

# VISHNU ROHIT ANNADANAM

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## EDUCATION

**Master of Science, Robotics | Northeastern University, Boston, MA | GPA – 3.8/4** **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

**Robotics Research Assistant [incl. Co-op] | Field Robotics Lab, Northeastern University, Boston, MA** **Sep 2023 – Present**

- Led the design and development of a multi-UAV swarm system for dynamic mapping, with a dual RGB camera setup for stereo vision on each drone and ensuring precise time synchronization across all cameras and platforms.
- Developed a Python and ROS2 based control architecture to achieve coordinated formation flight with collision avoidance for tracking dynamic targets with real-time camera feedback using ArduPilot on the Pixhawk 6X flight controllers.
- Calibrated camera intrinsic and extrinsic parameters for the stereo-camera rig before each mission to get accurate depth estimation for optimal 3D reconstruction and mapping.
- Generated 3D/ 4D representations and novel views of dynamic scenes using NeRFs and Gaussian Splatting, from optimized sparse point clouds produced by Structure from Motion (SfM) algorithms.
- Benchmarked state-of-the-art Visual SLAM algorithms such as NVIDIA ISAAC SLAM on the on-board Nvidia Jetson Orin Nano to evaluate real-time performance on edge devices.

**Graduate Teaching Assistant – Robotics Sensing and Navigation | Northeastern University, Boston, MA** **Sep 2023 – Dec 2024**

- Guided students on data acquisition using ROS/ROS2 and analysis techniques for IMU, GNSS, RTK GPS, 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.
- Developed an autonomous 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/ROS2 (Robot Operating System), Linux, Git, Docker, Gazebo, Raspberry Pi, Fusion 360.

**Programming Languages & Libraries:** Python, C++, MATLAB, OpenCV, PyTorch, CUDA, GTSAM, NumPy, Matplotlib.

**Proficiencies:** Robotics, Perception, SLAM, Deep Learning, System Design, Motion Planning, Machine Learning, CAD, 3D Printing.

## PROJECTS

### 3D Point Cloud Reconstruction from 2D Images through Structure from Motion

- Built and deployed custom Python based ROS2 drivers for real-time sensor data acquisition from a GNSS receiver and IMU mounted on a vehicle for localization and navigation tasks.
- 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 LM algorithm to improve camera poses and 3D landmarks from the initial triangulation, achieving a 94.5% decrease in reprojection error.

### GPS & IMU Sensor Fusion for Automotive Dead Reckoning

- Built and deployed custom Python-based ROS2 drivers for real-time sensor data acquisition from a GNSS receiver and IMU for vehicle localization and navigation.
- Analyzed IMU noise using Allan Variance, calibrated magnetometer for hard/soft iron distortions, and compensated for accelerometer bias to estimate forward velocity.
- Refined the heading estimation from IMU by fusing yaw data from gyroscope and magnetometer to obtain an improved IMU-based dead reckoning of the vehicle.
- Performed GPS and IMU sensor fusion by implementing Extended Kalman Filtering (EKF) to get an improved estimate of vehicle's overall trajectory including GPS-denied environments.

## PUBLICATIONS

- A. Gupta, D. Giaya, **V. R. Annadanam**, M. Diddi, H. Jiang, H. Singh, "A System for Multi-View Mapping of Dynamic Scenes Using Time-Synchronized UAVs", submitted to *2025 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*.