

# Venkata Harshavardhan Bontalakoti

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## Education

Johns Hopkins University, U.S.A | Masters in Robotics Engineering Aug'25 - Present  
Indian Institute of Technology, Hyderabad, India | B.Tech in Mechanical Engineering(Exchange) Aug'24 - May'25  
National Institute of Technology, Silchar, India | B.Tech in Mechanical Engineering Dec'21 - May'24

## Technical Skills

**Programming:** C, C++, Python, Matlab, C#, Linux, Cmake, Git/GitHub, Docker

**Robotics:** ROS2, Gazebo, Mujoco, Unity, SLAM, Nav2, Moveit, UART, Raspberry Pi, Sensor Fusion, Trajectory Planning

**AI & ML:** Pytorch, OpenCV, Tensorflow, Scipy, Pandas, Matplotlib, Reinforcement Learning, VLA, Transfer Learning

## Work Experience

Indian Institute of Technology Madras, India May'24 - Jul'24  
*Robotics Research Intern | Research and Development*

- Won the prestigious **Summer Fellowship (SFP-2024)** at the Department of Aerospace Engineering, standing out among **1000 plus applicants** for excellence in robotics research.
- Designed and developed a modular simulation environment using **Unity** and **ROS2** to support maritime **perception and control** research. Integrated realistic ocean and wind **physics models** to simulate environmental disturbances, resulting in **12.5%** reduction in deployment time for marine drones.
- Created an **open-source robotics platform** intended for advancing **autonomous navigation, multi-agent interaction, sensor fusion, and control strategies** in unstructured marine domains.

Instruments Research and Development Establishment, DRDO, India May'23 - Jul'23  
*Robotics Engineer Intern | Military and Defence Applications*

- Contributed to the design and analysis of **sensor-mounting systems** for autonomous aerial, ground, and naval platforms, with a focus on optimizing robustness, vibration isolation, and measurement accuracy.
- Assisted in developing a scalable hardware-software integration pipeline for deploying **multi-sensor payloads** (EO/IR cameras, LiDAR) on mobile defense platforms.
- Prototyped an **autonomous coastal surveillance** system using distributed sensor-equipped ocean buoys, **reducing operational costs by 30%** while significantly enhancing perimeter awareness and real-time detection capabilities.

## Projects

Vision-Based Quadruped Robot with Real-Time Sensor Fusion and Object Interaction [GitHub]  
*ROS2, Python, YOLO, MoveNet, C, MuJoCo, IMU Fusion, Object Detection, Pose Estimation, Embodied AI*

- Developed a fully open-source **quadruped robot (12-DOF)** with a 2-DOF gripper and onboard vision-based pose estimation using **MoveNet** and fused IMU-camera data for real-time perception-guided locomotion.
- Formulated a modular **ROS2-based perception and control pipeline**, incorporating sensor fusion(EKF), PID-based stabilization, and closed-loop actuation in unpredictable and cluttered environments.
- Enabled environment-aware navigation and manipulation for applications in **search and rescue, agriculture, and autonomous field robotics**.

Multimodal Embedded Perception Assistant using On-Device LLM [GitHub]  
*Python, OpenCV, Quantized LLM, Audio-Visual Perception, C, Embodied AI, Edge Computing*

- Engineered a lightweight, fully local **perception pipeline** integrating vision, speech, and ambient sensing to enable real-time human-aware interaction and autonomy on **edge devices**, improving the inference time by **22.5%**.
- Deployed on-device modules for **emotion analysis**, drowsiness detection, and user presence, facilitating context-aware decision-making without cloud dependence.

Human-Guided SLAM using TurtleBot3 and Pose Estimation [GitHub]  
*ROS2, Gazebo, TensorFlow Lite, PID Control, RViz, SLAM, Computer Vision, Pose Estimation*

- Enabled **autonomous SLAM mapping** by integrating **human pose estimation** (TFLite) with TurtleBot3, allowing the robot to follow and map based on real-time human motion cues.
- Implemented a PD-controlled visual servoing pipeline in **ROS2**, visualized via RViz Cartographer, showcasing a perception-driven alternative, **faster by 32%** compared to traditional manual mapping.

## Achievements

- **Academic Exchange Scholar, Indian Institute of Technology Hyderabad** : Selected for a prestigious academic exchange awarded to the **top 10%** students post-junior year based on **academic excellence and research interest**.
- **Smart India Hackathon 2024 Winner (Hardware Edition)**: Engineered a **drone-based automation** system addressing a real-world smart automation challenge; selected among the **top 7 teams** out of 30 nationally.

## Publications

1. **Improvement in Multi-resident Activity Recognition System in a Smart Home Using Activity Clustering(IFIPIoT 2023)**, *Topics: Machine Learning, Deep Learning, Multi-Modal Learning* [Paper]