

# P Sai Ramana Kiran

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Domain skills: Computer Vision, Deep Learning, Robot Perception, Sensor Fusion, Localization, Mapping, Motion Planning

## 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**

Jul 2013 - Jun 2018

### Indian Institute of Technology Madras

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

## SKILLS

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

**Softwares and Frameworks** : GDB, Valgrind, Pytorch, TensorFlow, CUDA, ROS, Git, Gazebo, OpenCV, MMCV, Docker, Gtests, Blender

**Deep Learning Architectures** : VGG16, ResNet, DenseNet, NeRF, RAFT, Transformers, VectorMapNet, DETR

## WORK EXPERIENCE

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

Aug 2023 - Dec 2023

#### Baseline Shared Encoder Design

- Researched on **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

- Engineered an **end-to-end** localization **drift correction pipeline** in a warehouse environment using structural elements as cues.
- Investigated **custom** depth correction algorithms using Passive **Stereo** and **ToF** registration in textureless, repetitive environment
- Created an **automated annotation** pipeline for **fine-tuning** YOLOv8 network using Segment Anything Model (**SAM**) and **DINOv2**

### Perception and Autonomous Robotics (PeAR) | Research Assistant

Jan 2023 - Present

#### EdgeFlowNet: 100FPS @ 1W High Speed Optical Flow For Autonomous Drone Navigation | Under Preparation for RA-L

- Designed a **quantization** compatible **multi scale optical flow** network which gives inferences at **100FPS** with **3px EPE**
- Demonstrated the effectiveness of speed ups in autonomous drone navigation in static, dynamic and flying through gap scenarios

### Quantitative Brokers LLC | Senior C++ Software Developer

Jul 2020 - Aug 2022

#### Profiling and Instrumentation

- 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**

#### Messaging Service

- Designed a light-weight **multi-threaded** message oriented **middleware** based on **publish-subscribe** model
- Built a template driven **code generator** for (de)serialization of nested messaging structures across JSON, C++ and K objects
- Developed **language neutral 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 a **ring buffer** to handle out of sequence packets and transport Central Limit Order Book using **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**

## RELEVANT PROJECTS

**Structure From Motion (SfM)** - Simultaneously reconstructed 3D scene (**Mapping**) and extracted camera pose (**Localization**) from given 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](#)

**Parallelizing RRT using CUDA** - Parallelized collision checker module of RRT path planner and demonstrated 10x speedup - [GitLab](#)

**Multi Agent Collaborative Navigation** - Master's Thesis Project | [ICC Conference Paper](#) | [GitLab Flight Stack](#) | [GitLab Ground stack](#)  
- Designed software pipeline for collaborative navigation of **aerial-ground robotic system**

**Autonomous Ground Vehicle** - *Intelligent Ground Vehicle Competition 2017, Michigan* - [GitLab Technical Report](#)

- Engineered AGV which can **detect lanes**, **avoid obstacles** using **bezier pure pursuit controller** whilst following GPS waypoints