

# 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 - May 2024

M.Sc. Robotics, CGPA: 4.0/4.0 | Courses: Computer Vision, Vision based Manipulation, Directed Research

### Indian Institute of Technology Madras

Jul 2013 - Jun 2018

Dual Degree(B.Tech + M.Tech), Aerospace Engineering, CGPA: 8.41/10

Courses: GPU Programming, Mechanics and Control of Robotics Manipulators, Adaptive and optimal Control

## SKILLS

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

**Softwares and Frameworks** : GDB, Valgrind, Pytorch, TensorFlow, CUDA, ROS1&2, Git, Gazebo, POSIX, Docker, Gtest, GProtobuf

**Deep Learning Architectures** : VGG16, ResNet, DenseNet, HomographNet, NeRF, RAFT, SpyNet, Transformers, LSTM

## WORK EXPERIENCE

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

Aug 2022 - Present

Deep Optical Flow Estimation on TPU | Guide Dr. Nitin Sanket

- Investigating on speed and accuracy trade-off of various implementations of **optical flow** deep learning architectures on **TPU**

### 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 scalable 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

- Developed a **configurable** sensor fusion module and ROS wrapper for **proprioceptive** sources using Extended Kalman Filter
- Handled **asynchronous** measurements and **heterogeneous** sensor sources using a sequential EKF model

## RELEVANT PROJECTS

**Structure From Motion** - 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](#)

**Face Swap** - Swapped faces in videos using traditional Delaunay **Triangulation** and Thin Plate Splines(TPS) methods and applied Kalman motion Filtering for smoothness - [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](#)

**Edge Detection** - Detected edges in image using simplified probability based boundary detection using K-means clustering of Oriented DoG (**ODOG**), Leung-Malik (**LM**) and **Gabor** Filter bank responses - [GitHub](#)

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

**Active Vision Grasping** - Developed an architecture to move the camera, stitch point clouds and identify good grasps - [GitHub](#)

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

**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**
- Implemented a module to store and transport **ORB feature** descriptors and **elevation occupancy grid** maps
- Generated **terrain estimation filters** to determine navigable region for ground vehicle using elevation maps

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

- Engineered software for AGV capable of **lane detection**, obstacle avoidance and GPS way point navigation
- Illustrated **pure pursuit guidance controller** with **bezier** landing curve for path following
- Conceptualized architecture to integrate exteroceptive sensor's **point clouds** for generating **2D occupancy grid** cost maps