - Present]
Summer Undergraduate Research Project | Prof. Rajesh Zele *(IIT Bombay)*

- Designing a **digital circuit** to interface with an **RF receiver** for the **NavIC program** to extract navigation data
- Designed and simulated a circuit in **SIMULINK** to perform **C/A phase acquisition** and fine frequency estimation
- Developed a digital-based tracking circuit to **track acquired GPS signal** and **extract navigation data** at 50 Hz
- Developing the digital circuit using **VHDL** in **Vivado** to test the design on the FPGA **ZC706 development board**
- Further work includes translating to **chip-level** synthesisable logic and developing software to estimate user position

Design & Testing of Modern MPC system for MIMO Suspension in LIGO [May'21 - Present]
Research Project | Dr Suresh Doravari *(Inter-University Centre for Astronomy and Astrophysics, India)*

- Modelling the **six degrees of freedom** of a single-stage LIGO suspension module using **Lagrangian Mechanics**
- Modelling **wire bending** and cantilever blade deflection by incorporating relevant potential terms in the Lagrangian
- Developing a **SIMULINK** model for above dynamics to evaluate system response and **simulate control algorithms**
- Future work involves developing an **MPC based algorithm** to compute a control filter for suspension stabilisation

Modelling and Control of Flexibility in Manipulators [Mar'21 - Present]
Summer Research Project | Prof. Ravi Banavar & Prof. Josè Angel Acosta *(University of Seville, Spain)*

- Modelling the kinematics via dynamics of interaction of a **flexible multi-link arm** with a compliant non-rigid surface
- Kinematic force balance derived in **product of exponentials form** via a slow-moving approximation in the dynamics
- Further, a **closed-loop, inverse kinematic algorithm** based on the **transpose Jacobian scheme** will be explored

Key Projects

Auto-fare Calculator [Mar'21 - Apr'21]
Course Project - Microprocessor Lab | Prof. V. Rajbabu *(IIT Bombay)*

- Used **embedded C** interfaced with **assembly** to create an auto-rickshaw fare calculator on the **PT-51 dev board**
- Used **timer interrupts** to keep track of distance travelled and **trigger events** for input change read and fare output

16-bit ALU design [Nov'20 - Dec'20]
Course Project - Digital Systems | Prof. Virendra Singh *(IIT Bombay)*

- Designed a 2-bit control, **16-bit ALU** capable of performing signed addition, subtraction, NAND and XOR operations
- Researched various look-ahead adder designs and selected the **Kogge-Stone** and **Brent-Kung** look-ahead adder
- Worked in a group of 2 to implement and test the functionalities of the ALU in **VHDL** using **Quartus** and **Modelsim**

Lab Bench Power Supply [Aug'19 - Nov'19]
Course Project - Introduction to Electrical Engineering | Prof. Joseph John *(IIT Bombay)*

- Designed and built a power supply using a **full bridge rectifier**, an **LM7805** & **Zener diodes** outputting 5V, ±12V
- Recognised as one of the **top 10** teams out of **70**+ for **exceptional design**, **soldering** and **layout** of the board

Frequency Domain Analysis of Linear Systems [Mar'20 - May'20]
Controls and Dynamical Systems Student Reading Group *(IIT Bombay)*

- Worked with a team of **fifteen** to learn and deliver a report on using the frequency domain to analyse linear systems
- Implemented various algorithms in **MATLAB** for **echo simulation** and **echo elimination** in a closed room

Spaceflight Dynamics Report [Apr'20 - Jun'20]
Summer of Science | Maths And Physics Club *(IIT Bombay)*

- Provided a **mathematical basis** of **frame transformations** and **angle representations** used for spacecraft motion
- Undertook secondary research of **orbital motions** & elements and their relevance to **inter-planetary trajectories**
- Analysed key challenges to spacecraft re-entry and detailed solutions along with mathematical formulation for re-entry
- Provided a small case study of the **Voyager Deep Space missions** and outlined the inter-planetary trajectory

Technical Skills

Programming Languages:	Python, VHDL, Assembly, C++, LaTeX
Softwares and Packages:	MATLAB, Simulink, Eagle, Kiel, Quartus
Hardware:	Arduino, Raspberry Pi

Key Courses

- **Electrical Engineering:** Introduction to Electrical Engineering Practice, Signals & Systems, Analog Circuits, Digital Systems, Control Systems, Microprocessors, VLSI CAD*
- **Systems and Control:** Mathematical Structures for Control, Signals and Feedback Systems, Control of Nonlinear Dynamical Systems, Linear and Non-Linear Systems*, Adaptive Control*
- **Coursera:** Spacecraft Dynamics and Control Specialization, An Introduction to Programming the Internet of Things

∗ to be completed by December 2021

Extracurriculars

Social
- Active participant in local hill **rejuvenation** and **tree** plantation project to promote return of wildlife
- An active volunteer for **The Art of Living** in the Pashan (Pune) area and AOL camps for **10**+ years

Others
- Conducted a **crash course** and **doubt solving session** for **150**+ students on Power Engineering
- Avid Origamian, created modular origami structures of **10,000+** pieces displayed at an art exhibition
- Successfully completed the **Design Bootcamp** and created many designs using **Adobe Illustrator**
- Designed and executed a Photostory depicting the life of a book whilst drawing analogies to real-life
- Built a **surface-following drone** in the **PlutoX Hackathon**, '19 conducted by Drona Aviation
- Led a team to create a **6-ft tall hologram** as the centre of attraction for the school hosted science fair

Awards and Recognitions

- Won the award for Social Responsibility at **Rohde & Schwarz Engineering Competition 2021** with team SPINS
- Won **Second Place in Game Jam Titans** Pune(2015), a video game design competition (The Ethical Hackers)

Scholastic achievements and extracurricular activities are not verified by the Placement Cell