UNIVERSITY OF SOUTH FLORIDA

Defense of a Master's Thesis

Edge Computing for Deep Learning-Based Distributed Real-time Object Detection on IoT Constrained Platforms at Low Frame Rate

by

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For the MSCP degree in Computer Engineering

As the era of IoT (Internet of Things) and Edge Computing emerges, there is a demand for real-time applications in the field of computer vision. Implementing IoT with neural networks for image and video recognition has shown promising performance when deployed in complex environments. There is an emerging demand for applications that require data computation in real-time with low latency. In an effort to address these issues, while keeping in mind the limited computing capabilities of IoT edge devices, we seek to develop a framework for efficient object detection on a distributed constrained platform system. In this thesis, a scalable and adaptable network for fast and easy convolutional neural network prototyping on a local cluster of Xilinx PYNQ nodes has been proposed. We used PYNQ Z1 AP-SoC (All Programmable System-on-Chip) as the platform and integrated state-of-the-art algorithms for object detection and classification. The distributed architecture is robust and exploits the heterogeneous computing capability of the PYNQ platform. The proposed work is on a wireless distributed network with low latency. Our framework runs at 0.43 frames per second with Tinier YOLO (You Only Look Once) object detection algorithm. The frame rate increases approximately linearly with the number of nodes in the network. The latency added by the communication can be offset by the scalability offered by the distributed network.

Thursday, June 25, 2020
3:00 PM
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