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 **C**entral **L**imit **O**rder **B**ook 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 **E**xtended **K**alman **F**ilter
● Handled **asynchronous** measurements and **heterogeneous** sensor sources using a sequential EKF model

RELEVANT PROJECTS

Point Cloud Semantic Mapping - Built a **map** from **raw** LiDAR **point cloud** and transferred the predicted **semantic** labels from camera RGB images using **point painting** technique onto the LiDAR's **3D** point cloud - *GitHub*

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 **T**hin **P**late **S**plines(TPS) methods and applied **K**alman motion **F**iltering 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*

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**
  - 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 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