Mohammed Rayan

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About Me

Robotics and Embedded Systems Developer with hands-on experience in real-time autonomy, ROS2, and AI-powered automation. I build scalable systems using Jetson, Raspberry Pi, and microcontrollers with SLAM, PPO, and sensor fusion. Currently leading research in hybrid control (PID + PPO) and actively contributing to robotics innovation through IEEE and EV racing projects.

Education

B.E. in Electronics Engineering
M S Ramaiah Institute of Technology, Bangalore **2023 – 2027**
CGPA: 8.4

12th Grade – Sir M.V PU College
Percentage: 93.5%

10th Grade – Sri Mahaveer Vidyalaya
Percentage: 96.6%

Skills

Programming: C, C++, Python, MATLAB
Embedded Systems: Arduino, STM32, ESP32, Raspberry Pi, NVIDIA Jetson
Robotics/AI: ROS2, SLAM (RTAB-Map, AMCL), Nav2, PPO, Path Planning
Tools & Libraries: Git, VS Code, Linux, Flask, Gymnasium, TensorFlow Lite, scikit-learn
Sensors: Lidar, Depth Camera, IMU, Gas, Current/Voltage, Motor Drivers

Technical Projects

Smart Power Home Automation System (CAPE)
- Developed IoT system for real-time power tracking, automated billing, and AI-based predictive maintenance.
- Reduced testbed energy usage by 20% using sensor-driven analytics and fault detection.
- *Tools:* Arduino, Raspberry Pi, Flask, LightGBM, Sensors
- *Best Hardware Project – Ignitex, BGSIT*

AURORA – Autonomous Mobile Robot (AMR)
- Designed and built logistics AMR using ROS2, RTAB-Map SLAM, and Nav2 stack on Raspberry Pi 5.
- Implemented obstacle avoidance, global path planning, and sensor fusion (IMU + Lidar).
- *Tools:* ROS2 Humble, 2D Lidar, IMU, Flask UI
- Currently integrating into full SLAM-based Gazebo simulation.

Self-Balancing Robot with Reinforcement Learning (PPO)
- Developed hybrid control robot using classical PID and PPO reinforcement learning.
- Trained PPO agent on real-world sensor-action dataset from MPU6050 via Arduino.
- *Tools:* Stable-Baselines3, Gymnasium, Arduino, Python

AI-Powered Corrosion Monitoring System
- Built a real-time corrosion monitoring platform using AD5933 with Raspberry Pi.
- Logged and visualized impedance data for early warning; future-ready for ML prediction + LoRa.
- *Tools:* AD5933, Python, ThingSpeak, TensorFlow Lite (planned)

Positions of Responsibility

Vice Technical Head – IEEE Sensors Council, RIT-B **2024 – Present**
- Organized RoboSoccer event featuring 4 custom-built bots using nRF modules.
- Designed and prototyped bots for the "SensoryBot" robotics hardware competition with 30+ participants.

- 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 (EV Club) **2025 – Present**

- Designed LV shutdown and TSAL (Tractive System Active Light) circuits for EV go-kart.
- Implemented safe power distribution with emergency interlocks for race compliance.
- Developed sensor supply design for onboard electronics reliability during racing conditions.

Research

PID vs PPO for Real-Time Self-Balancing Robots
Under Dr. Shivprakash G, HOD, RIT-B (Ongoing)

- Investigating hybrid control using classical PID and PPO-based reinforcement learning.
- Collected training data using MPU6050 + BTS7960 with Raspberry Pi + Arduino.
- Implementing PPO agent for real-time physical balancing on embedded system.
- Preparing submission to IEEE Access / RA-L journal in 2025.

Awards

- **Best Hardware Project** – Ignitex, BGSIT (**Apr 2025**)
- **Best Technical Bot Design** – RoboSoccer @ DSU × MIT Square (**Apr 2025**)