Saketh Ram Madhuvarasu

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Education

University of California, San Diego **Sept 2023 - Mar 2025**

MS in Electrical and Computer Engineering(Intelligent Systems, Robotics and Control) ***GPA:3.82/4.00***

- **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 | Gaussian Splatting with active image selection **Aug 2024 – Mar 2025**

Graduate Student Researcher *Python*

- Developed a novel active image selection framework for Gaussian Splatting (3DGS), leveraging density and occupancy estimation using black-box optimization to ensure diverse viewpoint coverage.
- Achieved significant performance improvements in real-time **3D scene rendering**, surpassing passive selection baselines, by achieving increased LPIPS, SSIM, and PSNR metrics by almost **5%** with fewer training images
- Manuscript under review for top-tier conference. **(Paper)**

Vimaan Robotics | *San Jose, CA* **Apr 2024 – Sep 2024**

Computer Vision Intern *Python, C++, ROS*

- Developed a cloud-based Object Detection and Segmentation system for ground and pallet detection using **DETR**, improving mAP50-95 by **4%**. Utilized Roboflow for data annotation to enhance performance.
- Developed and optimized an end-to-end **Camera calibration** controller module, achieving camera pose estimation accuracy within **0.25 degrees** and **2 cm**, and implemented marker-based localization for company machines
- Coordinated the team in testing, configuring, and deploying a **TIM551** 2D-LiDAR to the company's equipment.

Pluto Drone Swarm Challenge | *Inter IIT Technical Meet 11.0, IIT Kanpur* **Jan 2023 – Apr 2023**

Team Lead *Python, ROS*

- Implemented motion planning algorithms, including **RRT*** for global path planning and **DWA** for obstacle avoidance
- Integrated real-time sensor feedback(ArUco Tags) for localization, enabling dynamic re-planning and collision avoidance

Fog-based DCNS for Surveillance Applications **IEEE Robio-2023*[PDF]***

Projects

Multi-Object Tracking | *Python, 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* **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 and robot localization, while recognizing and categorizing robot activities (e.g., movement, interaction with objects) based on spatial-temporal cues.

Designing Roomba prototype | *ROS, Python* **Sep 2023 - Dec 2023**

- Developed an integrated real-time motion planning and navigation system for an autonomous robot (**Roomba**) using the Qualcomm RB5 platform, incorporating a LiDAR and camera for environmental sensing.
- Designed and implemented path planning algorithms (**A*, RRT**) and integrated SLAM techniques (**EKF, ICP**) for precise localization and mapping, with real-time **Pose graph optimization** and Loop closure constraints

Other Projects

- **Text-to-3D Mesh Generation**: Enhanced the Gaussian Dreamer framework for Text-to-3D with stable diffusion **Foundation Model** 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, Amazon Sagemaker, GTSAM, SAPUI5