NIRANJAN SUJAY

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EDUCATION

Master of Science in Mechatronics and Robotics Engineering **Aug 2022 - Jun 2024**
New York University, Tandon School of Engineering **CGPA:3.6/4.0**
Courses: Robot Localization and Navigation, Robot Perception, Artificial Intelligence.

Bachelor of Technology in Robotics and Automation **Aug 2018 - Jun 2022**
Jain University, School of Engineering & Technology **CGPA: 8.9/10 ~ 3.68/4.0**
Courses: Foundations of Robotics, Mathematics for Robotics, Kinematics & Dynamics of Machinery, Machine learning, Electronic Devices & Control.

TECHNICAL SKILLS

Algorithms & Techniques: Fast-LIO, GTSAM, Visual Place Recognition (VPR), A*, RRT, NoMaD, GNM, ViNT.
Data Processing: 3D Gaussian Splatting, R3LIVE, Environment Reconstruction, Sensor Fusion-LiDAR, RGB-D, GPS Data Integration.
Simulation & SLAM: NVIDIA Isaac SIM, Gazebo, MATLAB Robotics Toolbox.
Programming Languages: C, Python, MATLAB, ROS/ROS2.
Machine Learning Frameworks: PyTorch, TensorFlow, Keras.
Tools & Software: NVIDIA Omniverse, OpenCV, CUDA.
CAD & Electronics: Shaper 3D, Fusion 360, LPKF ProtoMat D104 (Circuit Board Design), regular and SMT Soldering.
Office & Collaboration Tools: Microsoft Office (Word, Excel, PowerPoint, Outlook), Google Suite (Docs, Sheets, Slides, Forms).

WORK EXPERIENCE

Robotic Research Intern, *AI4CE Lab, NYU Tandon, USA* **May 2024 - Present**
- Deployed a Unitree Go1 robot dog equipped with Livox LiDAR, u-blox GPS, and Insta360 camera, capturing over 120 hours of data, and tested a trained model on 1000+ hours of urban walking videos from the web. Achieved a 77.3% increase in navigation accuracy a 20% improvement over previous methods with high performance in right-turn and crossing scenarios (87.8% arrival rate, 4.63° AOE).
- Designed a custom hardware mount with dual LiDARs, dual 360 cameras, and GPS for the MappingNYC Project, collecting 160+ hours of data for NYC mapping. Processed up to 1-2 TB of data per session, enhancing loop closure accuracy through interactive SLAM, and enabled real-time urban navigation applications.
- Created a handheld sensor mount for the Curb2Door Project, using 3D Gaussian Splatting and R3LIVE to generate high-detail 3D models, enhancing navigation and scene reconstrcution on uneven terrains by up to 30% compared to latest R3LIVE models.

Robotic Research Intern, *Green Quest Solutions Private Limited, Singapore* **Sep 2021 - Aug 2022**
- Developed a YOLO-based model for waste categorization, integrating Intel RealSense for depth measurement, achieving an 85-96% accuracy improvement in waste sorting, and reducing processing delays. Along with custom circuits with integrated sensors and a power distribution board, improving power discharge rates and extending system runtime by approximately 50% for fieldwork applications.
- Built sensor equipped robotic arm for tree health monitoring, reducing assessment time across a million trees from 2 years to 6 months.

Robotic Intern, *Flux Auto, Bengaluru, India* **Dec 2019 - Feb 2020**
- Designed and implemented real-time object recognition on an NVidia Jetson Nano developer board, achieving a 60% improvement in detection accuracy for autonomous vehicles, integrating 15 cameras and 4 echolocation sensors for reliable obstacle detection.
- Contributed to motion planning algorithms, enhancing predictability and safety in urban navigation, and improving overall autonomous vehicle performance through refined decision-making protocols.

PROJECTS

Visual Odometry using RGB-D Camera **Tools:** Python, OpenCV, ROS, Isaac SDK
- Developed a real-time camera motion estimation algorithm using RGB-D data and implemented a Visual SLAM system, achieving accurate pose estimation and autonomous robot navigation over 80% of the map.

Pose Graph Mapping for Maze Navigation **Tools:** Python, OpenCV, SLAM, SIFT, KNN
- Developed a Pose Graph Mapping technique for building and optimizing maze maps while tracking robot trajectory. Integrated path planning and VPR technique using KNN and SIFT for accurate pose extraction and found the target location under 12 seconds.

Sensor Fusion and State Estimation for Aerial Robot **Tools:** MATLAB, Simulink, EKF, UKF
- Estimated pose and velocity of an aerial robot using IMU, 20% noise added VICON and camera data, applying Kalman filter for state estimation and visual localization in 3d space.

Autonomous Robotic Systems **Tools:** Arduino, Raspberry Pi, QTI Sensors, A* Algorithm
- Developed various autonomous systems including an inventory bot, intelligent parking system, and adaptive factory navigation to optimize processes and reduce manual labor.

Deep Learning Model with ResNet-50 on CIFAR-10 **Tools:** Python, TensorFlow
- Developed a model using ResNet-50 to classify images from the CIFAR-10 dataset, employing data augmentation techniques to enhance robustness. Trained and optimized the model, achieving over 90% classification accuracy.

Variational Autoencoder for Digit Generation **Tools:** Python, TensorFlow
- Implemented a VAE to generate digit images from MNIST data, optimizing the model with RMSprop and Optuna for improved performance and latent space exploration.

Comparative Study on Optimization Techniques **Tools:** Python, TensorFlow
- Analyzed optimization methods, comparing Adam and SGD on MNIST using logistic regression. Highlighted Adam's faster convergence, achieving a 25% reduction in training time and 15% lower final loss compared to SGD.

CERTIFICATES

Robotics Certification Course by **IIT Kharagpur**

Nanodegree in Deep Learning and Machine Learning Certification Course by **Udacity** and **AndrewNgs**

Google Cloud Certification course by **Google**