ZAHIRUDDIN MAHAMMAD

linkedin.com/in/zahir-mahammad | zahirmahammad.github.io | zahirmd@umd.edu | College Park, MD, 20740

EDUCATION

University of Maryland, College Park — **Aug 2023 - May 2025**
Master of Engineering in Robotics, GPA: 3.81/4.00 — *Maryland, USA*
Indian Institute of Information Technology Design & Manufacturing — **July 2018 – May 2022**
Bachelors in Mechanical Engineering, CGPA: 8.74/10.00 — *Chennai, India*

TECHNICAL SKILLS

Programming Languages: Python, C++, C#
Software Tools: ROS1, ROS2, Gazebo, Docker, SolidWorks, MATLAB, Linux, MoveIt, SLAM
Technologies/Frameworks: Pytorch, OpenCV, YOLO, OpenAI API, 3D Print, Drone Piloting

PUBLICATIONS

[1] Sehgal Aditya, **Zahiruddin Mahammad**, Sasank Poorna, Badhwar Ankur, Nagamanikandan Govindan. "*WireFlie: A Novel Obstacle-Overcoming Mechanism for Autonomous Transmission Line Inspection Drones*" - *IEEE RA-L 2025*

[2] Bhaskar Amisha, **Zahiruddin Mahammad**, Sachin R. Jadhav, and Pratap Tokekar. "*PLANRL: A Motion Planning and Imitation Learning Framework to Bootstrap Reinforcement Learning*" arXiv preprint arXiv:2408.04054 (2024)

WORK EXPERIENCE

Robotics Algorithms & Autonomous Systems (RAAS) Lab — *March 2024 – Present*
Research Assistant under Dr. Pratap Tokekar — *UMD, College Park, US*

- **Imitation & Reinforcement Learning**: Developed a reinforcement learning environment and a system for data collection, training behavior cloning model and **train reinforcement learning** bootstrapped with BC model on **real-world UR3e robot**
- **Sketch-based RL:** Developed a framework leveraging human-drawn trajectory sketches to bootstrap robot learning. Designed and implemented methods for mapping **sketches to executable robot trajectories** on UR3e robot, enabling efficient imitation and reinforcement learning for manipulation tasks.
- **Interactive Mobile Manipulator:** Built a custom mobile manipulator with a **Kobuki base** and a **custom-made arm**. Integrated vision-based navigation and **Language Model** for navigation and manipulation. Currently working on incorporating a physical intelligence model **(pi0)** for the manipulator, SLAM, and memory system to log tasks and retrieve relevant data based on input.

Robotics Research Center — *Dec 2022 – Dec 2024*
Research Assistant under Dr. Nagamanikandan G — *IIIT Hyderabad, India*

- **Modeling and Simulation:** Designed, modeled, and 3D-printed a total of three revised versions of an **underactuated mechanism** for **aerial robots** to lock onto transmission lines and traverse for inspection while avoiding in-line obstacles. Simulated the mechanism using ROS Noetic, Gazebo, and **PX4 SITL**, integrating it with drone models for validation.
- **Flight Test and Autonomy:** Mounted mechanism on **DJI F550 drone** and led numerous on-field drone flight tests, **15+ hours**, to validate manual locking on a transmission line testbed. Revised and optimized the design and integrated a vision-based autonomous system for **fully autonomous** latching, traversal, obstacle avoidance, and detachment.

PROJECTS

RAGFusion: A Multimodal Pipeline for Document Understanding — *Oct 2024 – Dec 2024*
Course Project: CMSC848K: Multimodal Foundation Models — *University of Maryland, US*

- **Multimodal Information Retrieval:** Developed a document retrieval system integrating FAISS for text indexing, **ColPali** for text-image retrieval, and **Qwen2.5-VL-7B-Instruct** for reasoning of images. Processed retrieved data through **Mistral-7B-Instruct** for end-to-end query answering, with an interactive chatbot interface and minimal voice-based query support.

Vision-Based Autonomous Navigation - TurtleBot3 Waffle — *March 2024 – May 2024*
Course project: EMPM673: Perception for Autonomous Robots — *University of Maryland, US*

- **Computer Vision Methods:** Developed a perception pipeline for horizon line detection, stop sign recognition, **dynamic obstacle avoidance**, and navigation through papers. Used Hough transform for horizon line detection, trained **YOLOv5** for stop sign recognition, applied optical flow for obstacle tracking, paper contour detection for waypoint identification.
- **ROS2 Sim & Real-World Deployment:** Implemented a closed-loop control system in **ROS2 Humble for Turtlebot3** to coordinate all perception tasks in real-time and demonstrate successful **autonomous** navigation in simulation and real-world environments.