Rohan kumar | **22B4510**
Mechanical Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology Bombay | **Gender: Male**
Specialization: Computer Integrated Manufacturing | **DOB: 21/08/2003**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2027	
Intermediate	CBSE	Kendriya Vidyalaya EME	2021	90.80%
Matriculation	CBSE	Kendriya Vidyalaya Darjipura	2019	91.60%

*Pursuing a minor in **Computer Science and Engineering** from Department of CSE , IIT Bombay*

SCHOLASTIC ACHIEVEMENTS

- Obtained **99.69** percentile out of 1M+ candidates in **Joint Entrance Examination Mains** *[2022]*
- Qualified among **0.16 M+** candidates in **JEE Advanced** to secure admission at IIT Bombay *[2022]*
- Received **top AA** grade in Computer Programming and 9 ABs over the first 4 semesters *[2022-23]*
- Cleared the National Defence Academy Examination **three** times, where pass rate is 1.8% *[2021-22]*

ENGINEERING EXPERIENCE

Design Engineer - Driverless Navigation & Guidance | IITB Racing | *Prof. S Anand [Aug'23 - Present]*

*A team of over **70+** dedicated students fabricating advanced formula-style driverless electric race cars for the autonomous Formula Student International Competition. Secured **third** place in Real World AI at FSAI'23.*

Formula Student Artificial Intelligence '24 - Silverstone, UK

- Implemented and **optimized** the **EKF SLAM** algorithm within a **Linux**-based **ROS2** framework in Python
- Significantly reduced the pipeline's **latency** to under **20 ms** by migrating the codebase from Python to C++
- Achieved a **0.25m** RMSE in vehicle pose estimation on integrating Localization and Controls subsystem
- Achieved a **98%** landmark matching accuracy by deploying data association via MRPT's advanced **APIs**
- Presented **2** autonomous design **IEEE** format papers to a panel of **AI** industrialists at Formula Student AI
- Successfully trained and mentored a group of **22+** enthusiastic students in the team's SLAM methodologies
- Developing FastSLAM 2.0 which can achieve up to **20%** to **30%** higher accuracy compared to EKF SLAM

Research and Testing

- Leveraged IMU, stereo cameras, and **LiDAR** to autonomously navigate a racecar on **unpredictable** tracks
- Tested the overall pipeline on Gazebo based **simulators** on multiple road conditions and **5+** track layouts
- Delivered a **5x** increase in pose update frequency by implementing the concurrent version of EKF SLAM
- Conducted extensive research on implementing the **Graph-Based SLAM** using the renowned **g2o** library
- Researched **PID** control, **Kalman** filters, **CAN-bus**, race-line optimization, overfitting, backpropagation
- Understood **core** concepts of ML including cross validation, linear and logistic regression, decision trees
- Covered the concepts of **Image Processing**, Neural Networks, Realtime Object Detection using **YoloV5**

KEY PROJECTS

Squat Analysis Model | Computer Vision Self Project | *MediaPipe* | *Python* *[Jul'24]*

- Built a squat analysis tool using Mediapipe, OpenCV, and Python, allowing video input for assessing form
- Added capability to assess squat depth, ensuring comprehensive analysis of squat form with **4+** parameters
- Implemented algorithms to monitor back angles and ankle-to-knee separation for assessing squat form

Music Genre Classification | Deep Learning Course Project | *Prof. Shyamprasad Karagade* *[May'24]*

- Developed and trained a 1D **CNN** for audio classification using Mel-Frequency Cepstral Coefficients (MFCC)
- Classified mp3 audio files into ten different genres, achieving a **3%** test accuracy improvement over **SVMs**
- Attained training accuracy of **95.82%** and test accuracy of **87.64%** on over **10000** industrial audio tracks

Jansen's Linkage Analysis | Python Simulation Course Project | *Prof. P Seshu* *[May'24]*

- Engineered a Python-based simulation model replicating Jansen's advanced **8**-link mobile leg mechanism
- Utilized the mechanism library for defining vectors, joints and loop equations using angular motion inputs
- Visualized the point of interest moving straight, with a max lift of 22.45 units and a stride of 67.91 units

RC F22 Raptor | RC Plane Competition | *Aeromodelling Club, IIT Bombay* *[Oct'23]*

- Facilitated use of **BLDC** motor, understood Jet Dynamics to execute smooth barrel rolls & vertical hovers
- Achieved **maneuverability** with precise aileron and elevator fabrication, mirroring the F22 Raptor's design

Android-Controlled Bot | Tinkerkar DIY | *Tinkerer's Laboratory, IIT Bombay* *[Feb'23]*

- Utilized **Arduino IDE** to develop a user interface enabling switching between multiple operational modes
- Facilitated the use of the **L298D** motor driver and used a differential mechanism to execute smooth turns
- Controlled the bot via an **Android** app, utilizing the **HC-05** Bluetooth Module and Arduino's **Dabble** library

Line Following Bot | Robotics Course Project | *Prof. Tanmay K. Bhandakkar* *[Feb'23]*

- Fabricated a 3D-printed arm with servo motors and a pulley system utilizing magnets for lifting objects
- Harmonized the behavior of L293D and L298D motor drivers to facilitate autonomous obstacle removal

POSITIONS OF RESPONSIBILITY

Sports Secretary | *Hostel 1, IIT Bombay* *[Jan'23 - Jul'23]*

- Led a team of four to enhance the overall student sporting experience through active feedback & response
- Renovated the hostel gym with modern equipments and installed a volleyball court worth over **Rs 3 lakh**
- Organized the Hostel Big Bash League, Inter-Wing Football Cup, and Volleyball Cup with **150+** participants
- Collaborated with the Institute Sports Council to organize Freshiesta, a two-day freshmen sports event

Events and Public Relations Coordinator | *E-Cell, IIT Bombay* *[Jul'23 - Feb'24]*

Asia's Largest Entrepreneurship promoting student body recognised by NEN | Patronage from UNESCO

- Supervised the inaugural campus startup portal, fostering entrepreneurial growth for **14,000+** residents
- Led initiatives to deliver guidance from renowned expert mentors within the entrepreneurial community
- Served as the designated primary contact for investors at 'Ten Minute Ten Million' event during E-Summit
- Mentored 150+ Junior Semi-Finalists, handled queries, and executed the Eureka! Junior with 30k+ teams

TECHNICAL SKILLS

- **Packages/Libraries** : Pandas, NumPy, OpenCV, Scipy, Sci-KitLearn, Keras, TensorFlow
- **Front-end Development** : HTML, CSS, JavaScript, Tailwind CSS, BootStrap, React, Figma
- **Back-end Development** : Mongoose, NodeJS, ROS, ROS2, MySQL, Python, C/C++
- **Applications** : VS Code, Android Studio, GitHub, Jupyter, ChatGPT, Da Vinci Resolve

RELEVANT COURSES UNDERTAKEN

Core	Solid Mechanics, Fluid Mechanics, Dynamics of Machines, Thermodynamics
Maths	Integral Calculus, Linear Algebra, Differential Calculus
Computer Sciences	Computer Programming & Utilization, Logic in Computer Science, Applied Data Science & Machine Learning

EXTRACURRICULAR ACTIVITIES

Sports	Won 1st prize in Powerlifting (69 kg) at Freshiesta, competing against 30+ lifters As the **captain** of H1's Tug of War team, I led us to secure the **2nd** prize Trained in Olympic Weightlifting for over 16 weeks under the NSO scheme at IITB Awarded **Man of the Match** twice in Hostel One's Big Bash League Awarded the Best Yoga Pose on International Yoga Day 2023 by Team Yogastha Secured **1st** prize in Inter-Wing Volleyball tournament against **5+** teams Competed in KVS Regional Volleyball championship, secured **3rd** position
Culturals	Took on the role of **anchor** for my school's Independence Day Celebration Performed hindi **Drama** in front of 2k+ audience at Air Force School's Annual day Hobbies: Calisthenics, Guitar, Running, Trekking