

VISHNU ROHIT ANNADANAM

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EDUCATION

Master of Science, Robotics | Northeastern University, Boston, MA | GPA – 3.7/4 **Expected Dec 2024**
Coursework: Autonomous Field Robotics, Mobile Robotics, Computer Vision, Control Systems, Robotics Sensing & Navigation.

Bachelor of Engineering, Electronics & Telecommunication | University of Mumbai, India | GPA – 8.4/10 **Jun 2022**
Coursework: Neural Networks & Fuzzy Logic, Image Processing & Machine Vision, Discrete Time Signal Processing.

EXPERIENCE

UAS Research Assistant | Field Robotics Lab, Northeastern University, Boston, MA **Dec 2023 – Present**

- Developed and field tested a multirotor swarm system to achieve dynamic mapping of an area through coordinated formation flight using ArduPilot systems running on the Pixhawk 6X flight controllers.
- Implemented decentralized formation flying and object tracking with four multirotor UAVs, each equipped with a pair of FLIR cameras for stereo vision, while also deploying real time camera feedback on the ground control station.

Graduate Teaching Assistant – Robotics Sensing and Navigation | Northeastern University, Boston, MA **Sep 2023 – Dec 2023**

- Guided students on data acquisition using ROS and analysis techniques for IMU, GNSS, RTK, Camera and LiDAR sensors.
- Led discussions on core robotics concepts such as localization, mapping, path planning, computer vision, optimization, etc. and their state-of-the-art algorithms.

Computer Vision & IoT Intern | EdVerb Learning Pvt. Ltd, Mumbai, India **Feb 2022 - Mar 2022**

- Built multiple Computer Vision and TinyML projects leveraging the ESP-32 Cam to create practical applications such as Face Detector, Eye Detector & Tracker, Flower Classifier, etc.
- Programmed the ESP-32 board to interface these projects with multiple sensors to devise several cost efficient IoT-based solutions for automation.
- Designed and programmed movement of a miniature car to automatically detect and avoid obstacles using Arduino Nano and ultrasonic sensors; developed components such as, LDR-enabled Smart Headlights, IR Remote Control.

TECHNICAL SKILLS

Operating Systems & Software: ROS (Robot Operating System), Linux, Windows, Git, Gazebo, Raspberry Pi, Arduino, Proteus.
Programming Languages & Libraries: Python, C++, MATLAB, OpenCV, GTSAM, MAVSDK, NumPy, Matplotlib, SciPy.
Proficiencies: Robotics, Computer Vision, System Design, Motion Planning, Machine Learning, Internet of Things (IoT).

PROJECTS

GPS & IMU Sensor Fusion for Automotive Dead Reckoning **Nov 2023 - Dec 2023**

- Collected data from GPS module and IMU mounted on a car through ROS using self-written device drivers in Python.
- Analyzed IMU's noise characteristics through Allan Variance and calibrated magnetometer by correcting hard and soft iron distortions along with error compensation in IMU and GPS data.
- Compensated for accelerometer bias to estimate vehicle's forward velocity, and fused yaw angle computed from gyroscope and magnetometer data to estimate heading for Dead Reckoning with IMU.
- Performed sensor fusion by implementing Extended Kalman Filtering (EKF) to get an improved estimate of vehicle's overall trajectory including GPS-lacking environments.

3D PointCloud Reconstruction from 2D Images through Structure from Motion **Oct 2023 – Nov 2023**

- Developed a 3D reconstruction algorithm that performs Structure from Motion to create a sparse point cloud from 2D images captured with a phone camera, using OpenCV for processing and GTSAM for optimization.
- Matched features between images using SIFT and RANSAC to estimate camera poses using essential matrix and Perspective-n-Point (PnP) pose computation, and triangulate their inlier feature points into 3D space.
- Optimized the point cloud by performing global Bundle Adjustment using GTSAM's factor graphs with Levenberg-Marquardt algorithm to improve camera poses and landmarks from the initial triangulation.

Autonomous Disaster Response Reconnaissance Bot **Mar 2023 – May 2023**

- Applied techniques of mobile robotic kinematics and sensing, motion planning and SLAM, to conduct autonomous reconnaissance in an initially unknown simulated disaster environment using a TurtleBot3.
- Utilized 360° LiDAR with ROS packages like *cartographer*, *explore_lite* & *move_base* in conjunction with custom nodes developed to achieve robust and efficient exploration.
- Calibrated Raspberry Pi Camera v2 and wrote custom nodes for *apriltag_ros* integration, enabling precise detection and localization of 11 AprilTags used as simulated victims; visualized poses using *rviz*.
- Generated a complete occupancy grid map of environment with 11/11 detected AprilTags represented with correct pose and ID during official demo session.

EXTRA-CURRICULAR ACTIVITIES

- Chairperson* (Aug 2021 - Jun 2022), *Assistant Technical Secretary* (Sep 2020 - Aug 2021), IEEE-RGIT, IEEE (Institute of Electrical and Electronics Engineers).