Sumukh Porwal

sporwal@wpi.edu • (774) 253-0580 • linkedin.com/in/sumukhporwal • sumukh18.github.io

EDUCATION

Worcester Polytechnic Institute (WPI) | Worcester, MA
Master of Science in Mechatronics, Robotics and Automation Engineering | **GPA:** 4.0/4.0 August 2024 - May 2026 (expected)
Coursework: Computer Vision, Robot Dynamics, Motion Planning, Reinforcement Learning, Robot Control

Indian Institute of Technology Tirupati (IIT Tirupati) | Tirupati, India
Bachelor of Technology in Mechanical Engineering | **GPA:** 8.69/10.0 July 2020 - June 2024
Coursework: Machine Learning, Modeling & Control of Mobile Robots & Manipulators, Attitude Estimation & Control

RELEVANT EXPERIENCE

SeiAnmai Technology Pvt. Ltd. | Robotics Intern | Delhi, India **May 2023 – July 2023**

- Led a team of 6 to develop an autonomous robot with 95% navigation accuracy, integrating ROS 2 and micro-ROS.
- Created an ArUco marker detection system, achieving docking precision within 1 cm.
- Enhanced real-time telepresence by implementing internet-based teleoperation within 100 ms latency.
- Optimized performance by refining control algorithms and leveraging Docker for seamless micro-ROS deployment.

PROJECTS

Learning Vision-based Agile Flight via Differentiable Physics, WPI **January 2024 – Present**

- Developing a GPU-accelerated simulation with Taichi's differentiable physics to train neural network control policies for high-speed aerial navigation using only visual input as the sole sensor.
- Targeting real-time navigation at speeds up to 20 m/s in simulation, leveraging backpropagation through differentiable physics to surpass existing benchmarks.

Learning-Based Collision & Clearance Estimator for Manipulators, WPI **November 2024 – December 2024**

- Implemented a neural network-based heuristic achieving a 50% reduction in collision-checking time compared to geometric methods like the Gilbert–Johnson–Keerthi algorithm.
- Designed a clearance adjustment algorithm, improving planning efficiency by 35% in cluttered environments.

Deep Reinforcement Learning for TurtleBot3 Navigation, WPI **October 2024 – December 2024**

- Implemented DDPG, PPO, TD3, & DQN algorithms achieving obstacle avoidance with 88% accuracy in simulations.
- Built a ROS 2 & Gazebo environment using LiDAR for precise distance sensing and decision-making.
- Conducted performance benchmarking, revealing a 15% improvement in path efficiency for PPO over others.

Perception-aware Model Predictive Control on Quadrotor, WPI **September 2024 – December 2024**

- Integrated YOLACT architecture, achieving 95% accuracy in real-time detection and tracking targets.
- Developed a NMPC using Acados, enabling trajectory tracking with sub-1% error in constrained environments.

Trigger Word Detection | IIT Tirupati **June 2024 – August 2024**

- Created a deep learning model that achieved 91% accuracy in detecting the trigger word "activate" in audio streams.
- Synthesized and processed 10,000+ audio samples by combining audio samples of words and background noises to create a diverse and robust training dataset.

Semantic Image Segmentation for Autonomous Vehicles, IIT Tirupati **May 2024 – August 2024**

- Achieved 90% segmentation accuracy using U-Net CNN on CARLA self-driving datasets for navigation tasks.
- Delivered precise object detection by training on 100,000+ labeled samples, enhancing autonomous driving safety.
- Evaluated model performance with detailed mask predictions, surpassing benchmarks by 5%.

Face Recognition using Siamese Network, IIT Tirupati **May 2024 - June 2024**

- Built a face recognition system with 99% accuracy, using MTCNN and Inception ResNet architectures.
- Utilized triplet loss with 128-dimensional embeddings, enabling robust face verification for similar datasets.

Navigation and Control of Cooperative Mobile Robots, IIT Tirupati **January 2023 – May 2024**

- Designed omnidirectional robots, achieving 95% SLAM accuracy with real-time laser sensor fusion.
- Developed collaborative navigation in linear and triangular formations, reducing task completion time by 25%.

TECHNICAL SKILLS

Operating System: Windows, Linux
Programming Languages & Tools: Python, C, C++, MATLAB, Bash, LaTeX, Git, Docker, Singularity
Frameworks & Libraries: ROS 1 & 2, TensorFlow, Keras, PyTorch, OpenCV, OMPL, Acados, Taichi, CasADi
Embedded Systems: Raspberry Pi, Raspberry Pi Pico, Arduino, Jetson Orix NX
Simulation & ROS Tools: Gazebo, RViz, MoveIt, Nav Stack, rqt