

Santhosh Sankar

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EDUCATION

Master of Science in Robotics

Northeastern University, Boston, MA

May 2023

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

Anna University, Chennai, India

May 2020

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

Chatbot using sequence to sequence Transformer

July 2023 - Present

- Built a sequence to sequence Transformer based chatbot with a custom multi-head attention module from scratch using TensorFlow for natural language processing and generation.
- Currently training the chatbot using TPUs offered by Kaggle on the large Cornell movie dialog corpus, containing 220,579 conversational exchanges, and aiming to achieve a high BLEU score.

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 (GLDv2) 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.
- Trained the Siamese models on a high-performance GPU cluster and evaluated them on the Revisited Oxford and Paris datasets, with the subnetwork utilizing SE attention module 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.

Pedestrian tracker and counter using YOLOv3 and DeepSORT

Oct 2022 - Dec 2022

- Constructed YOLOv3 with TensorFlow utilizing the Darknet-53 architecture, incorporating weights pre-trained on the COCO dataset to significantly enhance pedestrian detection in tracking applications.
- Integrated the YOLOv3 object detector with the DeepSORT algorithm for pedestrian tracking and counting and visualized the pedestrian paths over the most recent 50 frames.
- Evaluated DeepSORT with YOLOv3 and Faster RCNN on MOT16 benchmark, with YOLOv3 attaining 6% higher MOTA, 3% higher MOTP, and 2% higher HOTA scores over Faster RCNN.

Performance comparison of RL algorithms in Super Mario Bros

Oct 2022 - Dec 2022

- Developed and trained DQN, DDQN, and PPO deep reinforcement learning agents to complete one level of Super Mario Bros using PyTorch and assessed the performance of the agents.
- Achieved 1% and 30% higher success rate, 2.4% and 22.7% higher average returns, and 4.1% and 34.9% lower average steps per episode with DDQN and PPO agents, respectively, over the DQN agent.