

Venkata Harshavardhan Bontalakoti

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Work Experience

Capstan Medical, California, U.S.A (Robotics Software Intern) Jun'26 - Aug'26

- Built a custom **catheter simulator** modeling the bending, roll and insertion behavior coupled to the production **robot controller**, enabling closed-loop controller testing and failure-case exploration without physical hardware time.
- Implemented **power-on self-test (POST)** routines in **C++** for range-of-motion and stiction checks, in a regulated surgical robotics codebase with unit tests.
- Characterized actuator and robot motion** writing analysis scripts over motion logs to quantify friction and range limits which defined the pass-fail thresholds used by the POST suite.

Indian Institute of Technology Madras, India (Robotics Research Intern) May'24 - Jul'24

- Won the prestigious **Summer Fellowship (SFP-2024)** at the Department of Aerospace Engineering, standing out among **1000 plus** applicants for excellence in robotics research.
- Built complete maritime simulation platform using **Unity** and **ROS2** with realistic ocean and wind physics for autonomous vehicle research. Open-sourced on [GitHub](#) with active community adoption.

Defense Research and Development Organization, India (Robotics Engineer Intern) May'23 - Jul'23

- Developed **hardware-software integration pipeline** for multi-sensor payloads on mobile defense platforms, enabling rapid payload deployment.
- Prototyped an autonomous coastal surveillance system using distributed sensor-equipped ocean buoys, reducing projected operational costs by more than **15%**.

Education

Johns Hopkins University, U.S.A | Masters in Robotics Engineering | GPA: 3.75/4.0 Aug'25 - Present

Achievements

- YCP Hacks 2025 (MLH) (2nd Place Overall and Hardware Track Winner)**: Built PerceptEye, a real-time **accessibility system** deployed on RaspberryPi combining face recognition with TTS, sign language detection, and object detection to enable independent navigation for blind and deaf users.
- NexHacks CMU 2026 (MLH) (Sponsor Track Winner)**: Built AI-powered Smart Medical Kit using **multi-agent LLM council architecture** for first-aid diagnosis; designed consensus-based reasoning pipeline improving diagnostic reliability for rural healthcare deployment.
- Smart India Hackathon 2024 Winner (Hardware Edition)**: Engineered a **drone-based automation** system addressing a real-world smart automation challenge for social security and monitoring. Emerged as the winners out of more than a 100 teams

Projects

Vision-Based Quadruped Robot with Real-Time Sensor Fusion [\[GitHub\]](#)

ROS2, Python, MoveNet, C, MuJoCo, Sensor Fusion, Object Detection, Pose Estimation

- Built **12-DOF open-source quadruped robot** with 2-DOF gripper and real-time **pose estimation** (MoveNet) and IMU-camera sensor fusion for autonomous navigation and multi-agent research combining ground and aerial platforms.

ClipSort: DeepSort Implementation with CLIP features [\[GitHub\]](#)

Python, OpenCV, Multi-Object Tracking, PyTorch, Object Detection

- Developed **Multi-Object Tracking** framework with DeepSort and YOLOv11, employing Hungarian Algorithm and Kalman filter for enhanced data association. Implemented a novel feature extraction pipeline using Contrastive Language-Image Pretraining(**CLIP**) model.

Human-Guided SLAM using TurtleBot3 and Pose Estimation [\[GitHub\]](#)

ROS2, Gazebo, TensorFlow Lite, PID Control, SLAM, Computer Vision, Pose Estimation

- Integrated human pose estimation (**TensorFlow Lite**) with TurtleBot3 for autonomous SLAM guided by real-time human motion; implemented PD-controlled **visual servoing** pipeline in ROS2, achieving **25%** faster mapping than manual approaches.

Publications

- Autonomous aerial deployment of a hybrid drone-quadruped system for environmental tasks (Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science)**, Topics: Robotics, Deep Learning, Design, Control Systems [\[Paper\]](#)
- Improvement in Multi-resident Activity Recognition System in a Smart Home Using Activity Clustering(IFIPIoT 2023)**, Topics: Machine Learning, Deep Learning, Multi-Modal Learning [\[Paper\]](#)

Technical Skills

Perception: PyTorch, TensorFlow, OpenCV, Pose Estimation, Object Detection, Vision-Language-Action Models(VLA)

Robotics & Simulation: ROS 1/2, Gazebo, MuJoCo, Unity, SLAM, Nav2, MoveIt, Sensor Fusion, Trajectory Planning

Programming: C++, Python, C, MATLAB, C#