Durga Prakash Karuppannan

Email: dkaruppannan@wpi.edu

Linkedin Github Personal Website

Location: Fremont, CA | **Phone**: +1 (774) 701-8281

EDUCATION

Worcester Polytechnic Institute — Worcester, MA
Master of Science - Robotics Engineering, GPA 4.0/4.0 — Aug 2021 - May 2023

National Institute of Technology Tiruchirappalli — Tiruchirappalli, India
Bachelor of Technology - Mechanical Engineering, GPA 7.73/10.00 — Aug 2014 - May 2018

COURSEWORK AND SKILLS

Coursework : Deep Learning, Artificial Intelligence, Computer Vision, AI for AV, Motion Planning, Robot Dynamics

Languages and OS : C, C++, Python, MATLAB, Linux

Softwares and Tools : Docker, ROS1, ROS2, Unity, Gazebo, Git

Libraries and Frameworks : TensorFlow, PyTorch, TensorRT, Keras, Numpy, OpenCV, SkLearn, Pandas, Matplotlib, PCL

Hardwares and Sensors : NVIDIA Xavier NX, Intel Realsense, OAK-D-Lite, LIDAR, IMU, UART

EXPERIENCE

Robotics Software Intern: July '22 - Dec '22
Addverb Technologies USA *Fremont, CA*

- Designed real-time collision avoidance mobile robot with TensorRT optimized Yolov7 and StrongSORT Pedestrian Tracking
- Deployed AMR and configured sensors, and network in the client warehouses for autonomous package pickup and drop
- Integrated ROS2 navigation stack in addition to elbrus visual SLAM with realsense using ISAAC GPU accelerator
- Built an AMR autonomous navigation and SLAM stack on Nvidia Xavier NX with lidar and Realsense d435 camera
- Analyzed performances of the Rtabmap and NVIDIA Visual Odometry with Wheel encoder odometry
- Worked on Sensor Fusion of visual odometry, IMU and wheel encoder using Extended Kalman Filter (EKF) for pose
- Deployed Apriltag and Reflective Marker based Localization for charger docking of Autonomous Mobile Robot (AMR)

Graduate Researcher: Nov '22 - Present
Vision, Intelligence, and System Laboratory (VISLab) *Worcester, MA*

- Analyzing DL based keypoint detectors based on metrics including reliability and Geometric Registration.
- Developing Common output DL models for Keypoint detectors and training with KITTI dataset

Occupant Safety CAE Software Engineer - Sub Local Technical Lead: Aug '18 - Aug '21
Renault Nissan Technology and Business Centre India *Chennai, India*

- Deployed and validated python automation scripts for model setups and cut down processing time by 30%
- Reviewed and enhanced quality of global projects, trained recruits, prepared guidelines and cascaded updates
- Conducted state of the art FEA methods for full vehicle crash analysis and improved safety performance

PROJECTS

Multi-Task model for Segmentation and Depth : Feb '22 - Apr '22

- Engineered MobileNet encoder and RefineNet decoder with pre-trained weights on Cityscape and NYUD dataset
- Integrated proposal free instance segmentation using discriminative loss and found optimal hyperparameters
- Achieved 0.43 mean Intersection of Union (mIoU) for segmentation and 0.2 RMSE for depth estimation

Real-Time Koala Bear Detection and Tracking: Oct '21 - Dec '21

- Developed detection model using Histogram Of Gradients feature descriptor and SVM classifier with 95% accuracy
- Built Object Detection model using YOLOv3 with bounding boxes of confidence scores more than 0.7 on custom dataset
- Performed Pose Estimation and Tracking of Koala Bear using SLEAP deep learning framework

Motion Prediction for Autonomous Vehicle with Lyft Dataset: Sep '21 - Dec '21

- Constructed two variants of Convolutional Neural Network (CNN) for motion prediction using Lyft Level5 Dataset
- Devised fully connected convolutional layer from scratch and fine tuned EfficientNet-b0 on ImageNet dataset
- Attained best kaggle score 91.9 for mean pooling out of 3 ensembles namely concatenation, weight and mean pooling

Motion Planning of Self Driving car with Reinforcement Learning : Sep '21 - Dec '21

- Utilized Policy Proximal Optimization (PPO) reinforcement learning method with imitation loss based reward
- Rendered trajectory from group normalized CNN and stable baselines Policy network with Gym environment
- Obtained optimal trajectories of ego vehicle with 19.97 Average Displacement Error(ADE) metric

Dynamic Collision Avoidance of custom Mobile robot in Unity : Feb '22 - Apr '22

- Implemented Simultaneous Localization and Mapping (SLAM) for generating Hospital Map using ROS gmapping
- Designed optimal path planning using A star global planner with ROS Navigation stack and sensors for Perception
- Formulated local planners with Time Elastic Band, Dynamic Window Approach and Model Predictive Control(MPC)
- Simulations of MPC took 54% less time compared to Velocity Obstacle and 82% compared to Artificial Potential Field