# RAGHURAM CAULIGI SRINIVAS

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## EDUCATION

**New York University** — **2025**
M.S. Electrical Engineering — **New York, USA**
Coursework: Robot Perception, Robot Localization and Navigation, Reinforcement Learning

**Birla Institute of Technology and Science (BITS), Pilani** — **2023**
B.E. Electrical & Electronics Engineering, Minor in Robotics and Automation — **Hyderabad, India**

## WORK EXPERIENCE

**Graduate Research Assistant** — Nov 2023 – Present
*Agile Robotics and Perception Lab (ARPL), NYU* — *New York, USA*
- Set up the camera calibration pipeline for an Intel RealSense D455 using kalibr in ROS2, including the camera-IMU calibration for the drone.
- Used the OpenVINS platform to configure the correct transform (TF) tree between the camera and world frames, ensuring localization outputs align with the drone's body frame.
- Fine-tuned OpenVINS in ROS2 to achieve a positioning error of under 5 cm when performing minimum-snap trajectories.
- Built and configured the autonomy pipeline—comprising localization, control, and mapping—on an NVIDIA Jetson Orin, transitioning from JetPack 5.1 to JetPack 6.2.
- Integrated the "Depth Anything" model as a TensorRT module, merging RealSense depth data with Depth Anything outputs to enhance mapping. All data was visualized and processed using NVBlox.
- Incorporated GPS inputs into OpenVINS through EKF2, considerably improving outdoor performance.

**Software Engineering Intern** — June – Aug 2024
*Scoutos Inc* — *Remote*
- Developed an advanced evaluation framework for an LLM-based system using Retrieval Augmented Generation (RAG) to integrate contextual data—resulting in more accurate, context-aware outputs.
- Engineered and executed over 100 rigorous test cases with Pydantic validations to identify and eliminate data issues (null errors, duplicates), reducing document processing errors by 45% and ensuring reliable system performance.
- Implemented multi-threaded document chunking and deployed the system on Google Cloud, which reduced response latency by 35% and enabled the platform to support over 500 concurrent requests.

**Robotics Engineering Intern** — June – Aug 2022
*RBCCPS, Stoch Lab at IISc* — *Bengaluru, India*
- Developed 3D point cloud maps using COLMAP, achieving 890,000 points with RGB data for map augmentation.
- Designed a visual-inertial localization pipeline integrating PCA and DBSCAN clustering, improving biomass detection accuracy to 66% on variable-height datasets.
- Optimized multi-way stereo registration with iterative closest point (ICP) algorithms, enhancing map augmentation under dense canopy occlusion.

## PROJECTS

**Mobile Robot Maze Solving** — [GitHub](#)
*Python, ROS, OpenCV* — *Aug–Dec 2023*
- The project aimed to explore a maze made of image tiles and accurately locate target frames.
- In the exploration phase, we used state-based logic and ORB feature extraction to create FPV maze maps, with keyboard control to assist when the robot got stuck in complex loops.
- For navigation, we consolidated the explored area into a comprehensive map and developed an A* path planner, refining our initial brute-force approach by filtering out closed-loop conditions.
- We then integrated FLANN-based descriptor matching with ORB feature extraction to reliably identify target images, even under challenging 180° rotations.

**Quadrotor State Estimation and Localization**
*Python, MATLAB, OpenCV* — *Jan–May 2023*
- Used an EKF to estimate quadrotor state from IMU data, tracking velocity with near-sinusoidal accuracy.
- Built a homography pipeline with AprilTags for camera-to-world pose computation, ensuring consistent calibration.
- Estimated velocity via optical flow and RANSAC, effectively handling outliers despite challenging depth conditions.
- Switched to a UKF for non-linear velocity transforms, improving overall pose estimation accuracy.
- Compared estimates against Vicon data, highlighting the UKF's advantage even with minimal tuning.

**3D Free-Space Decomposition for Safe Flight Corridor Extraction** — [GitHub](#)
*Python, Open3D, SciPy* — *Month – Month Year*
- Generated a 3D occupancy grid from merged inverse depth and stereo depth point clouds computed in nvblox.
- Applied morphological dilation to expand obstacles and create a safety margin.
- Labeled connected free-space regions and computed minimal axis-aligned cuboids that cover the free areas.
- Visualized the decomposed free space by overlaying cuboid bounding boxes on the merged point cloud.
- Developed a pipeline for extracting safe flight corridors for autonomous navigation.

## SKILLS

**Programming:** Python, C++, Embedded C
**Robotics:** SLAM, Visual-Inertial Odometry, Sensor Fusion (EKF), Trajectory Optimization
**Perception:** 3D Reconstruction (COLMAP), Point Cloud Processing (DBSCAN), OpenCV
**Tools:** ROS, PyTorch, PX4, Git, Docker