Mayank Sharma

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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 Respresentations**: 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

- 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

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**.