

EDUCATION

Worcester Polytechnic Institute

Master of Science in Robotics Engineering (In progress)

- GPA: 3.82/4.00

Sardar Patel College of Engineering (University of Mumbai)

Bachelor of Technology in Mechanical Engineering (Class Rep)

Capstone Project: Design and Development of an Autonomous Cooking System

- CPI: 8.95/10.00

Worcester, Massachusetts

2022-2024

Mumbai, India

2018-2022

TECHNICAL SKILLS

- Programming Languages:** Python, C/C++, Java, Arduino, MATLAB
- Software:** ROS/ROS2, Gazebo, WeBots, ADAMS, SolidWorks, Creo, AUTOCAD, CURA (3D Printing), Excel
- Important Libraries:** OpenCV2, Point Cloud Library, TensorFlow, Numpy, PyGame
- PLC Programming** (Representation in STL, LAD and FBD),
- Fast Prototyping, 3D Printing, Control System Design, Sensor Fusion, Deep Learning, Machine Learning, Reinforcement Learning, Computer Vision**

WORK EXPERIENCE

Void Robotics

Robotics Software Intern

- Enhanced autonomous delivery robot navigation accuracy by integrating NMEA and F9P GPS systems.
- Leveraged Micro ROS for real-time communication, improving control and system reliability.
- Collaborated effectively in a cross-functional team, contributing to the overall performance of the project.

September-December 2023

3 Months

The Innovation Story, Mumbai

Robotics Teaching Intern

- Devised a robotics syllabus for 8th-10th graders in local schools including requisite physics and math along with robotics-specific knowledge.
- Designed and fabricated a modular mobile pick and place robot for teaching purposes.

October-December 2021

2.5 Months

Bridgestone India Pvt Ltd

Mechanical Execution System (MES) Intern

- Hands-on training experience in MES with emphasis on principles of IOT and Industry 4.0
- Prepared an internship report to be utilized for training future interns.

June-July 2021

1.5 Months

PROJECTS

Grasp Generation using top surface Point Cloud data and Robot Control Using Visual Servoing

September-October 2023

- Utilized Point Cloud library and ROS2 to process data from a simulated RGB-D camera, generating top surface point clouds for objects on a table.
- Applied grasp quality metrics and grasp matrix to a parallel jaw gripper to synthesize effective grasping points for objects.
- Implemented robot control using the analytical Jacobian for a 2D RRBot, and feedback using image features to achieve the generated grasp

RRT Based Motion Planner for pick and place on a UR5e robot

March-April 2023

- Implemented a MATLAB simulation of RRT based motion planning on UR5e in the presence of obstacles
- Used the robotics toolbox for importing an accurate robot model
- Sampled points in Cartesian space and used inverse kinematics for pose estimation to perform collision detection

Parallel Parking Motion Planner using Hybrid A*

February-March 2023

- Developed a 2D environment from scratch using PyGame to simulate a car moving in an environment with obstacles
- Enabled convex polygon collision detection using separating axis theorem and introduced optimizations to speed up calculations
- Developed a kinematically consistent motion planner to park the car between 2 obstacles using hybrid A*

Deep Q-Learning based model for controlling a car in a 2D Environment.

November-December 2022

- Collaborated in a team of 4 to implement a deep reinforcement learning model involving driving a car on a racetrack with other cars present.
- Used TensorFlow and OpenAI Gym to build the model and generate the environment respectively.
- Devised a novel exploration strategy using q-values as probability measures for each action.

Pick and place on a UR5e robot using ROS.

October-December 2022

- Collaborated in a team of 5 to implement pick and place operations on a real UR5e robot.
- Used the ur_robot_driver ROS library to interface with the robot through a static network address.
- Derived the forward kinematic equations from scratch using PoE notation and used Newton-Raphson method to numerically solve inverse kinematics.

Design and development of an autonomous cooking system (Undergraduate Capstone Project)

January-June 2022

- Collaborated in a team of 3 to build a 5 DOF Robot arm from scratch including CAD Modelling, Electronic circuits, and Control algorithms along with subsidiary systems to enable cooking actions.
- Applied different software at various levels of development including SolidWorks, Ansys and WeBots (to simulate the system along with the control algorithm).

ACHIEVEMENTS

- Publications:**
 - Mepani, M. M., Gala, K. B., Mishra, T. A., Bhole, K. S., Gholave, J., & Daingade, S. (2022). Design of robot arm for domestic culinary assistance. *Materials Today: Proceedings*, 68, 1930-1945.
 - Bhoir, A. A., Mishra, T. A., Narayan, J., & Dwivedy, S. K. (2023). Machine Learning Algorithms in Human Gait Analysis. In *Encyclopedia of Data Science and Machine Learning* (pp. 922-937). IGI Global.
- DD-Robocon:** Collaborated in a team of 20 students to earn National Rank 1 in Round 1 in 2019 and 2021. Rank 9 attained in the Final Round in 2019 and 2020, special prize for Best Solution Idea, 2019.
- National Engineering Olympiad:** National Rank 8 in 2019.
- NPTEL course 'Speaking Effectively':** Top 1% Nationally
- AMCAT:** 99th Percentile in Quantitative Ability (Advanced), 97th Percentile in Logical Ability
- FTC (FIRST Tech Challenge):** Achieved Rank 3 in the National robotics competition and participated in the Asia-Pacific Invitationals in 2015 held at Sydney, Australia.