Shambhuraj Anil Mane

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Education

- **Worcester Polytechnic Institute** — Worcester, MA
  Masters of Science in Robotics Engineering. — *August 2023 - Present*
  Courses: Foundation of Robotics, Motion Planning, Reinforcement Learning
- **Savitribai Phule Pune University** — Pune, India
  Bachelor of Mechanical Engineering, 8.12/10.0 — *August2016 - November 2020*
  Courses: Mechatronics, Mechanical System Design, Product Design and Development

Skills Summary

- **Languages**: Python, C, C++, MATLAB, HTML
- **Developer Tools**: ROS/ROS2, Gazebo, MATLAB, Solidworks, CATIA, Linux, Git
- **Frameworks and Libraries**: nav2, ros2_control, moveit2, pandas/scikit-learn, PyTorch, Tensorflow, OpenCV

Professional Experience

- **Cognitive Medical Technology Laboratory, Worcester, MA — Lab Assistant**: *August 2023 - Present*
  - Built Concentric Tube Robot (CTR) consist of three curved tubes nested inside of each other resulting in a surgical instrument with a high degree of dexterity with 3D printing, Laser cutting and Tube fabrication methods and troubleshooting.
- **Infosys Limited, Mysore, India — Senior System Engineer**: *January 2021 - July 2023*
  - Delivered 500+ production orders in CATIA and SAP 3D visuals for manufacturing work instructions with collaboration.
  - Developed 150+ engine manuals and service bulletins, analyzing technical data to clearly document maintenance procedures.
  - Created automated tool for consumables and spares used in inspection tasks to improve process efficiency by 15 percent.
- **Product Innovation Lab, Pune, India — Project Manager**: *June 2018 - March 2020*
  - Represented the lab at several conferences and industry official visits and secured funding for 2 projects.
  - Organized 10 projects with professor and student allocation to provide suitable incubation for students interest.

Projects

- **Multi-agent path finding with CBS algorithms** : *August 2023 - Present*
  - Implemented Improved Conflict-Based Search (ICBS) algorithm, incorporating extensions like prioritizing conflicts and bypassing conflicts with consideration of kinodynamic constraints suitable for real time application.
  - Combined ICBS with disjoint splitting to further improve performance over ICBS alone, reducing node generation by 5-10%.
- **Reinforcement Learning for Short Range Path Planning in Indoor Environment** : *August 2023 - Present*
  - Developed a custom OpenAI Gym environment to simulate a Pioneer 3AT robot with differential drive and laser scanner in a 3D hospital environment using ROS2 and Gazebo.Significantly increased simulation speed to 50x real-time using launch files.
  - Trained a Proximal Policy Optimization (PPO) reinforcement learning agent with over 12 million steps to accomplish short-range path planning goals. The agent learned to navigate targets within 10 meters while avoiding obstacles.
- **Motion planning for Nonholonomic Vehicles** : *August 2023 - Present*
  - Tuned cost functions of a hybrid A* planner and implemented state lattice planner for differential and Ackermann constraints.
  - Simulated car parking in Gazebo, Generating smooth trajectories with obstacle avoidance for vehicles parking in tight spaces.
- **Open-manipulator Arm** : *August 2023 - Present*
  - Implemented forward and inverse kinematics, position, velocity and current control nodes in ROS2 for the end effector control.
  - Configured Open-manipulator Arm with moveit 2 for real time planning around objects and pick and place application.
- **Bionic Arm** : *August 2018 - March 2020*
  - Designed an 11 dof bionic arm with electronic hardware to enable anthropomorphic finger motion and grasping.
  - Developed machine learning models using SVM and random forest algorithms to classify EMG signals for precise grasp.
- **Real Time Cloud Sensing (RTCS))**: *October 2018 - August 2019*
  - Originated the RTCS idea and published the findings from live data stream of IR, humidity and temperature sensor with GPS and timestamp in the cloud server using ThingSpeak in the International Journal of Advanced Science and Technology.

Leadership

- **US Kids 4 Water, San Jose, CA — Robotics Team Lead**: *March 2023 - Present*
  - Led a team of 7 tutors and 6 supervisors to spread robotics awareness, reaching to students across 10 rural villages.
  - Conducted robotics, logic learning, and Arduino programming sessions for 24 students from underprivileged communities.