Santhosh Sankar

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EDUCATION

Master of Science in Robotics May 2023
Northeastern University, Boston, MA **CGPA:** 3.838
Coursework: Deep Learning, Reinforcement Learning and Sequential Decision Making, Pattern Recognition and Computer Vision, Mobile Robotics, Robot Sensing and Navigation, Robot Science and Systems

Bachelor of Engineering in Mechanical Engineering May 2020
Anna University, Chennai, India

TECHNICAL SKILLS

Programming Languages: C++, Python, MATLAB
Machine Learning Frameworks: TensorFlow, Keras, PyTorch
Parallel Programming: CUDA, OpenMP
Software Libraries: OpenCV, PCL, numpy, pandas, matplotlib, scipy, scikit-learn
Software Tools and Operating Systems: Nsight Systems, ROS, Git, Docker, Windows, Linux

PROJECTS

Parallel Image Processing with CUDA May 2023 - Jun 2023
- Developed baseline sequential code with OpenCV in C++ for processing input images and live video feed with Gaussian, Sobel, magnitude, quantization and cartoonization filters.
- Parallelized filtering operations with CUDA and profiled code with Nsight Systems, optimizing memory access and reducing execution time by 75% from baseline implementation.

Siamese networks with attention for large-scale landmark retrieval Mar 2023 - Apr 2023
- Augmented Google Landmark Dataset v2 by eliminating missing landmarks, revising labels, and developing a dynamic process to generate a fresh set of landmark pairs for each training epoch.
- Designed and implemented Siamese networks in TensorFlow, pairing ResNet-101 with four attention mechanisms (Spatial, Channel, CBAM, SE) as subnetworks and evaluated them on the Revisited Oxford and Paris datasets.
- Trained the Siamese models using high-performance GPU clusters, with the SE attention module subnet yielding the highest mAP increase of 9.46% relative to the baseline landmark classifier.
- Experimented with ensemble models as subnetworks, with the combination of SE, CBAM, and Spatial attention models performing the best, with an additional 4.4% increase in mAP.

German to English translator using Transformers Feb 2023 - Mar 2023
- Implemented a Transformer-based sequence-to-sequence model for machine translation between German and English using PyTorch with a custom multi-headed attention module for the encoder and decoder.
- Utilized the Multi30k dataset for training and validation, and implemented data preprocessing functions for creating attention masks and padding sequences to optimize the model's performance.

Pedestrian Tracker and Counter using Yolov3 and DeepSORT Oct 2022 - Dec 2022
- Constructed YOLOv3 with TensorFlow utilizing the Darknet-53 architecture, incorporating pre-trained COCO dataset weights to significantly enhance pedestrian detection in tracking applications.
- Implemented DeepSORT algorithm for pedestrian tracking and counting using Kalman Filters, Hungarian Algorithm with Yolov3 as the object detector and visualized the pedestrian paths over 50 frames.
- Evaluated DeepSORT with YOLOv3 and Faster RCNN on MOT16 Benchmark, attaining 6% higher MOTA, 3% higher MOTP, and 2% higher HOTA scores using YOLOv3 over Faster RCNN.

Performance Comparison of RL Algorithms in Super Mario Bros Oct 2022 - Dec 2022
- Trained deep reinforcement learning(RL) agents using DQN, DDQN, and PPO using PyTorch and increased success rates by 1% and 30% for DDQN and PPO agents, respectively, compared to DQN.
- Optimized efficiency for DDQN and PPO agents by increasing average returns by 2.4% and 22.7% and decreasing average steps per episode by 4.1% and 34.9%, respectively, compared to the DQN model.