EE454 Project Phase 3 Report
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Performance Comparison:

Using the waveform on ModelSim, we observed that our FPGA calculated the entire convolutional layer in only 1 cycle, but required 1 more cycle to read or utilize the calculated values. We used a 50MHz clock when running on the FPGA. This means that it would take 20ns to calculate and prepare the values from the Convolutional Layer.

Using the <chrono> library in our CUDA code, we found that the entire convolutional layer was calculated in 154,506 μs, or 154,506,000ns. This makes our FPGA several orders of magnitude faster than our GPU implementation.

CUDA Validation:

Several different elements of the output matrix ("o_featuremap") were tested given the input featuremap ("i_featuremap") and kernel ("kernel"), and each one had the correct calculated result.

FPGA Validation:

Display statements throughout the convolution module indicated intermediate and final sums. We modified the input image and kernel provided by the testbench several times, and manually verified the results, to ensure the convolution was being performed correctly. Finally, we verified that the waveform matched what was expected.