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 and Parallel Programming: TensorFlow, Keras, PyTorch, 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 - August 2023
- Designed and implemented an end-to-end chatbot based on sequence-to-sequence Transformer with TensorFlow and a data preprocessing pipeline to extract and process the chat data for efficient training.
- Trained the model using Kaggle TPUs on Cornell movie dialog corpus with over 200,000 conversational exchanges and improved BLEU score by 3% with word tokenizer and significant hyperparameter tuning.

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.
- Accelerated filtering operations with CUDA and profiled code with Nsight Systems, optimizing memory access and reducing execution time by at least 75% from baseline implementation.

Siamese networks with attention for large-scale landmark retrieval Mar 2023 - Apr 2023
- Devised a data preprocessing pipeline that yielded new landmark pairs and similarity scores from 1.6 million images in the Google Landmark Dataset (GLDv2) while training to prevent overfitting.
- Designed and trained Siamese networks in TensorFlow on GPU cluster, pairing ResNet-101 with spatial, channel, CBAM, and SE attention modules as subnetworks to retrieve images similar to a given image.
- Achieved 9.46% higher mAP than the baseline classifier with the SE module and improved the mAP further by 4.4% with an ensemble of spatial, SE, and CBAM attention modules.

German to English translator using Transformer Feb 2023 - Mar 2023
- Built a Transformer-based sequence-to-sequence model to perform machine translation from German to English using PyTorch, with a custom module to compute multi-head attention.
- Trained and assessed the Transformer model on the Multi30k dataset with over 30,000 German translations of English descriptions, achieving a high BLEU score of 78% on the validation dataset.

Pedestrian tracker and counter using YOLOv3 and DeepSORT Oct 2022 - Dec 2022
- Constructed YOLOv3 with TensorFlow utilizing the Darknet-53 architecture to perform pedestrian detection on video frames and incorporated weights pre-trained on the COCO dataset.
- 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 with a Python script.
- 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 over 1000 episodes.
- Achieved 1% and 30% higher success rate, 2.4% and 22.7% higher average returns, and 4.1% and 34.9% lower mean steps per episode with DDQN and PPO agents, respectively, over the DQN agent.