

# SAKETHRAM MADHUVARASU

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## Education

### University of California, San Diego

Sept 2023 - May 2025

*MS in Electrical and Computer Engineering(Intelligent Systems, Robotics and Control)*

**GPA:4.00/4.00**

- **Coursework:** Advanced CV, Image Synthesis(UE4), Statistical Learning, Robot Manipulation

### Indian Institute of Technology

Aug 2019 - May 2023

*Bachelor of Technology in Electrical Engineering*

**GPA:3.92/4.00**

- **Key Coursework & PoR:** Robotics, Computer Vision, DSA, Digital Systems, Vice-president of Robotics club

## Experience and Publications

### ActiveInitSplat | 3D-Gaussian Splatting with active image selection

Aug 2024 – Mar 2025

*Graduate Student Researcher*

*Python*

- Developed an end-to-end(**E2E**) novel active image selection framework for Gaussian Splatting (3DGS), leveraging density and occupancy estimation using **Gaussian process(GP)** surrogate model optimization to ensure diverse coverage.
- Achieved almost **5%** improvement in LPIPS, SSIM, and PSNR metrics over passive selection baselines using only **45%** of training images, enabling faster, higher-fidelity real-time **3D scene rendering**.
- Manuscript under review at **ICCV** conference. ([Paper](#))

### Vimaan Robotics | San Jose, CA

Apr 2024 – Sep 2024

*Computer Vision Intern*

*Python, C++, ROS*

- Deployed an end-to-end **transformer-based (DETR)** detection/segmentation system on cloud for pallet/ground recognition, improving mAP50-95 by **5%** by customizing decoder outputs.Utilized Roboflow for data annotation.
- Developed and optimized an end-to-end(E2E) Camera **calibration** module with **noise modeling** techniques achieving camera pose estimation accuracy within **0.25 degrees** and **2 cm**
- Coordinated the team in testing, configuring, and deploying a **TIM551** 2D-LiDAR to the company's equipment.

### Visual-Inertial SLAM | Roomba

Sep 2023 – Mar 2024

*Graduate Student Researcher*

*Python, ROS, C++*

- Built an autonomous robot (Roomba) using the Qualcomm RB5, incorporating a **LiDAR**, **IMU** and **camera** for environmental sensing. Performed **ICP SLAM** along with Pose graph optimization and Loop closure constraints.
- Implemented **Visual-Inertial SLAM** by triangulating 3D landmarks from stereo feature correspondences and fusing **IMU** data using an **EKF** for robust 6-DoF pose estimation and mapping.
- Incorporated IMU bias correction, feature filtering, and sliding window optimization; benchmarked performance against **ORB-SLAM3** under real-world motion profiles and KITTI dataset.

### Fog-based DCNS for Surveillance Applications

IEEE Robio-2023([PDF](#))

## Projects

### Multi-Object Tracking | Python, ROS2, C++

Sep 2024 - Present

- Engineered an advanced KF-based multi-object tracking (**MOT**) system, leveraging probabilistic data association for superior tracking accuracy, increasing HOTA and MOTA metrics by almost **10%**.
- Integrating ReID features into the tracking pipeline, inspired by **StrongSORT**, to improve robustness in real-time tracking under occlusions and cluttered scenes.

### Semantic Odometry | Python,ROS

Jan 2024 - June 2024

- Developed a semantic odometry pipeline on a small race car with **NVIDIA Jetson nano**, using RGBD images, combining **Fast Point Feature Histogram(FPFH)** features with **FastSAM** semantics to enhance robot pose
- Integrated SE(3) transformations for continuous global registration(**FGR**) and robot localization, while recognizing and categorizing robot activities (e.g., movement, interaction with objects) based on spatial-temporal cues.

### Other Projects

- **Text-to-3D Mesh Generation:** Enhanced the Gaussian Dreamer framework for Text-to-3D with **MV Dream** for better 2D diffusion and **Variational Score Distillation** for improved loss. ([Report](#))
- **Multimodal Edge-to-RGB Image Translation:** Designed an encoder-decoder architecture using **cVAE** and **GAN** to convert edge images into realistic RGB images, enhancing scene interpretation. ([Report](#))
- **BEV Perception:** Replicated a BEV system using multi-camera inputs and transformers to map 3D environments.

## Technical Skills

**Languages:** Python, C++, Java, C, CUDA, Matlab

**Developer Tools:** ROS, OpenCV, Foxglove, iFogsim, REST, ROS2, GNU Octave, Eclipse, Git, Docker

**Technologies/Frameworks:** Pytorch, JAX, AWS Sagemaker, GTSAM, SAPUI5