Swapneel Wagholikar

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Education

- **Worcester Polytechnic Institute** — Worcester, MA
  Master of Science in Robotics Engineering; GPA: 4.0/4.0 — *Aug. 2022 – May. 2024*
- **University of Pune** — Pune, India
  Bachelor of Technology; CGPA: 3.75/4.0 — *Aug. 2016 – Oct. 2020*

Skills

- **Programming**: C/C++, Python, Matlab, Arduino
- **Frameworks**: ROS, ROS2, Linux, Git, Docker, Pytorch, Numpy, OpenCV, Matplotlib, sklearn, Open3D, Gazebo

Experience

- **DEKA Research and Development (Manchester, NH)** | *Robotics Intern (Perception)* *Sept 2023 - Ongoing*
  - Working on Sentry bot to create accurate ground truth depth maps through sensor fusion and classical computer vision.
  - Utilizing Velodyne's Vellarray LiDAR sensor and a pair of Long Range RGB cameras for data collection.
- **Void Robotics (Marathon, FL)** | *Robotics Software Intern (Perception, Navigation)* *May 2023 - August 2023*
  - Worked on ZED2/GNSS Odometry Fusion to get an accurate position of the voidwalking bot. The final odometry integrated RTK GPS + Visual Odometry + IMU. Enabled the bot to walk GPS and ZED2 within an accuracy of 1cm.
  - Constructed a Docker-integrated ROS package for SLAM on the environment resulting in a 15% productivity boost.
  - Test cases automation is done in ROS2 for line rendering in RVIZ via calling the sevice through rqt.
- **Vision, Intelligence and System Lab (WPI, MA)** | *CV/ML Graduate Researcher* *May 2023 - August 2023*
  - Trained PointAttN: Transformer Network for Point Cloud Completion | Guide: Prof. Ziming Zhang
  - Experimented with the Geometric Details Perceptron (GDP) and Self Feature Augment (SFA) blocks in the encoder.
  - Implemented cross layer information integration in the PointAttN Network and enhanced the baseline results by 20%.
- **Aespaes Labs Pvt. Ltd. (Pune, India)** | *Artificial Intelligence Intern (Computer Vision)* *May 2020 - Nov 2020*
  - Developed a deep learning pipeline for O-ring detection and classification of Camshaft on presence/ absence of O-ring.
  - Deployed on Bajaj Auto Pvt. Ltd. plant for inspection purposes and helped to increase plant efficiency by 20%.

Projects

- **Mobile NeRF** | *Skills: Pytorch Mobile, On-device Deep Learning* *Ongoing*
  Optimizing a NeRF-based 3D reconstruction model, with techniques such as model pruning and quantization, and planning to deploy it on Android, demonstrating proficiency in on-device deep learning for real-time 3D reconstruction.
- **Panoptic Segmentation** | *Skills: Pointcloud, TensorFlow, CUDA, Feature Pyramid Network (FPN)* *Github*
  Implemented Panoptic segmentation in Tensorflow 2.0 on 3D LiDAR Point Cloud data to combine the outputs of semantic and instance segmentation using a shared encoder-decoder backbone and novel parameter-free panoptic head.
- **Path Planning of Non-holonomic Robots** | *Skills: Sampling based planning, MPC, Gazebo, ROS2* *Github*
  Planned path traversal for non-holonomic robots by state-of-the-art algorithms like AIT* and BIT* for global and APF, MPC for local path planning. Evaluated based on time-complexity and accuracy of optimal path detection+traversal.
- **Point Cloud Semantic Mapping** | *Skills: Sensor fusion, Pytorch, SegFormer, Semantic Segmentation* *Github*
  Built a map from raw LiDAR point cloud and transferred the predicted semantic labels from camera RGB images using the point painting technique onto the LiDAR's 3D point cloud. Classified each point using SegFormer NN on KITTI dataset.
- **3D Reconstruction from images** | *Skills: Pointcloud, 3D geometric math, SfM (Structure from Motion)* *Github*
  Simultaneously reconstructed 3D scene Mapping and extracted camera pose Localization from given stereo camera correspondences using classical approach Non-Linear triangulation, Non-Linear PnP, and Bundle Adjustment BA pipeline.
- **Boundary Detection** | *Skills: Edge Detection, Image Filtering, OpenCV, Image Noise Removal, CNNs* *Github*
  Executed a simplified version of Probability based edge detection using filter banks. Research Paper
- **Auto Calib** | *Skills: Camera Calibration, Classical Computer Vision, OpenCV* *Github*
  Implemented Zhang's camera calibration research paper by nonlinear optimization of intrinsics and extrinsics.
- **Complex Highway Navigation** | *Skills: Deep Reinforcement Learning, OpenAI, Discrete Action Space* *Github*
  Implemented DQN, DQN-MR, and DQN-PER in OpenAI's Highway-env, finding DQN-PER as the best performer.
- **Path Planning of Continuum Robots** | *Skills: Path planning, Configuration Space, MATLAB* *Github*
  Reconstructed informed RRT algorithm for path planning of biomedical continuum robots - needle-sized manipulators
- **3D Trajectory Tracking** | *Skills: Sliding Mode Control, UAVs, ROS, Gazebo, MATLAB* *Github*
  Designed and deployed Sliding Mode Controllers for trajectory tracking for micro UAVs, within small error range of 1%.