Mayank Sharma

3402 Tulane Drive, Hyattsville, MD 20783

301-728-7495 smayank@terpmail.umd.edu LinkedIn mayanksharma mayankysharma.github.io

Education

University of Maryland, College Park Aug 2022 - May 2024
Master of Engineering in Robotics GPA: 3.54/4.00

NMIMS University, India Aug 2018 - May 2022
Bachelor of Technology in Mechatronics GPA: 3.65/4.00

Experience

Robotics Algorithms & Autonomous Systems Lab, University of Maryland March 2024 - Present
Graduate Student Researcher Advisor: Prof. Pratap Tokekar

- Improving object mapping and reconstruction with a mobile robot using Next-Best-View (**NBV**) planning, utilizing deep learning and **Gaussian splats** to predict full models efficiently from partial views without assuming they are centered at the object's center.

Kick Robotics, College Park, MD Feb 2024 - Present
Computer Vision Engineer Intern

- Developing a autonomous mobile robot to explore and map a warehouse with **RTAB-Map** pipeline using LiDAR, IMU, Depth Camera, Nvidia Jetson, and ROS2 to monitor carbon monoxide levels.

Lighter than Air Systems Lab, Indian Institute of Technology, Bombay July 2021 - Aug 2022
Robotics Engineer Intern Advisor: Prof. Rajkumar Pant

- Designed CAD, manufactured and developed firmware for novel and modular mid-air UAV docking and battery swapping mechanism increasing UAV flight time from **60 minutes** to **30 days**.
- Performed precision landing in ROS gazebo using ARUCO tags and OpenCV to achieve landing accuracy of **+-40cm**.

Projects

SLIC and Image Segmentation Network ***Github*** | *Python, PyTorch, OpenCV*

- Executed superpixel Simple Linear Iterative Clustering algorithm and used **ResNet18** as backbone to create a superpixel image segmentation network for super pixels achieving **85%** accuracy.

3D Time to Collision using Sensor Fusion ***Github*** | *C++, Eigen, PCL, OpenCV*

- Detected and tracked objects in 3D space from the benchmark KITTI dataset based on camera and lidar measurements.
- Computed time-to-collsion on both camera and lidar sensors by projecting 3d lidar points on to camera sensor.
- Identified the best combination of keypoint detectors and descriptors for object tracking.

Neural Radiance Fields for View Synthesis (NeRF) | *Python, PyTorch, OpenCV*

- Developed a fundamental implementation of Neural Radiance Fields (**NeRF**) to synthesize novel views of intricate 3D scenes using only a sparse set of input views

Auto Pano | *Python, PyTorch, OpenCV*

- Implemented panorama stitching algorithm using traditional (Homography estimation using feature points) and deep learning (HomographyNet: Supervised and unsupervised) methods.

Structure from Motion ***Github*** | *Python, OpenCV*

- Reconstructed a 3D scene from a given set of images by feature correspondence with **RANSAC**-based outlier rejection along with triangulation and nonlinear optimization techniques for robust camera pose estimation.

Camera Calibration ***Github*** | *Python, OpenCV*

- Implemented Zhang's and Tsai's camera calibration methods which resulted in a mean re-projection error close to **0.5** pixels. Used **SVD** for getting an initial estimate of calibration parameters and Maximum Likelihood Estimation(**MLE**) for optimization.

ARIAC Agility Challenge ***Github*** | *Python, C++, MoveIt, ROS2*

- Used MoveIt motion planning and ROS Services to pick and place bin parts using UR5 robot and submitted orders using AGVs.

Cyber Shopper ***Github*** | *Python, ROS2, MATLAB*

- Implemented ROS services for pick-and-place operations with UR5 robot in ROS2 Gazebo; validated inverse kinematics using MATLAB Robotics Toolbox, enhancing robotic manipulation accuracy.

Technical Skills

Languages: Python, C, C++, MATLAB
Software Tools: ROS (Robot Operating System), Blender, Git, Docker, CI/CD, Gazebo, Cmake, SolidWorks, Fusion 360, AutoCAD, Unity, MySQL, Blender, Unreal Engine
Libraries: PyTorch, Pandas, Sklearn, NumPy, Matplotlib, OpenCV, open3D
Deep Learning Architectures: VGG16, ResNet, DenseNet, HomographNet, SfMLearner, LSTM, NeRF

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.