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**: Python, C++, C, Matlab, Arduino, HTML, BASH
- **Frameworks**: Pytorch, Tensorflow, ONNX, CUDA, Open3D, NumPy, ROS, ROS2, Gazebo, Linux, Git, Docker, Flask
- **DL Architectures**: VGG16, NeRF, CompletionFormer, RangeNet, Segformer, Mask R-CNN, Transformers, LSTM

Experience

- **DEKA Research and Development (Manchester, NH)** | *Robotics Intern (Perception)* *Sept 2023 - Ongoing*
  - Working on Sentry bot to create high-quality depth maps using classical vision techniques and Deep Learning networks.
  - Developed software for real-time data integration from Velodyne's LiDAR and a pair of Long-Range cameras using ROS.
  - Enhanced accuracy by 39% of depth completion CNN+Transformer architectures to predict the terrain's traceability.
- **Findability Sciences (Boston, MA)** | *Deep Learning Researcher (Generative AI, LLM)* *Jan 2024 - Ongoing*
  - Developing an LLM-based conversational interface for business users to request database records and industry reports.
  - Fine-tuning foundational large language models like Llama using market forecasts and real estate-related analyst reports.
  - Working on Retrieval Augmented Generation (RAG), SQL Generation and Large Language Model (LLM) optimization.
- **Void Robotics (Marathon, FL)** | *Robotics Software Intern (Perception, Controls)* *May 2023 - August 2023*
  - Fused odometry from RTK-GPS + ZED2 + IMU and achieved accuracy within 1cm for voidwalking bot positioning.
  - Constructed a Docker-integrated ROS package for SLAM on the environment, resulting in a 15% productivity boost.
  - Developed automated test cases in ROS2 to validate line rendering in RVIZ by invoking the service 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 23%.

Projects

- **Mobile NeLF** | *Skills: PyTorch Mobile, ONNX, Lens Studio, ML deployment, Knowledge Distillation* *Github*
  - Optimized NeLF-based novel view synthesis through pruning and knowledge distillation via pseudo image techniques.
  - Deployed the optimized model on iPhone using Lens Studio and ONNX, showcasing proficiency in on-device deployment.
- **On-device Deep Learning** | *Skills: Pytorch, CUDA, Deep Learning Network Optimization, MobileNet*
  - **P&Q** : Implemented **Pruning & Quantization** for optimizing the VGG16 network for CIFAR-10 classification. *Github*
  - **NAS** : Performed **Neural Architecture Search** for microcontroller deployment from MCUNet super-network. *Github*
  - **DNI** : Optimized a network using **Dynamic Network Inference** by entropy-based early exit on BranchyNet. *Github*
- **Point Cloud Semantic Mapping** | *Skills: Sensor fusion, Pytorch, SegFormer, Semantic Segmentation* *Github*
  - Constructed a map from raw LiDAR cloud, transferring semantic labels from camera RGB images using point painting.
  - Segmented each point in the LiDAR generated map using SegFormer (Transformer-based) Neural Net on KITTI dataset.
- **Panoptic Segmentation** | *Skills: Pointcloud, TensorFlow, CUDA, Feature Pyramid Network (FPN)* *Github*
  - Implemented panoptic segmentation on 3D LiDAR data combining the outputs of semantic and instance segmentation.
  - Enhanced accuracy and efficiency through a shared encoder-decoder backbone and a 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 AIT* and BIT* algorithms for global path planning.
  - Applied local path planning with Model Predictive Control (MPC), ensuring efficient traversal in dynamic environments.
- **Structure from Motion** | *Skills: Pointcloud, 3D geometric math, 3D Reconstruction from images* *Github*
  - Simultaneously reconstructed 3D-scene (Mapping) + extracted camera pose (Localization) from stereo correspondences.
  - Developed a pipeline incorporating (Non)Linear triangulation, (Non)Linear PnP and Bundle Adjustment (BA).
- **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.
- **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%.