P Sai Ramana Kiran

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Senior C++ Engineer with domain skills in Computer Vision, Deep Learning, Robot Perception, Sensor Fusion, Localization, Mapping

EDUCATION

Worcester Polytechnic Institute Aug 2022 - Present

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**

PUBLICATIONS

S Raju, R Singh, M Vel, N Sanket. "**EdgeFlowNet: 100FPS@1W Dense Optical Flow For Tiny Mobile Robots"**, IEEE Robotics and Automation Letters (**RA-L**) : Designed **quantizable multiscale deep** optical flow network [Under Review] Video

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

WORK EXPERIENCE

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

- Investigated 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 **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

Quantitative Brokers LLC | **C++** Software Developer Jul 2018 - Jul 2020

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 **L**imit **O**rder **B**ook with **shared memory** IPC methods
- Created **shared libraries** and **plugins** to transform messages from C++ to K structures and store in KDB

Honeywell Technology Solutions - Advanced Technology Group | Research Intern May 2017 - Jul 2017

Green House Inspection - Sensor Fusion Localization Package - GitHub

- Developed sensor fusion module for heterogeneous **proprioceptive** asynchronous sensor sources using **sequential EKF**

SKILLS

Programming Languages : C++(11/14/17/20), Rust, Python, JavaScript, Shell Scripting (BASH, ZSH)
Softwares and Frameworks : GDB, Valgrind, Pytorch, TensorFlow, CUDA, ROS, Git, Gazebo, OpenCV, MMCV, Docker, Blender
Deep Learning Architectures : VGG16, ResNet, DenseNet, NeRF, RAFT, Transformers, VectorMapNet, DETR

RELEVANT PROJECTS

Structure From Motion (SfM) and NeRF - Simultaneously reconstructed 3D scene (**M**apping) and extracted camera pose (**L**ocalization) 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 **M**ulti **S**tate **C**onstrained **K**alman **F**ilter (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

Parallelizing RRT with CUDA - Parallelized **collision checker** module of RRT motion planner and demonstrated 10x speedup - GitLab

STSU++ - Enhanced lane centerlines preds with multi-view traffic scenes by extracting BEV features from **Vision Transformers** - GitHub

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