Ayush Garg

Email : connect@ayushgarg.dev
LinkedIn: www.linkedin.com/in/ayushgarg97
Github: www.github.com/ayushgargdroid
Mobile : +1-857-204-8075
Available - *June 2022 Onwards*
Website: www.ayushgarg.dev

Education

Northeastern University, Boston, MA Expected May 2022
Candidate for Master of Science in Robotics - ECE Concentration GPA 3.7/4.0
Coursework: Computer Vision, Autonomous Field Robotics, Reinforcement Learning

Manipal Institute of Technology, Manipal, India July 2019
Bachelor of Technology in Computer Science and Engineering
Coursework: Artificial Intelligence, Machine Learning, Data Structures, Algorithms

Professional Experience

Vecna Robotics, Inc., Waltham, MA Summer & Fall 2020
Graduate Robotics Software Intern, Robot Autonomy Point Cloud Library, Eigen

- Investigated techniques for **Pallet Detection using 2D and 3D Lidars**. Ultimately designed a complete Pallet Detection pipeline which will be the main pallet detection system on the new Counterbalanced Fork Truck product.
- Worked in conjunction with the Office of CTO to investigate latest advances in **3D SLAM frameworks** that will substantially improve the current 2D localization system. Also sourced and tested 3D lidars that best fit the needs.
- Integrated a **higher resolution 2D SLAM pipeline** into the deployment process effectively doubling the localization accuracy and reducing deployment time from days to hours.
- Contributed to the Advanced Development Team by rapidly prototyping and bringup of a new prototype truck.

GreyOrange Pte. Ltd., Gurgaon, India Spring & Summer 2019
Embedded Intern ROS, Gazebo, gtest

- Developed a HIL testing suite for the Butler Bot navigation stack using ROS & Gazebo coupled with unit test cases.

RedCarpet Pvt. Ltd., Gurgaon, India Fall & Summer 2018
Computer Vision Intern OpenCV, Cython

- Developed Image Forensics algorithms like ELA on JPG images and Photo Response Non-Uniformity Detection.

Academic Experience - Northeastern University, Boston, MA

Masters' Thesis: Depth Estimation at Nighttime with Monocular LWIR camera PyTorch

- Developing a self-supervised pipeline based on CNNs for scale-consistent **dense depth estimation at nighttime**.
- Devised novel self-supervision signals to attenuate Brightness Constancy Constraint, improve performance in low texture regions using masking techniques and employ multi-task learning with Optical Flow estimation.
- Dataset collection with a FLIR Thermal Camera in Boston for the purpose of deployment on Autonomous Vehicles.

Structure from Motion pipeline OpenCV, GTSAM

- Applied Photogrammetry to build a **robust SfM pipeline** for sparse 3D reconstruction from a handheld video.
- SIFT feature extraction and matching for essential matrix estimation and triangualation to get 3D keypoints.
- Solved **Bundle Adjustment** using GTSAM to get accurate and optimized keypoints with camera poses.

Mosaicing on Underwater Images OpenCV, Scipy, NetworkX

- Designed a robust Mosaicing pipeline for a low feature environment using SIFT features for Homography estimation.
- Homography refinement by solving Bundle Adjustment using Scipy's **Levenberg Marquardt** optimizer.

Lego-Loam & ICP C++, GTSAM, PCL

- Added GPS Factors and experimented with Lego-Loam on challenging Autonomous Car 3D Lidar Datasets.
- Implemented **ICP** algorithm to evaluate different loss functions like Point-to-Point and Point-to-Plane.

Self-Supervised Depth Prediction on Monocular RGB images using ViT PyTorch

- Added visual similarity loss to DPT (Dense Prediction Transformers) for self-supervision via image backprojection.

Skills

Programming Languages & Softwares: Python, C/C++, MATLAB, Gazebo, Git, Docker, CMake
Libraries & Frameworks: OpenCV, NumPy, Eigen, PyTorch, Tensorflow, ROS, SLURM, PCL, GTSAM
Other Skills: Perception, SLAM, 3D Reconstruction, Multi-view Stereo, Non-Linear Optimization, Deep Learning