

SUMUKH PORWAL

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ACADEMIC QUALIFICATION

- MS Robotics Engineering, Worcester Polytechnic Institute Aug '24 - May '26(expected)
- B. Tech Mechanical Engineering, Indian Institute of Technology Tirupati (CGPA: 8.69/10) Jul '20 - June '24

INTERNSHIPS

- SeiAnmai Technology, Delhi** Development of TeleOperation and TeleObservance Robot May '23 - Jul '23
- Developed an autonomous robot using ROS2 and micro-ROS as the communication framework.
 - Seamlessly integrated SLAM, autonomous navigation, and teleoperation.
 - Leveraged ArUco marker detection for precise autonomous docking.
 - Employed a Docker container for micro-ROS using C language, also merging mechanical design and control expertise to enhance hardware performance.
- BluJ Aero, Hyderabad** Design and Analysis of an EVTOL Aircraft Bulkhead Jun '22 - Aug '22
- Created a Computer-Aided Design and performed Finite Element Analysis on the bulkhead, which functions as the key load-bearing element within the fuselage of an EVTOL aircraft, along with the link connecting bulkhead and wing's I-beam.
 - Employed CATIA for CAD modeling to form the solid bulkhead model and wing attachments.
 - Subsequently, employed Abaqus for the simulation of the bulkhead's mechanical behavior under different loads, moments, and boundary conditions.

PROJECTS

- Trigger Word Detection** Jun'24 - Present
- Team Size: 1
- Developed a deep learning model to detect the trigger word "activate" in audio streams.
 - Synthesized and processed diverse audio datasets for training and evaluation.
 - Utilized a neural network with a 1D convolutional and 2 GRU layers to achieve high accuracy.
- Semantic Image Segmentation** May'24 - Present
- Team Size: 1
- Developed a U-Net CNN for pixel-level semantic image segmentation on a self-driving car dataset.
 - Achieved precise object recognition, 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** Jun '24
- Team Size: 1
- Developed a face recognition system using Multi-Task Cascaded Convolutional 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** Jan '23 - May '24
- Team Size: 2
- Role: Team lead
- Developed omnidirectional 3-wheel mobile robots with cameras and laser sensors for seamless SLAM and self-navigation.
 - Integrated Cooperative Navigation system with linear and triangular formations for collaborative tasks.
 - Utilized Raspberry Pi 4, Raspberry Pi Pico, and ROS2 for core components and communication framework.
- Modeling and Estimation of Satellite Attitude Kinematics and Dynamics** Aug '23 - Nov '23
- Team Size: 1
- Developed a MATLAB model to simulate satellite attitude kinematics and dynamics under thruster-generated moments.
 - Incorporated sensor models with noise characteristics to represent real-world measurements accurately.
 - Implemented Triad algorithm, q-method, and extended attitude Kalman filter for diverse attitude estimation.
- Sentinel Drone** Sep '22 - Feb '23
- Team Size: 4
- Role: Navigation system lead
- Developed an automated surveillance drone for accident, fire, and anomaly detection using computer vision algorithms.
 - Uploaded data to GIS, utilized ROS Noetic for communication, and Gazebo for simulation.
 - Conducted hardware testing with a nano drone, incorporating navigation, controls, and a PID controller.
- Alexa controlled Robotic Manipulator** Oct '22 - Dec '22
- Team Size: 1
- Simulating a 3-DoF robotic manipulator capable of autonomously reaching desired destinations and executing tasks via Alexa voice commands, utilizing ROS, Gazebo, RViz, and MoveIt.
 - Upon successful simulation, a hardware model will be built using an Arduino UNO microcontroller, with ROS serving as the communication link between the system and the microcontroller.

TECHNICAL SKILLS

Operating Systems: Windows, Linux

Programming Languages: Python, C, C++, MATLAB

Framework: Robotics Operating System (ROS), TensorFlow

Simulation Tools: Gazebo and MATLAB Simulink

CAD and CAE Software Packages: DS Catia, DS Solidworks, DS Abaqus, Autodesk Fusion 360, Autodesk Inventor, Autodesk Ansys, AutoCAD for Mechanical

TECHNICAL COURSES

Worcester Polytechnic Institute, MA:

- Reinforcement Learning *
- Motion Planning *
- Robot Control *

(* - will be completed by Dec '24)

Indian Institute of Technology, Tirupati:

- Machine Learning for Mechanical Engineers (May '24)
- Mechatronics (May '24)
- Mechanics and Control of Robotic Manipulators (Dec '23)
- Attitude Estimation and Control (Dec '23)
- System Dynamics and Control (Oct '23)
- Modeling and Control of Autonomous Mobile Robots (May '23)
- Numerical Analysis (May '22)
- Complex Variables (Nov '21)
- Differential Equations and Matrices (Jul '21)
- Calculus (Feb '21)

Coursera:

- Deep Learning (Jun '24)
- Linear Algebra (Nov '23)
- Probability and Statistics (Nov '23)

NPTEL:

- Computer Vision (Nov '23)
- Robotics (Sep '22)

EXTRACURRICULAR

- Team Lead of the Organizing Committee for Robotics Events at IIT Tirupati's Annual Techno-Cultural Fest in 2022 and 2023.

LEADERSHIP ROLES

- Technical Affairs Secretary, IIT Tirupati, May '23 - May '24
- Robotics Club Head, IIT Tirupati, Jul '22 - Jun '23
- Contingent Leader, Inter IIT Tech Meet, IIT Tirupati, Oct '22 - Feb '23