Sumukh Porwal

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Education

Worcester Polytechnic Institute (*WPI*) **Worcester, MA**
Master of Science in Mechatronics, Robotics and Automation Engineering *Aug 2024 - May 2026 (expected)*
Coursework: Motion Planning, Reinforcement Learning, Robot Control

Indian Institute of Technology Tirupati (*IITT*) **Tirupati, India**
Bachelor of Technology in Mechanical Engineering (CGPA: 8.69/10) *July 2020 - June 2024*
Coursework: Machine Learning, Modelling & Control of Mobile Robots & Robotic Manipulators, Attitude Estimation & Control

Experience

SeiAnmai Technology Pvt. Ltd. **May 2023 – July 2023**
Project Lead
- Led the development of an autonomous robot using ROS2 and micro-ROS for communication.
- Integrated SLAM, autonomous navigation, and teleoperation for seamless performance.
- Implemented ArUco marker detection to achieve accurate autonomous docking.
- Optimized robot performance by integrating mechanical design and control, utilizing Docker for micro-ROS in C.

Projects

Perception-aware Model Predictive Control on Quadrotor, *WPI* **Sept 2024 – Present**
- Integrated the YOLACT architecture for the detection and tracking of moving targets.
- Developed a model-free Model Predictive Control (MPC) system for quadrotor visual tracking capabilities without GPS.
- Created a quadrotor simulation using ROS 2 & Gazebo, facilitating real-time interactions within dynamic environments.

Breakout using Deep Q-learning Network, *WPI* **Sept 2024 – Present**
- Implemented a Deep Q-Network (DQN) algorithm to play the classic game Breakout using Python 3 and PyTorch.
- Utilized OpenAI's Atari wrapper and clipped rewards to enhance training process and improve performance in the game.

Semantic Image Segmentation, *IITT* **May 2024 – Aug 2024**
- Implemented a U-Net CNN for pixel-level semantic image segmentation on CARLA self-driving car dataset.
- Achieved precise object segmentation, crucial for autonomous vehicle navigation and safety.
- Implemented, trained, and evaluated the model, demonstrating high accuracy with detailed mask predictions.

Face Recognition using Siamese Network, *IITT* **May 2024 - Jun 2024**
- Developed a face recognition system using Multi-Task Cascaded Conv Neural Networks (MTCNN) and Inception ResNet.
- Implemented a triplet loss function to use 128-dimensional encodings generated by a deep learning model from face images to effectively distinguish between similar and dissimilar faces.

Navigation and Control of Cooperative Mobile Robots, *IITT* **Jan 2023 – May 2024**
- Developed omnidirectional 3-wheel mobile robots with laser sensor for seamless SLAM and self-guided navigation.
- Integrated Cooperative Navigation system with linear and triangular formations for collaborative tasks.
- Utilized RPi 4, RPi Pico, and ROS2 as micro-processor, micro-controller and communication framework respectively.

Sentinel Drone, *IITT* **Sep 2022 - Feb 2023**
- Engineered an surveillance drone for accident, fire, and anomaly detection, utilizing computer vision algorithms.
- Integrated ROS Noetic for communication and Gazebo for detailed simulation.
- Conducted hardware testing using a nano drone, implementing PID control for stable navigation.

Alexa-controlled Robotic Manipulator, *IITT* **Oct 2022 - Dec 2022**
- Simulated a 3-DoF robotic manipulator, enabling autonomous task execution through Alexa voice commands.
- Utilized ROS, Gazebo, RViz, and MoveIt to manage simulation and control.
- Planned to build a hardware model using Arduino UNO, linking it to ROS for communication.

Skills

Operating System	Windows, Ubuntu
Programming Languages	Python, C, C++, MATLAB, Bash, LaTeX, Git
Frameworks & Libraries	ROS 1 & 2, TensorFlow, Keras, PyTorch, OpenCV, OMPL
Software Tools	Gazebo, RViz, MoveIt, Nav2
Hardware	Raspberry Pi, Raspberry Pi Pico, Arduino, RP LiDAR
CAD & CAE	DS Solidworks, Fusion 360, PTC Creo, DS Abaqus, Ansys