Pavan Yarlagadda

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Buffalo, NY, USA

Objective

Robotics Software Developer with strong experience in ROS2, C++, and Python for real-time autonomous systems. Skilled in computer vision, SLAM, sensor fusion, and GPU-accelerated AI pipelines. Passionate about building robust field-deployable robotics solutions in precision agriculture and edge-device environments.

Experience

- **University at Buffalo – EARTH: Excavation Autonomy with Resilient Traversability and Handling** *Jun 2025 – Present*
  Graduate Research Assistant (Advisor: Associate Prof. Karthik Dantu) Buffalo, NY
  - Designed a **state estimation pipeline** using AprilTags, inclinometer angles, and LiDAR/GNSS data to accurately compute excavator joint poses under sensor noise and occlusion.
  - Developed **autonomous navigation modules** for large excavators, integrating mapping, localization, and motion planning in unstructured outdoor environments.
  - Currently **designing bucket safety measures** using control barrier functions (CBFs) for whole-body collision avoidance and workspace constraint enforcement.
  - Collaborated with **Moog Inc.** for hardware–simulation integration and real-world autonomy testing.
  - Currently deploying and testing robotic manipulation pipelines on **UR5** arm using ROS2, with focus on camera–robot calibration, motion planning, and workspace constraints.
  - Contributed to autonomous system stack for large excavator platform; involved in real-world integration and control system tuning.
  - Developed ROS2 nodes and embedded-safe C++ modules for actuator safety and feedback control.
- **IIT Varanasi (Prof. Sanjay Kumar Singh)** *Jan 2024 – May 2024*
  Research Intern – TinyML for Edge Devices Varanasi, India
  - Trained a face recognition model optimized for deployment on Arduino Nano BLE.
  - Reduced inference latency using TensorFlow Lite quantization and memory-efficient ops.
  - Deployed quantized CV models on edge hardware (Arduino Nano BLE) for real-time recognition in resource-constrained environments.
- **ACE Robotics Pvt Ltd. (Ref: Vivek – +91 9600581564)** *Jan 2024 – Apr 2024*
  Industrial Robotics Trainee Chennai, India
  - Designed and simulated a 6-DOF robotic arm for industrial use; created end-effector designs and CAD documentation.
  - Participated in on-site actuator testing and control verification; supported embedded-level interfacing and wiring.
- **Godrej Agrovet Ltd.** *May 2023 – Jul 2023*
  Python Developer Telangana, India
  - Developed and implemented an image processing pipeline to assess fruit ripeness using OpenCV and HSV segmentation.
  - Reduced manual inspection time by 40% and improved classification accuracy by 25%.
  - Leveraged CNN-based deep learning techniques for ripeness classification and detection; aligned with real-world agri-tech use cases.
  - Integrated QGIS with Python to visualize and map spatial crop maturity data for precision harvesting.
  - Contributed to a GIS-based visualization platform for geo-tagged agricultural data.

Education

- **University at Buffalo** *Aug 2024 – Present*
  M.S. in Robotics Buffalo, NY
  - Courses Completed : Robotics-1, AI, ML, Probability
  - Ongoing Courses: Robotics-2, Deep Learning, Intro to Computer Vision and Image Processing, Robotic Algorithms, MEMS
- **IIITDM Jabalpur** *2020 – 2024*
  B.Tech in Mechanical Engineering Jabalpur, India

PROJECTS

- **Autonomous Navigation using Reinforcement Learning & ROS2** *2025*
  ROS2, Gymnasium, Stable-Baselines3, PyTorch, Gazebo, LiDAR, PPO
  - Built a custom **ROS2–Gymnasium environment** integrating TurtleBot3, LiDAR perception, and velocity control in Gazebo simulation.
  - Trained **PPO-based RL policies** for adaptive obstacle avoidance in dynamic maps.
  - Applied reward shaping and constraint-aware action policies to ensure smooth, stable motion.
  - Applied PID tuning and real-time velocity control to ensure safe hardware execution, with control recovery loops.
  - Developed modular ROS2 packages with TF tracking and PPO-based path planning logic for mobile robots.
  - Created a sim-to-real pipeline for navigating dynamic environments using velocity control and obstacle awareness.
  - Developed ROS2–Gymnasium pipeline with embedded-safe velocity controls and TF-based state tracking.
- **Autonomous Waypoint Navigation for TurtleBot3** *2025*
  ROS2, Nav2, Python, RViz2, TMUX, Gazebo
  - Implemented complete **ROS2–Nav2 waypoint navigation** pipeline in simulation.
  - Added RViz2 waypoint recording, automated execution scripts, and dynamic goal insertion.
  - Tuned navigation parameters for smooth path following, efficient obstacle avoidance, and robust recovery.
  - Designed system using ROS2 lifecycle nodes and behavior trees for flexible execution.
  - Implemented structured software stack with reusable launch and config files.
- **Inventory Management using Reinforcement Learning (Prof. Sunil Agarwal)** *2023*
  Python, Q-Learning, SimPy
  - Modeled inventory decision-making using Q-learning agents based on historical and simulated order volumes.
  - Achieved 15% reduction in excess inventory and 10% improvement in stock availability ratio.
  - Developed visualization module using Matplotlib for tracking stock levels and policy learning curve.
  - Applied Q-learning to simulate decision-making under inventory constraints; scalable training over variable demand patterns.
  - Evaluated agent behavior with statistical visualizations; iterated based on exploration–exploitation performance metrics.

SKILLS

- **Languages:** **C++**, Python, Embedded C
- **Robotics Middleware:** **ROS2**, ROS, Nav2, TF2, Action Servers, Lifecycle Nodes, Launch Files
- **Planning & Localization:** SLAM, Path Planning, PPO RL, Control Barrier Functions (CBFs), Waypoint Execution
- **Deployment & Integration:** System Installation, Hardware Bring-up, Field Debugging, Sensor/Actuator Calibration, Documentation, User Training
- **Robotics Stack:** ROS2, TF2, MoveIt (if used), AMR-style navigation (TurtleBot3), Arm Control, End-Effector Integration
- **Robotic Systems:** UR5, URScript, Inverse Kinematics (IK), Hand–Eye Calibration, Kinematics Simulation
- **Computer Vision:** OpenCV, YOLOv5, HSV Segmentation, LiDAR-Camera Calibration
- **Tools:** TMUX, Git, Linux, Docker (basic), System Configuration, Embedded Integration

LEADERSHIP AND RESPONSIBILITY

- **Final Year Project Lead**, Led a 6-member team, improved output by 70% *2023*
- **Cultural Coordinator**, Ta-Rang Fest Organizer at IIITDM *2022*
- **Captain, Badminton Team**, Semifinalist – Inter-School Doubles *2016*
- **Core Member, Shutter Box Club**, Photography and Campus Media *2022 – Present*
- **Cultural Volunteer**, Telugu Festivals – Ugadhi, Pongal *2021 – 2023*

ACHIEVEMENTS

- **2nd Rank** – National Talent Search Olympiad (2015)
- **Qualified** – Regional Maths Olympiad (2018)
- **Stage-1 Finalist** – DD Robocon Robotics Hackathon (2023)
- **Merit Scholarship** – Top 10% rank holder at IIITDM (2020–2024)
- **1st Runner-Up** – Inter-School Badminton Doubles (2016)