

Mohammed Rayan

Robotics and Embedded Systems Engineer

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PROFILE

Robotics Engineer with proven expertise in building autonomous systems from PCB to perception - spanning embedded firmware, ROS2 middleware, and RL-based control. Experienced in developing end-to-end robotic platforms—from low-level firmware and microcontrollers to high-level AI planners and reinforcement learning. Seeking robotics/embedded systems internship to apply end-to-end system design in real-world autonomous platforms.

EDUCATION

- **M. S. Ramaiah Institute of Technology** Bangalore, India
Bachelor of Engineering in Electronics and Instrumentation 2023 – 2027 (Expected)
 - 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 $<2^\circ$ 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 $8\times$ 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)**

2023 – 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.