Durga Prakash Karuppannan

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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, Motion Planning, Robot Dynamics
- **Languages**: C/C++, Python, MATLAB
- **Skills**: TensorFlow, PyTorch, keras, Numpy, OpenCV, Gym, SkLearn, Pandas, Git, Matplotlib, ROS, Unity, Gazebo

Experience

- **Graduate Research Assistant**: *May '22 - Present*
  VISLab, WPI - Advisor: Dr. Zhiming zhang
  - Working on creation of point cloud feature detector and descriptor for effective point cloud registration
  - Implementing graph neural network to use descriptors for feature matching for robust SLAM & reconstruction
- **Occupant Safety CAE Automation Engineer - Sub Local Technical Lead** : *Aug '18 - Aug '21*
  Renault Nissan Technology and Business Centre 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
  - Designed state of the art FEA methods for full vehicle crash analysis and improved safety performance

Projects

- **Multi-Task model for Semantic, Instance Segmentation & Depth** (*PyTorch | Python*): *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** (*Python | OpenCV | Scikit − Learn*): *Oct '21 - Dec '21*
  - Built detection model using Histogram Of Gradients feature descriptor and SVM classifier with 95% accuracy
  - Modeled detection 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** (*Pytorch| Python*): *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 Efficient-b0 on ImageNet dataset
  - Attained best kaggle score 91.9 for mean pooling out of 3 ensembles - concatenation, weight and mean pooling
- **Motion Planning of Self Driving car with Reinforcement Learning** (*Python| pytorch*): *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 optimized trajectories of ego vehicle with 19.97 Average Displacement Error(ADE) metric
- **Classification for Fashion MNIST from scratch** (*Numpy | Python*): *Feb '22 - Apr '22*
  - Created neural network and backpropagation with stochastic gradient descent and regularized cross entropy cost
  - Attained 87.75% test accuracy by optimizing the crucial hyperparameters on validation set using grid search
  - Performed Principal Component Analysis(PCA) to reduce parameters and plot 3D cross entropy loss vs parameters
- **Collision Avoidance of custom Mobile robot in Unity** (*Python| Unity | ROS*): *Feb '22 - Apr '22*
  - Implemented Simultaneous Localization and Mapping (SLAM) for generating Hospital Map using ROS gmapping
  - Achieved optimized path planning using A* 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)
- **Implementation of Standard and Advanced Path Planning Algorithms** (*Python*): *Jan '22 - Apr '22*
  - Incorporated BFS, DFS, Dijkstra and A* algorithms to find path from start to goal in custom generated maps
  - Programmed RRT, RRT*, Informed RRT* and PRM with random, uniform, gaussian and bridge sampling methods
  - Implemented D* algorithm to plan path in changing environment with process state and modify cost functions