Mohammed Rayan

Bengaluru, India • +91 81057 29755 • mohammedrah1289@gmail.com • LinkedIn • GitHub • Portfolio

PROFILE

A dedicated and curious engineer passionate about designing intelligent robotic systems that bridge hardware and intelligence. Experienced in developing end-to-end autonomous platforms — from embedded firmware and ROS2 middleware to reinforcement learning–based control and perception. Skilled in translating ideas into real-world, reliable systems, with a strong interest in advancing robotics and embedded systems through thoughtful design and innovation.

EDUCATION

- **Bachelor of Engineering in Electronics and Instrumentation** 2023 − 2027
  M. S. Ramaiah Institute of Technology *Bangalore, India*
  - Current GPA — 3.256 / 4

TECHNICAL SKILLS AND INTERESTS

Languages: C/C++, Python, Bash, MATLAB.
Robotics Tools: ROS2, SLAM (RTAB-Map, AMCL), Nav2, PPO, Git, Path Planning, Micro-ROS, TinyML.
CAD & Design: FreeCAD, KiCad.
Libraries: NumPy, OpenCV, Matplotlib, Pandas, Gymnasium, PyTorch, TensorFlow Lite, scikit-learn.
Soft Skills: Leadership, Problem Solving, Mentoring, Self-learning, Presentation, Adaptability.

PROJECTS

- **CAPE – Smart Power Home Automation System**

  IoT-Based Power Optimization and Predictive Maintenance
  - Developed an IoT system for real-time power tracking, automated billing, and AI-based predictive maintenance for household and industrial testbeds.
  - Integrated voltage/current sensors with MOSFET and relay switching to automatically reduce high load and send SMS-based alerts with consumption data.
  - Achieved 20% reduction in testbed energy usage through fault detection and analytics.
  - **Awarded 1st Place for Best Hardware Project** at *Ignitex 2025, BGSIT*, among 40+ competing teams.
  - Technologies Used: Arduino, Raspberry Pi, Flask, LightGBM, Sensors, Python.

- **Analysis of Deep RL, Traditional RL and PID Control for Assistive Walker and CartPole Systems**

  Designed a unified research framework benchmarking the Five controllers - PID, Traditional RL, Deep RL, PPO on custom Assistive Walker and CartPole systems.
  - Implemented self-balancing using MPU6050 IMU + BTS7960 drivers with PID and PPO reinforcement learning.
  - Achieved 125 Hz loop rate and <2° steady-state error through adaptive gain zoning.
  - Technologies Used: Arduino, Raspberry Pi 5, Stable-Baselines3 PPO, Python, C++.

- **AURORA – Autonomous Mobile Robot for Navigation & Mapping**

  SLAM & Autonomous Navigation for Warehouse Logistics
  - Implementing ROS2 Nav2 stack with Lidar SLAM and MoveIt! for indoor mapping and navigation.
  - Deploying on Mecanum-wheel platform using Pi 5 + Pixhawk with ±2 cm localization accuracy.
  - Reduced idle time by 25% and improved task allocation efficiency through adaptive DWA navigation.
  - Technologies Used: ROS2 Humble, Nav2, SLAM Toolbox, MoveIt!, Pixhawk, Lidar.

- **High-Accuracy DIY LiDAR-Alternative Module**

  Low-Cost Sensing & SLAM Integration
  - Engineered ultrasonic + encoder LiDAR emulator with AS5600 feedback and IMU fusion.
  - Published ROS2 LaserScan data with 3 cm accuracy and EKF fusion for SLAM mapping.
  - Technologies Used: Arduino Nano, Raspberry Pi 5, Ultrasonic Sensor, AS5600, ROS2 Humble.

- **G.R.I.D – Ground Recon & Intrusion Detection Drone**

  Humanitarian Autonomous System
  - Developing an IR + magnetometer fusion drone for landmine detection and risk-aware path planning.
  - Integrating Bayesian filtering, A* planner, and ROS2 middleware achieving 8× faster coverage vs manual sweep baseline through autonomous path planning and sensor fusion.
  - Technologies Used: Raspberry Pi 5, Pixhawk 2.4.8, ROS2, Python/C++, Sensor Fusion.

- **BALROS – Self-Balancing ROS Bot with DIY LiDAR**

  Autonomous Balance & Mapping
  - Built two-wheeled ROS2 robot with PID stability loop and DIY rotational LiDAR for mapping.
  - Integrated SLAM Toolbox and teleop control for real-time visualization in RViz.
  - Technologies Used: Raspberry Pi 5, Arduino, ROS2 Humble, SLAM Toolbox, PID Control.

POSITIONS OF RESPONSIBILITY

- **Vice Technical Head – IEEE Sensors Council** Dec 2024 – Sept 2025

  M. S. Ramaiah Institute of Technology
  - Organized RoboSoccer event featuring 4 custom-built bots using nRF modules and custom-made controllers with over 80 participants.
  - Designed and prototyped bots for the "SensoryBot" robotics hardware competition with 30+ participants.
  - Coordinated PCB Design workshop - an exclusive IEEE session.
  - Designed circuits on Tinkercad for "Breakpoint" hardware debugging challenge.
  - Leading development of a thermal anomaly detection drone using IR sensors and sensor fusion.

- **Electrical Subsystem Member – Team Volante (Electric Vehicle Team)** Jan 2025 – Present
  - Led electrical safety and low-voltage systems team; developed smart BMS and TSAL modules for competition vehicles.
  - Oversaw system integration and testing for EV safety circuits and performance analytics.

ACHIEVEMENTS

- **First place for Best Hardware Project** – Ignitex, BGSIT *Apr 2025*
  Developed IoT system for real-time power tracking, automated billing, and AI-based predictive maintenance.

- **Best Technical Design Award** – RoboSoccer 2025 @ DSU × MIT Square *Apr 2025*
  Developed a custom-built Rover with clean minimalist design.

- **Under Top 20 Performing Teams** – Amazon Sambhav Hackathon 2024 *Oct 2024*
  Prototyped and developed FruitBridge, a minimalist and user-friendly AI-driven supply optimization platform that connects farmers directly with local vendors.