Abhimanyu Suthar

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Education

New York University　　　　　　　　　　　　　　　　　　　　　　　Expected May 2025
Master of Science in Robotics and Mechatronics　　　　　　　　　　　*Brooklyn, New York*

- **Relevant Coursework:** Robot Localization and Navigation, Foundations of Robotics, Mathematics for Robotics, Deep Learning, Advanced Mechatronics

Research Experience

Agile Robotics and Perception Laboratory, NYU Tandon School of Engineering　　June 2024 – Present
Graduate Research Assistant　　　　　　　　　　　　　　　　　　　　　*Brooklyn, New York*

- Proposed and led a novel research direction exploring 3D Gaussian Splatting (3DGS) for scene extension, focusing on spatial and temporal consistency.
- Enhanced feature matching pipeline by integrating **Mast3r with COLMAP-compatible output** formats, enabling robust Structure from Motion initialization
- Performed large-scale empirical testing of **30+ diverse image sequences**, characterizing failures and success conditions for 3D Gaussian splatting
- Enhanced novel view synthesis quality by **27.7% (18 dB → 23 dB PSNR)** using Depth-Anything V2 priors, advancing photorealism in drone-captured sequences.

Defense Research and Development Organization (DRDO)　　　　June 2022 - August 2022
https://drdo.gov.in/drdo/labs-and-establishments/centre-artificial-intelligence-robotics-cair　　　*Bengaluru, India*

- Conducted analysis in scenarios where there was a loss of GNSS signals, quantifying key performance metrics such as position error and trajectory deviation
- Implemented a SLAM pipeline leveraging IMU and odometry data, reducing localization drift by **25%** during GNSS signal loss in desert environments
- Simulated GNSS outage scenarios in **Gazebo/ROS 2**, validating SLAM robustness across desert/urban environments

Projects

Architectural Approaches for 3D Gaussian Synthesis

- Implemented three neural architectures from scratch: **VAE, VQVAE, Transformer-based diffusion** for generating 3D Gaussian primitives
- Designed custom loss functions incorporating geometric and appearance constraints for improved 3D primitive quality
- Created efficient training pipeline to processsprocessing large-scale ShapeSplatsV1 dataset which has **65k 3D objects.** datasets using **NYU's HPC infrastructure**

Vision Based Pose Estimator for MAV

- Developed vision-based pose estimation leveraging geometric cues (AprilTags, homography) for robust state estimation in visually degraded environments.
- Enhanced motion estimation by detecting image keypoints and applying RANSAC for robust velocity calculation, resulting in reliable state estimation despite visual noise.

Multi-Robot Dataset Validation

- Developed data validation pipeline integrating LiDAR odometry and global mapping for multi-robot pose estimation
- Implemented Open3D-based analysis tools to evaluate raw LiDAR point cloud registration, achieving mean fitness scores of >**0.70 across diverse scenarios**
- Validated ground truth by comparing GPS, LiDAR odometry, and rosbag trajectories, achieving consistent trajectory alignment with mean **RMSE of 0.0469m** for House and **0.0453m** for forest environments

Technical Skills

Languages: C++, Python
Tools: OpenCV, PCL(Point Cloud Library), PyTorch, Docker, Git, ROS 2, SLURM
Concepts: Computer Vision, 3D Reconstruction, SLAM, Synthetic Data Generation, Deep Learning, Sensor Fusion