The Center for Cyber Defenders
Expanding Computer Security Knowledge

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Sasquatch

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Problem Statement:
There is a demand for computer vision applications on a variety of devices and architectures. Such applications benefit from device-agnostic frameworks that make it easy to train and use neural networks and utilize parallel-processing hardware (Graphics Processing Unit - GPUs). Our work provides such a framework.

Objective:
- Port open-source deep learning framework Caffe to OpenCL
- Improve the performance of a computer vision application running on a mobile device

Approach:
Port
- Convert the existing Compute Unified Device Architecture (CUDA) implementation of Caffe to OpenCL

Test
- Unit test Caffe layers
- Thoroughly test the new framework by generating and training networks
- Ensures the ported library produces the same results as the CUDA version

Optimize
- Add optimizations to the OpenCL implementation
- Test again

Deploy
- Modify an existing computer vision mobile application to use the ported framework
- Measure the performance of the modified application

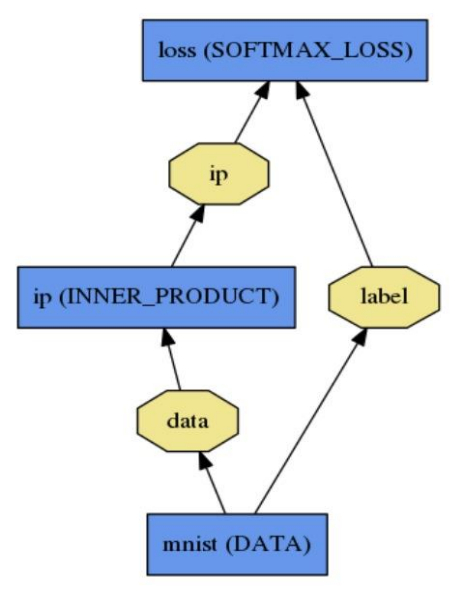

Figure 1: Example of a Caffe neural network structure [1]

Results:
- The framework was successfully ported to OpenCL
- Able to run on OpenCL-supported GPUs to speed up training and prediction

Impact and Benefits:
- The converted OpenCL implementation allows us to use the Caffe deep learning framework on any OpenCL-capable devices and many different architectures
- Large volume of matrix algebra required for deep learning/neural network computation can be sped up with an OpenCL-supported GPU

[1] Caffe.berkeleyvision.org, 'Caffe | Blobs, Layers, and Nets', 2015. [Online]. Available: http://caffe.berkeleyvision.org/tutorial/net_layer_blob.html. [Accessed: 09- Jul- 2015].

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