Saketh Ram Madhuvarasu

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Education

University of California, San Diego **Sept 2023 - Present**

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 | 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 and camera for environmental sensing. Performed **ICP** SLAM along with Pose graph optimization and Loop closure constraints.
- Designed and implemented real-time navigation and path planning stack (**A*, RRT**) and integrated robust **Visual Inertial SLAM** using **EKF** to calculate robot's pose along with precise localization and mapping

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(**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