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**: ROS, ROS2, Linux, Git, Docker, Pytorch, Tensorflow, sklearn, Open3D, NumPy, Pandas, Gazebo, 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 RGB cameras.
  - Enhanced accuracy by 20% 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, Navigation)* *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, Lens Studio, ML deployment, Knowledge Distillation* *Github*
  Optimized a NeLF-based novel view synthesis with techniques such as pruning and knowledge distillation via pseudo image generation, and deployed it on iPhone using Lens Studio, demonstrating proficiency in real-time 3D novel view synthesis.
- **On-device Deep Learning Projects** | *Skills: Pytorch, CUDA, Deep Learning Network Optimization*
  - **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*
  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.
- **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 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 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.
- **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 the given stereo camera correspondences using Non-Linear triangulation, Non-Linear PnP, and the Bundle Adjustment (BA) pipeline.
- **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%.