ZAHIRUDDIN MAHAMMAD

in/zahir-mahammad | zahirmd@umd.edu | (240)-604-0688 | College Park, MD, 20740

EDUCATION

University of Maryland, College Park **Expected May 2025**
Masters of Engineering in Robotics, GPA: 3.88/4.00 *Maryland, USA*

Indian Institute of Information Technology Design & Manufacturing **July 2018 – May 2022**
B.Tech Mechanical Engineering, ***CGPA: 8.74/10.00*** *Chennai, India*

TECHNICAL SKILLS

Tools, Software & OS: Robot Operating System (ROS) – Noetic; Galactic; Humble, Docker, Autodesk Fusion 360, CATIA, SolidWorks, MATLAB, Linux, Adobe Photoshop, Adobe Illustrator, Adobe Premiere Pro, 3D Print, Drone Piloting
Programming & Algorithms: Python, C++, C, C#, Git, Reinforcement Learning

WORK EXPERIENCE

Researcher at Robotics Algorithms & Autonomous Systems (RAAS) Lab *Feb 2024 – Present*
Reinforcement Learning, Mujoco, Pytorch, UR5e Manipulator *RAAS Lab, UMD*

- Imitation Bootstrapped Reinforcement Learning on UR5e manipulator to perform long horizon tasks in cooking robotics
- Working on an algorithm that uses imitation learning and reinforcement learning on UR5e manipulator with a spoon mount, the application involves actively detecting the food in a bowl, reaching it, aligning, scooping, and finally feeding the person and ensuring that all the food in the bowl is completely consumed.

Research Intern at Robotics Research Center [Full-Time] *December 2022 – July 2023*
PX4 Firmware SITL, ROS Noetic, Gazebo, ViSP, DJI F550, 3D Printing *IIIT Hyderabad, India*

- Modeled and fabricated a single DOF Gripper for aerial robot to latch on the Transmission line for inspection.
- Implemented drone simulations of gripper design on drone using PX4 SITL, with obstacle avoidance and stereovision.
- Led numerous on-field drone flight tests, 15+ hours, with the gripper mounted on DJI F550 and developed a tangible Proof of Concept. Currently working on PX4 HITL hardware to achieve obstacle avoidance and autonomy using computer vision.

PROJECTS

Reinforcement Learning for Humanoid Robot Gait *March 2024 – May 2024*
Gymnasium, Brax, Mujoco, Soft-Actor Critic (SAC), PPO *University of Maryland, US*

- Implemented and fine-tuned RL algorithms (SAC and PPO) for the humanoid robot "Stompy" by K-Scale Labs
- Included human-like joint limits to enhance realism and built an environment with efficient reward criteria to achieve natural gait patterns, trained the model in Gymnasium while tuning hyperparameters for improved results
- Created a Brax environment to accelerate training by running multiple parallel simulations, resulting in better performance in less time, conducted a comparative analysis of training outcomes between Gymnasium and Brax environments.

Vision-Based Autonomous Navigation - TurtleBot3 Waffle *March 2024 – May 2024*
ROS2 Humble, Gazebo11, OpenCV, YOLO-v5, TurtleBot3 *University of Maryland, US*

- Developed a pipeline for tasks that included stop sign detection, horizon line detection, dynamic obstacle avoidance, and navigation through papers, enabling TurtleBot to autonomously navigate through the environment.
- Trained the YOLOv5 model for stop sign detection, utilized Hough lines to identify vanishing points and draw the horizon line, employed optical flow for dynamic obstacle avoidance, and contour detection to identify waypoints.
- Implemented a closed-loop controller to autonomously navigate in simulation and real-world environments through the waypoints while performing the defined tasks and successfully demonstrated obstacle avoidance and task execution.

Multi-Modal Mobility Robot – Course project: Introduction to Robot Modeling *Oct 2023 – Dec 2023*
ROS2 Galactic, Gazebo11, SolidWorks *University of Maryland, US*

- Designed and modeled a robot with wheels designed to act as wheels, propellers and thrusters depending on the environment
- Integrated a 4 DOF arm manipulator and vacuum gripper in the vehicle, and devised inverse kinematics to grasp objects.
- Model is exported as URDF and simulated in land, air, water environments in gazebo for different modes of the robot.

Drone Technology Enabled Leaf Disease Detection *Dec 2021 – May 2022*
NodeMCU, Arduino IDE, Python *IIITDM Kancheepuram, Chennai*

- Devised a leaf disease detection system for agricultural fields with Convolution Neural Network, integrated into a camera.
- Programmed a PID controller using IMU sensor and ESP8266 Module to achieve autonomous flight with minimal resources.
- Constructed and assembled the DJI F450 drone, incorporating a leaf disease detection system through Raspberry Pi integration, and created a manual control application using MIT App Inventor.