

P Sai Ramana Kiran

+1 7745198387 | spinnamaraju@wpi.edu | [Blog](#) | [LinkedIn](#) | [GitHub](#) | [Website](#)

Senior Algorithms Engineer with domain skills in Computer Vision, Computer Graphics, Deep Learning, Language Processing

EDUCATION

Worcester Polytechnic Institute

Aug 2022 - May 2024

M.Sc. Robotics, CGPA: 4.0/4.0 | Courses: Deep Learning, Roles: Teaching Assistant for RBE549: Computer Vision

Indian Institute of Technology Madras

Jul 2013 - Jun 2018

(B.Tech + M.Tech), Aerospace Engineering, CGPA: 8.41/10 | Courses: GPU Programming using CUDA

RESEARCH PUBLICATIONS

Pinnama Raju, R Singh, M Vel, N Sanket. "EdgeFlowNet: 100FPS@1W Dense Optical Flow For Tiny Mobile Robots", IEEE Robotics and Automation Letters (RA-L) [Accepted in Journal] [Project Page](#) | [Video](#)

- Designed quantizable multiscale deep optical flow network that can be deployed on edge devices like Google Coral TPU.

S Raju, A Kumar, R Mohan. "Aerial-Ground Robotic System for Terrain Estimation". ICC [Paper](#) | Gitlab: [Flight Stack](#) | [Ground_stack](#)

WORK EXPERIENCE

Quidient - Algorithms Team | Senior Algorithms Engineer- Computer Vision and Computer Graphics

May 2024 - Present

Large Specular SDF Estimation using Diffusion priors

- Working on fusing normal and depth priors for large specular SDF estimation using Physics Based Inverse Rendering (PBIR).

Differentiable Ray Tracing Engine for 3D reconstructions - [Backpropagation Algorithm](#), [Jacobian Notes](#)

- Developed a GPU accelerated differentiable particle ray tracing engine for explicit scene primitives using NVIDIA OptiX.
- Designed a flexible API allowing BVH construction for various radiance and surface representations like 3D gaussians, Dipoles.
- Attained real-time ray tracing performance of 3D Gaussians (150FPS) with accuracy matching the original 3DGS (23 PSNR on Tanks & Temples dataset).
- Enhanced the reconstruction accuracy of specular surface SDF by 5% PSNR using unbounded 3D gaussians ray tracer as faux light field emitter instead of slow, low frequency NeRF based MLPs.
- Implemented low-level CUDA kernels for differentiable backpropagation, incorporating hand-derived volumetric rendering for ray-particle intersection Jacobians.

Pose Estimation: Custom RGBD SLAM on iPhone and Plenoptic Pose Refinement

- Engineered SLAM module tailored for closed enclosures and object captures as a drop in replacement for ARKit and COLMAP.
- Reduced average specular 3D reconstruction time from 8 hours to 4 hours, while also improving the user guidance experience.
- Module runs on-device with low memory footprint (400MB of RAM) and high throughput (60FPS) at VGA resolution.
- Key technology features: pose graph optimization using ceres solver, KLT and ORB based feature tracking and a simple global descriptor based place recognition.
- Implemented a SOTA differentiable pose refinement based on focal pose parametrization and Camera Preconditioning module for SLAM captures. Refinement boosts reconstruction accuracy by 20% PSNR and effectively replaces COLMAP.

Torc Robotics - Road and Lane Team | Computer Vision and Deep Learning Co-op

Aug 2023 - Dec 2023

Baseline Shared Encoder Design

- Researched shared encoder designs unifying road segmentation and laneline detection for optimized resource allocation.
- Unified the data loaders, iteratively implemented designs compatible with ONNX format, deployed and profiled on Orin AGX.

Nokia Bell Labs | Perception and Localization Intern

May 2023 - Aug 2023

Structure Aided Visual Localization

- Built custom depth correction algorithms using Passive Stereo and ToF registration in textureless, repetitive settings.
- Created automated annotation pipeline to fine-tune YOLOv8 network using Segment Anything Model (SAM) and DINOv2.

Quantitative Brokers LLC | Senior C++ Software Developer

Jul 2020 - Aug 2022

Profiling, Instrumentation and Messaging Service

- Created a compile time controlled latency profiler tool using a shared ring buffer to benchmark the C++ program scopes.
- Developed a Pollable-SHM transport mechanism for freeing up busy-wait processes using unix socket handle sharing.
- Designed a light-weight multi-threaded message oriented middleware based on publish-subscribe model.
- Engineered a template-based code generator for nested C++, K and JSON messaging structures (de)serialization.
- Developed language agnostic messaging protocols using google protobuf for integrating statistical and visualization services.

EuroNext Market Data Handler

- Developed a low-latency single threaded C++ handler to fetch, parse and publish from **UDP** packets to messages.
 - Built **ring buffer** to handle out-of-sequence packets and transport Limit Order Book with **shared memory** IPC methods.
 - Created **shared libraries** and **plugins** to transform messages from C++ to K structures and store them in KDB.
-

SKILLS

Programming Languages : C++(11/14/17/20), Rust, Python, JavaScript, SHELL Scripting (BASH, ZSH)

Softwares and Frameworks : GDB, Valgrind, Nvidia Nsight, Pytorch, TensorFlow, CUDA, ROS, Git, OpenCV, MMCV, Docker, Blender

Deep Learning Architectures : ResNet, NeRF, RAFT, Transformers, VectorMapNet, DETR, 3DGRT, NeRO, TSDF Fusion

RELEVANT PROJECTS

STSU++ - Enhanced lane centerlines predictions with multi-view traffic scenes by **extracting BEV features** from **Vision Transformers** - [GitHub](#)

Structure From Motion (SfM) and NeRF - Simultaneously reconstructed 3D scene (Mapping) and extracted camera pose (Localization) from camera correspondences using (Non)Linear **triangulation**, (Non)Linear **PnP** and Bundle Adjustment (**BA**) pipeline - [GitHub](#)

Stereo Visual Inertial Odometry (VIO) - Implemented process model and measurement model components in Multi State Constrained Kalman Filter (MSCKF) based stereo visual inertial odometry - [GitHub](#)

Auto Pano - Created a **panorama** by stitching images using homography estimated from traditional (**ANMS**, **RANSAC** feature points) and Deep learning (Supervised and Unsupervised **HomographyNet**) methods - [GitHub](#)

Auto Calib - Implemented Zhang's camera calibration by **nonlinear optimization** of intrinsics and extrinsics - [GitHub](#)

Painting LIDAR Cloud - Built 3D **semantic** point cloud map with predicted camera semantic labels using ICP and point painting - [GitHub](#)

MENTORSHIP

xFeatSLAM - Provided guidance in integrating latest xFeat feature descriptor into ORBSLAM3 - [GitHub](#)