Swapneel Wagholikar

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Education

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

Skills

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

Experience

- **Void Robotics (Marathon, FL)** | *Robotics Software Intern (Perception, Navigation)* — *May 2023 - Present*
  - Worked on ZED2/GNSS Odometry Fusion to get an accuartate position of the voidwalking bot. The final odometry integrated RTK GPS + Visual Odometry + IMU. Enable the bot to walk GPS and ZED2 within accuracy of 1cm.
  - Constructing a Docker-integrated ROS package for SLAM of the environment resulting in a 15% productivity boost.
- **Vision, Intelligence and System Lab (WPI, MA)** | *CV/ML Graduate Researcher* — *May 2023 - Present*
  - Implementation of PointAttN: Tranformer Network for Point Cloud Completion. Guide: Prof. Ziming Zhang
  - Experimenting with the Geometric Details Perceptron (GDP) and Self Feature Augment (SFA) blocks in the encoder.
  - Network aims paying attention to the relationsships between points without dividing shapes into smaller regions.
- **Atlas Copco, GECIA (Pune, India)** | *Design & Development Engineer* — *Nov 2020 - Jul 2022*
  - Designed 3D CAD models for compressors worth $1.5M using Design for Manufacturing and Assembly (DFMA) approach. Parameterized manufacturing drawings and Bill of Materials using GD&T-ASME Y14.5 to improve team efficiency by 10%. Handled critical customized designs for various compressor products under Oil Free Air range.
- **Aespaes Labs Pvt. Ltd. (Pune, India)** | *AI Intern (Computer Vision)* — *May 2020 - Nov 2020*
  - Developed a deep learning pipeline for detection of O-ring in Camshaft and classification of Camshaft based on presence/absense of O-ring. Project deployed on the production line of Bajaj Auto Pvt. Ltd. Pune for inspection purposes.
  - Augmented Reality using OpenCV to augment the blind spot at welding station for same manufacturing plant.
  - Prototyped and proposed VR Lab to AIM Laboratory of WPI for experimentation in Biomedical Robotics Research.

Projects

- **Panoptic Segmentation** | *Skills: Pointcloud, TensorFlow, OpenCV, 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 path 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: Pointcloud, 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 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*
  Implemented a simplified version of Probability based edge detection using filter banks. Research Paper
- **Auto Calib** | *Skills: Camera Calibration, Classical Computer Vision, OpenCV, Geometric Mathematics* *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 discrete action space algorithms such as DQN, DQN-MR and DQN-PER on OpenAI Gym's Third party environment, Highway-env. Compared training time and accuracy to discover DQN-PER has the best performance.
- **Path Planning of Continuum Robots** | *Skills: Sampling based path planning, MATLAB, Robot Dynamics* *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, Robot Control* *Github*
  Designed and deployed Sliding Mode Controllers for trajectory tracking for micro UAVs, within small error range of 1%.