Pranav Deshakulkarni Manjunath

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Professional Summary

Robotics and Embedded Systems engineer with over three years of **embedded firmware** experience and a **Robotics** master's. Bridge **hardware integration**, **real-time software**, and **autonomous systems** from path planning and perception to sensor fusion and control to deep reinforcement learning. Strong fit for roles that require **systems and hardware integration** and reliable deployment of robotic or autonomous platforms.

Skills

Robotics & Autonomy: `ROS 2, Path Planning, Sensor Fusion, Control, Deep Reinforcement Learning`

ProgrammingLanguages: `Python, C, C++ (14/17/20)`

Embedded & Hardware: `ARM Cortex-M, Jetson Orin Nano, Raspberry Pi, Renesas RA`

Frameworks & Sim: `Zephyr RTOS, FreeRTOS, MuJoCo, OpenCV, MATLAB`

Systems Integration: `Real-time Control Loops, OTA Updates, MQTT/TCP, CI/CD, Unit Testing (Unity, GTest)`

Work Experience

Graduate Student Researcher — *RAAS Lab, University of Maryland, College Park* *September 2024–Present*

- Integrating local **LLMs** to enable natural-language task planning and command interpretation toward long-term autonomy of mobile robots.

Embedded Firmware Engineer — *Intellicar Telematics Private Limited, Bengaluru, India* *November 2021–May 2024*

- Architected **BMS firmware** with SoC monitoring and fail-safe cutoff via CAN, and designed **real-time control** loops on RA2L1 (Cortex-M23) that achieved a **2**× reduction in interrupt latency.
- Raised system **reliability to 97%+** at maximum throughput, diagnosed field issues across **5000+** deployed units through **root-cause analysis**, and deployed **hotfixes** via an **MQTT**-based **OTA** and configuration system.
- Developed **unit and system tests** using Unity, Python, and Bash, and performed hardware bring-up and validation on custom PCBs.

Hardware Intern — *Intellicar Telematics, Bengaluru* *Aug–Nov 2021*

- Performed hardware bring-up and debugging using **Oscilloscopes** and **Logic Analyzers**, validated signal integrity and protocol compliance, and collaborated with hardware teams on PCB root-cause analysis and rework.

Projects

CFD-Informed Autonomous UAV Navigation: Developed a hybrid **Beziér–A*** global planner that integrates **CFD** wind-field data to plan Pareto-optimized trajectories in unknown, cluttered environments. This approach achieved a **∼14%** reduction in tracking error (RMSE) in high-wind conditions by routing through wind-shielded zones using CFD-aware cost maps.
Tools: `Python, ROS 2`

Energy-Efficient, Language-Conditioned Robotic Control: Built a language-conditioned **RL** framework (SAC + Sentence-BERT) on **MuJoCo** to balance task success with energy efficiency and motion smoothness. Semantic modulation (e.g. "gently") reduced **energy use by 30%** and **jerk by 40%**, and optimized training throughput by **8**× (50 to 400+ FPS).
Tools: `Python, MuJoCo, SAC, Sentence-BERT`

Semantic Mapping and VLM for Long-Term Autonomy: Developed vision-based semantic mapping on **Jetson Orin Nano** and integrated a **VLM** to observe and **dynamically adjust** to any given scene or environment, improving long-term autonomous navigation.
Tools: `ROS 2, Python, Jetson, VLM`

Robust Kalman Filter for Object Tracking: Improved pose estimation from noisy tracking by implementing a robust **Kalman filter** with incremental **EM-based** online learning and dynamic measurement weights. Deployed the system on a **real robot** using **Raspberry Pi** and camera data, reducing NRMSE from **0.094 to 0.019**.
Tools: `ROS 2, Python, MATLAB, Raspberry Pi`

Distributed Telemetry and BMS Firmware: Implemented a CAN/OBD-II telemetry pipeline with a lossless edge-compression algorithm (**2.6**× compression) and developed BMS firmware with SoC monitoring and OTA update capability.
Tools: `C (bare-metal), Renesas RA2L1, CAN/J1939, MQTT`

Human Gait Trajectory Prediction on the Edge: Developed an embedded gait-trajectory predictor that achieves **96%** accuracy with a model footprint under **200 KB** on Arduino Nano 33 BLE Sense.
Tools: `C++, Python, TensorFlow Lite, Arduino`

Education

University of Maryland, College Park — *Master of Engineering, Robotics* *August 2024–May 2026* (Expected)
Coursework: Robot Modeling, Control, Path Planning, Perception, Deep Learning, Embedded ML Current GPA: 3.55

B.M.S. College of Engineering — *Bachelor of Engineering, Mechanical* *August 2017–May 2021*
Coursework: Mechatronics, Microprocessors, Fundamentals of Robotics, Classical Controls Cumulative GPA: 3.56