

# MAYANK SHARMA

Address: 3413 Tulane Drive Apt 24, Hyattsville, MD 20783, USA

☎ +1 301-728-7495 ✉ [smayank@terpmail.umd.edu](mailto:smayank@terpmail.umd.edu) [in](#) [mayanksharma](#) [G](#) [mayanksharma](#) [G](#) [mayankysharma.github.io](#)

Domain skills: Control Systems, Computer Vision, Artificial Intelligence(AI), Machine Learning, Deep Learning, Robotics

## Education

### University of Maryland, College Park

Aug 2022 - May 2024

*Master of Engineering in Robotics*

Courses: Foundations of Deep Learning, Perception, Planning and Controls for Robotics

### NMIMS University, India

Aug 2018 - May 2022

*Bachelor of Technology in Mechatronics*

Courses: Digital Signals and Image Processing, Microcontroller and Microprocessors

## Skills

**Programming Languages:** Python, MATLAB, C, C++

**Libraries and Tools:** PyTorch, OpenCV, TensorFlow, ROS1, ROS2, Git, CI/CD, SolidWorks, NI Lab View

**Deep Learning Architectures:** ResNet18, VGG16, HomographNet, SfMLearner, Transformers, NeRF

## Work Experience

### Perception & Robotics Group(PRG), University of Maryland, College Park

Sept 2022 - May 2023

*Graduate Research Assistant*

- Worked on an object tracking algorithm to create polygon based bounding boxes to get maximum region of attraction (ROA) for objects in a video sequence.
- Researched and implemented **DeepFit** technique for fitting surface on event point clouds.

### Lighter than Air Systems Lab, Indian Institute of Technology, Bombay

July 2021 - Aug 2022

*Research Intern*

- Built battery swapping mechanisms and integrated them with the UAV docking mechanism resulting in **45%** less time to charge than most techniques.
- Developed firmware for a robust arresting mechanism to lock the UAVs in all six degrees of freedom [*Paper*].

### NMIMS University, India

May 2021 - July 2021

*Research Intern*

- Researched nonlinear BLDC motor speed control methods and implemented a speed control algorithm based on sliding mode reaching law (SMRL) to control the speed of the BLDC in MATLAB Simulink.

## Projects

- **Implicit Neural Representations:** Performs image compression with INR and improved image reconstruction by using positional encoding to achieve **29** PSNR over basic model. [Github](#).
- **SLIC and Image Segmentation:** Implemented image segmentation using superpixels generated with SLIC and k-means, resulting in **85%** accuracy with ResNet18 [Github](#).
- **Real time Semantic Segmentation:** Trained SegFormer model on the Cityscapes dataset, and performed evaluation testing on hardware producing real-time semantic segmentation, achieved **45%** mIOU [Github](#).
- **Robot Path Planning:** Implemented BFS, DFS, Dijkstra, RRT, RRT\*, and A\* for holonomic and non-holonomic robots.
- **Delivery Bot:** An autonomous robot that avoids static obstacles and generates best path using RRT\* to deliver food to humans from the kitchen in a restaurant [Github](#).
- **Structure from Motion:** Reconstructed a 3D scene and simultaneously obtained the camera poses from a given set of images using their feature points correspondence [Github](#).
- **Panorama Stitching:** Stitched images to create a panorama by homography estimation using feature points [Github](#).
- **Human Detection and Tracking:** Used the robust YOLOv3 neural network model, trained on the COCO dataset for human recognition and tracking [Github](#).
- **Optimal Control of Manipulator:** Optimal control approach for solving robust control problems for manipulators [Github](#).
- **Biomimicry Robotic Snake:** Attained snake-like robot motion through SolidWorks CAD modeling, Ansys structural analysis for stability validation, and python-based motor angle integration in Proteus [Github](#).
- **Arrow Shooting Robots:** Assembled and fabricated 2 robots from scratch to shoot arrows in a pot kept at some distance with a team of 75 students for ABU Robocon 2021.
- **Rugby Picking And Shooting Robots:** Designed and prototyped 2 robots to play the game of rugby, which includes picking, passing, and shooting the rugby ball with a team of 52 students for ABU Robocon 2020.
- **RoboWars Robot:** Re-engineered a 60kg combat robot. Upgraded the motors, weapon shape, and overall strength of the chassis with a team of 6 students for IIT Bombay Techfest 2020.

## Publications

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- Khojasteh Z. Mirza, Mayank Sharma, Saurabh V. Bagare, Dhwanil Shukla and Rajkumar S. Pant. **A Study on Autonomous Mechanisms for Swapping of Batteries on Unmanned Aerial Vehicles**, AIAA 2023-1142. AIAA SCITECH 2023 Forum. January 2023.
- Saurabh V. Bagare, Khojasteh Mirza, Mayank Sharma, Dhwanil Shukla and Rajkumar Pant. **Design of Mobile Docking Mechanism for Unmanned Aerial Vehicles capable of Vertical Take-off and Landing**, AIAA 2022-4063. AIAA AVIATION 2022 Forum. June 2022.

## Leadership Experience

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### Team Technotix, NMIMS University

Sept 2021 - Jul 2022

#### *Student Mentor*

- Mentored 150 students for ABU Robocon 2022 to create a control system design for robots that stack blocks in the competition, qualifying for National Finals.

### Team Technotix, NMIMS University

Sept 2020 - Aug 2021

#### *Team Co-leader*

- Managed a diverse team of 70 individuals for ABU Robocon 2021. This included managing teams within departments such as Manufacturing, Designing, and Simulation, and the team achieved a national rank of **11**.

### Team Technotix, NMIMS University

Sept 2019 - Aug 2020

#### *Head of Department: Manufacturing*

- Lead a team of 10 individuals to design and manufacture robots for the International Robotics Competition (ABU Robocon 2020), and the team achieved a national rank of **17**.