Pranjal
Mechanical Engineering
Indian Institute of Technology Bombay

B.Tech
210100117
CPI:

Pursuing a Minor Degree in the **Centre for Machine Intelligence and Data Science** and Elective in **Digital Health**

SCHOLASTIC ACHIEVEMENTS

- Attained a **perfect SPI** of **10/10** during the summer semester, securing **top grades** across all courses. [2023]
- Attained **99.76** percentile in **JEE Main** Examination among **1.2 million+** candidates all over India [2021]
- Attained **99.21** percentile in **JEE Advanced** Examination among **150,000+** candidates throughout India [2021]
- Successfully passed **NDA** exam conducted by **UPSC**, demonstrating exceptional proficiency in **mathematics** [2021]

PROFESSIONAL EXPERIENCE

Defence Research and Development Organisation (DRDO) | *Research Intern* [May'23 - Jul'23]

*DRDO is the R&D wing of **Ministry of Defence**, Govt of India, enpowering India with cutting-edge defence technologies*

- Used **Quantum Cryptography** to ensure a secure communication between two parties that is impossible to spy
- Conducted an investigation into the **most robust** Quantum Cryptography protocol and delve deeper into the subject
- Created a **Simulink** model in Matlab for the **simulation** of protocol; Did a *Literature review* of 20+ research papers

Acmegrade Pvt Ltd | *Machine Learning Trainee* [Jun'22 - Jul'22]

- Evaluated several **machine learning algorithms** to analyze their effectiveness & applicability in various contexts
- Explored and analyzed ML frameworks like **Scikit-learn and Keras** to understand their functionality and utility

Research Trainee | *Supervisor: Prof. Shobhna Kapoor, Department of Chemistry* [Dec'22 - Mar'23]

- **Guided** 45+ students as a Research Trainee for the course **Physical Quantum Chemistry** via personal interaction
- Conducted **problem-solving** sessions to clear conceptual doubts, providing **academic mentorship** to the students

ENGINEERING EXPOSURE | TECHNICAL PROJECTS

Understanding the classifier in neurodegenerative disorders using ML | *Prof. Srivastava* [Jan'24 - pres]

- Utilized diverse **spectroscopy** techniques to extract raw proteomics data from an authentic brain tumour sample
- Conducted **exploratory data analysis** and visualization, utilizing **dimensionality reduction** & various other methods
- Utilizing ML algorithms to comprehend classifiers, enhancing understanding through **predictive analysis**

Heart Disease Prediction | Machine Learning Course Project | *Prof. Abir De* [Jan'23 - Apr'23]

- Utilized **Neural Networks** to **classify** heart disease patients with a dataset of 303 patients from **UCI** ML Repository
- Leveraged a set of **76 attributes** to categorize patients, while fine-tuning the code for enhanced performance

Strategising location of Wireless Network Devices | Optimisation | *Prof. Avinash Bhardwaj* [Jan'24 - pres]

- **Formulated** and translated strategic objectives into **mathematical models** for optimizing the placement of WAPs
- Implemented algorithms and conducted Python coding to **simulate** and validate the formulated mathematical model
- **Compared** the outcomes of our implemented model with existing implementations and assessing **scalability**

Disney+ Hotstar Clone | Web Development [Jun '22 - Jul '22]

- Created a **responsive** and **interactive** user interface (UI) on the front-end that emulates the Disney+ Hotstar website
- **Refined** search box, implemented **carousel** with infinite scrolling effect, and added hover effects to the movie cards
- Utilized **CSS** to animate movie cards, **enhancing** their visual appeal, and seamlessly integrated **JavaScript**

Invisibility Cloak | Computer Vision | *Electronics and Robotics Club, IIT Bombay* [Jun'22]

- Surveyed the literature on the principles of **Computer Vision** like Image Sampling, Quantisation, Morphology etc.
- Implemented an Invisibility Cloak by extracting static background frame and **masking** using OpenCV

Winter of Data Science Mentor | *Analytics Club, IIT Bombay* [Dec'22 - Jan'23]

- **Led** a team of **4** sophomores and **handled** all the **logistics** in building a "Document Scanner" project
- Provided mentees with best **resources** to enhance their knowledge about Computer Vision using OpenCV, Numpy
- **Solved** their **doubts** regularly through online meets regarding OpenCV and basic **Machine Learning** concepts

RESEARCH & ACADEMIC EXPERIENCE

Computational Quantum Chemistry | Guide: Prof. Alok Shukla, Department of Physics [*Jan'23 - Feb'23*]

- Analysed **Hartree-Fock theory** and **correlation approaches** to examine energy of a **quantum many-body system**
- Used C++ based **Quantum Chemistry package, PSI4** to perform calculations on some molecules/clusters

Obstacle Maneuvering Omni Bot | *Electronics and Robotics Club, IIT Bombay* [*Aug'22*]

- **Engineered** a *3 wheeled*, well maneuverable omni bot capable of navigating in *10 directions* within the XY plane
- Created **obstacle avoidance algorithm** tailored for microcontroller & **implemented** it in conjunction with motor driver
- Incorporated a **Wi-Fi module** with the **Blynk IoT** application and configured it through C++ based **Arduino IDE**

Computational Fluid Dynamics | Guide: Prof. Neeraj Kumbhakarna, Mechanical eng. [*Mar'23 - Apr'23*]

*Simulation and in-lab research of flow around a cylinder using mixing length model for **2-D Navier Stokes** equations*

- **Devised framework** for turbulent flow modeling to **reduce computation time** by **30%** compared to existing methods
- Discovered three optimized flow patterns within the circular pipe, to **reduce pressure losses** and thus **save energy**

Remote-Controlled Plane | *Aeromodelling Club, IIT Bombay* [*Jun'22*]

- Worked in a **team of 4**, aimed at optimizing an aircraft for stable flight taking **aerodynamics** into account
- Assessed the operation of the RC plane by utilizing the **Phoenix RC** software, a **simulator** designed for RC flight

Space Science and Tech. AwaReness Training | *Indian Space Research Organisation (ISRO)* [*Jul '23*]

ISRO has envisaged the START programme, as an awareness programme in space science and technology

- Explored domains of **space science research** including Planetary science, Astronomy & Astrophysics, Heliophysics

Cosmology & Dark Matter | Summer of Science '23 | *Maths and Physics Club, IIT Bombay* [*May'23 - Jul'23*]

- Explored different domains of cosmology, beginning from the Newtonian view and later **cosmological inflation**
- Researched **vacuum energy**, zero-point **quantum fluctuations**, and candidate particles of dark matter

POSITIONS OF RESPONSIBILITY

Institute Technical Convener | *Electronics and Robotics Club, IIT Bombay* [*Jun'22 - Apr '23*]

*Worked in an **8 member team** catering to over **9K+** Electronics & Robotics enthusiasts across the institute*

- **Organized** Events, Hackathons, Competitions, Group Discussions, Research projects throughout the year
- **Lectured 200+** enthusiasts and covered basics of OpenCV using PyCharm in Code the pixels, a hands-on **Image processing** session followed by an illustratory project, Invisibility Cloak using Color detection and segmentation
- Indulged **700+ participants** and **100+ mentors** in our flagship, a **Wi-Fi Controlled Bot** making competition, XLR8
- **Presented help sessions** for core electrical, mechanical, **Mechatronics** concepts; **Coordinated** soldering session

JEE Mentor | *Physics Wallah* [*May'23 - Jul'23*]

Physics Wallah is an online ed-tech platform that provides a comprehensive learning experience to 9M+ students

- **Career counseling** and **mentoring** students to help them avoid stressful academic burnouts during JEE times
- **Promoting** betterment of mental health by conducting sessions and enhancing my **communication skills**

TECHNICAL SKILLS

- **Languages & Libraries** : C++, Python, MATLAB, Gazebo simulator, HTML, JavaScript, OpenCV, LaTeX
- **Applications** : ROS, SolidWorks, Ansys, Arduino, Blender, Eagle, PyCharm, Microsoft Office

RELEVANT COURSES UNDERTAKEN

Mathematics	Calculus I and II, Linear Algebra, Differential Equations, Numerical Analysis
Computers science	Computer Programming, Introduction to Machine Learning, Web Design
Mechanical Engineering	Control Systems, Engineering Mechanics, FEM, Thermodynamics, Structural Materials, Manufacturing Processes, Measurements, CAD, CAM

EXTRA-CURRICULAR ACTIVITIES

Entrepreneurship and Corporate	• **Interned** at **Coding Ninjas** in **PR** and **Marketing**, and contributed to **Project management** • Secured **funding** exceeding **10 lakh** rupees for the Tinkerers' Lab, 24/7 lab for engineers • Worked as **Campus Ambassador** for Unacademy to augment its reach in the campus
YouTube	• **Interviewed** on Sankalp Bharat's **YouTube** channel with **500K+ subscribers**
Social Work	• Conducted a 3 week bootcamp for under-privileged students; Encouraged STEM education
Event Management	• **Hosted** Career Assistance session in the domain of **University Research Internships** • Conducted awards ceremony for Institute Technical Projects showcasing 45+ projects