

ASHWIN DISA

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Education

Master of Science, Robotics Engineering (3.71/4.0)

Worcester Polytechnic Institute (WPI)

Aug 2023 - May 2025

Worcester, MA

Bachelor of Technology, Aeronautical Engineering (8.67/10)

Manipal Institute of Technology

Aug 2019 - May 2023

Minor in Fundamentals of Computing

Udupi, India

Technical Skills

Languages Python, C++, MATLAB

Tools & Libraries Linux, Git, ROS2, Docker, L^AT_EX, PyTorch, TensorFlow, OpenCV, Numpy, wandb, pymavlink

Hardware Realsense D430i stereo & L515 LiDAR, OAKD-Lite, RaspBerryPi 4, CubeOrange FCU

Experience

Perception & Autonomous Robotics Group (PeAR), Worcester Polytechnic Institute

Jul 2024 - Present

Research Assistant | Advisor - Dr. Nitin Sanket

Worcester, MA

- Developing depth map prediction models from ultrasound (ICU20201 sensor) in TensorFlow. A **ResNet** based **encoder-decoder** neural network architecture with ground truth depth from Realsense D430i stereo cameras and L515 LiDAR is used. The loss function is **MAE** with **L2 Regularization**. The baseline model **SSIM** and **PSNR** are found to be **19.9** and **7.6 dB** respectively.
- Completed **multi-camera calibration** to determine extrinsics with **re-projection error** of **0.17 pixels**, coordinate transformations for **point cloud stitching** to generate a unified depth map with an expanded field of view (FOV), data collection, post-processing (time sync) and dataset generation, training on HPC cluster.

Relevant Projects

Road scene understanding and 3D visualization from a single monocular camera

- Leveraged deep learning techniques for autonomous driving, including **YOLO**, **DETI**C for object detection (cars, road signs, traffic signals), **Marigold** for **monocular depth estimation**, **OSX** for pedestrian pose estimation and **mask RCNN** for lane detection and classification and **RAFT** for **optical flow** to create a 3D representation of the driving scene. Integrated this data into Blender for visualization.
- The project was inspired by Tesla's dashboard focused on enhancing essential autonomous driving features contributing to the development of safer and more efficient **ADAS technologies**. [\[report\]](#)

Structure from Motion (SfM) and NeRF

- Implemented an end-to-end pipeline for Structure from Motion to reconstruct a 3D scene from a set of images and simultaneously obtain the camera poses of the monocular camera with respect to the given scene. Steps involved Feature Matching and Outlier rejection using **RANSAC**, Estimating Fundamental using epipolar constraint and Essential Matrix, Estimate Camera Pose and Cheirality condition using Triangulation, PnP and Bundle Adjustment. The **re-projection error** was found to be **6.8 pixels**. Reconstructed the same scene using **COLMAP**.
- Also implemented the modern deep learning approach using **Neural Radiance Fields (NeRF)** for photo realistic visualization and synthesize novel views of complex scenes. **SSIM** and **PSNR** are used as performance metric. The values are found to be **0.88** and **25.5 dB** respectively on the test set. [\[repo\]](#)[\[report\]](#)

Panorama Stitching using classical Computer Vision | Python, OpenCV, RANSAC

- Implemented corner detection, **Adaptive Non-Maximal Suppression (ANMS)** for uniform distribution of keypoints across image, feature extraction and matching, **RANSAC** for outlier rejection. The inliers are used to estimate the **homography** between the two images. Finally warped and stitched to produce a seamless panorama. [\[repo\]](#)

State Estimation for Object Tracking

- Developed object tracking algorithms utilizing **Kalman Filter**, **EKF**, **UKF**, and **PF** in MATLAB to estimate robot's position and velocity. **MSE** performance metric is used to compare estimated values against the ground truth to validate tracking accuracy and robustness. The error is found to be consistently below **10%** mark.

Publications

- A. Disa** and V. G. Nair, "Autonomous Landing of a UAV on a Custom Ground Marker using Image-Based Visual Servoing," 2023 IEEE 4th Annual Flagship India Council International Subsections Conference (INDISCON), Mysore, India, 2023, pp. 1-6, doi: 10.1109/INDISCON58499.2023.10270190. [\[paper\]](#)

Team Achievements and Positions of Responsibility

- Winner** out of 242 teams, in the E-Yantra Robotics Competition 2021-22, hosted by IIT Bombay. [\[certificate\]](#)
- Ranked 18th overall and **2nd best** in Flight Readiness Review out of 71 teams in the AUVSI SUAS Competition 2022.
- Graduate Teaching Assistant** - Grader for RBE550 (Motion Planning) at WPI for Fall 24.
- Undergraduate Assistant** - Proctor for make-up exams at WPI for Spring, Fall 24.