GPU-Accelerated Deep Convolutional Neural Network for Object Recognition

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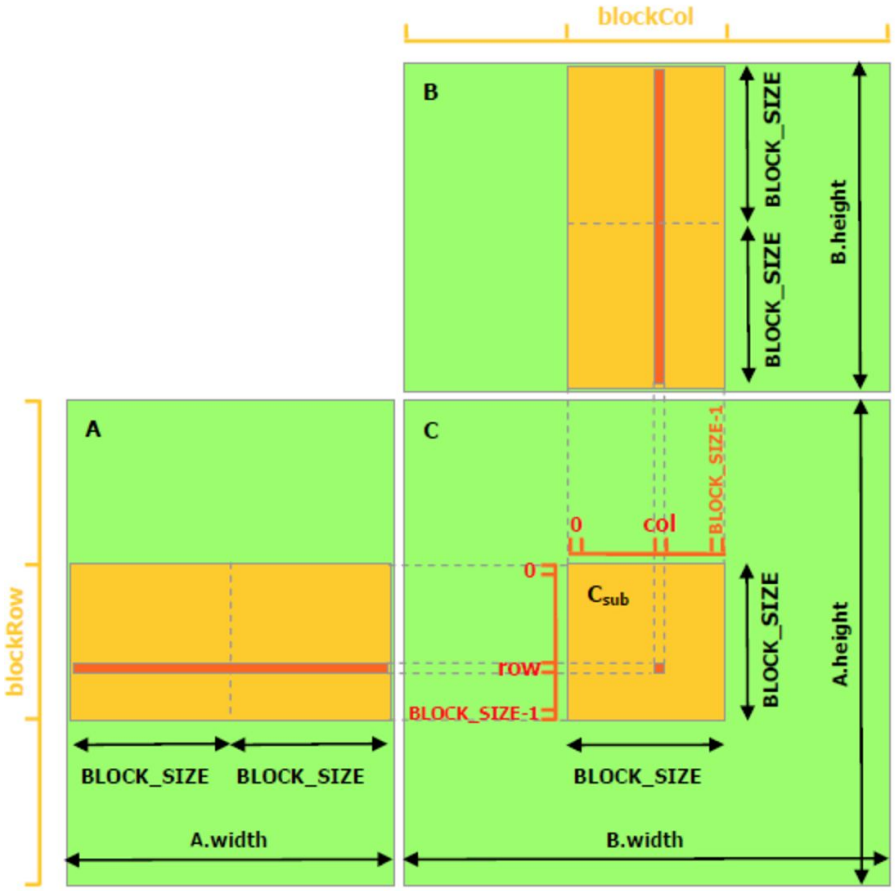
Goal for this week

Continue working on optimization

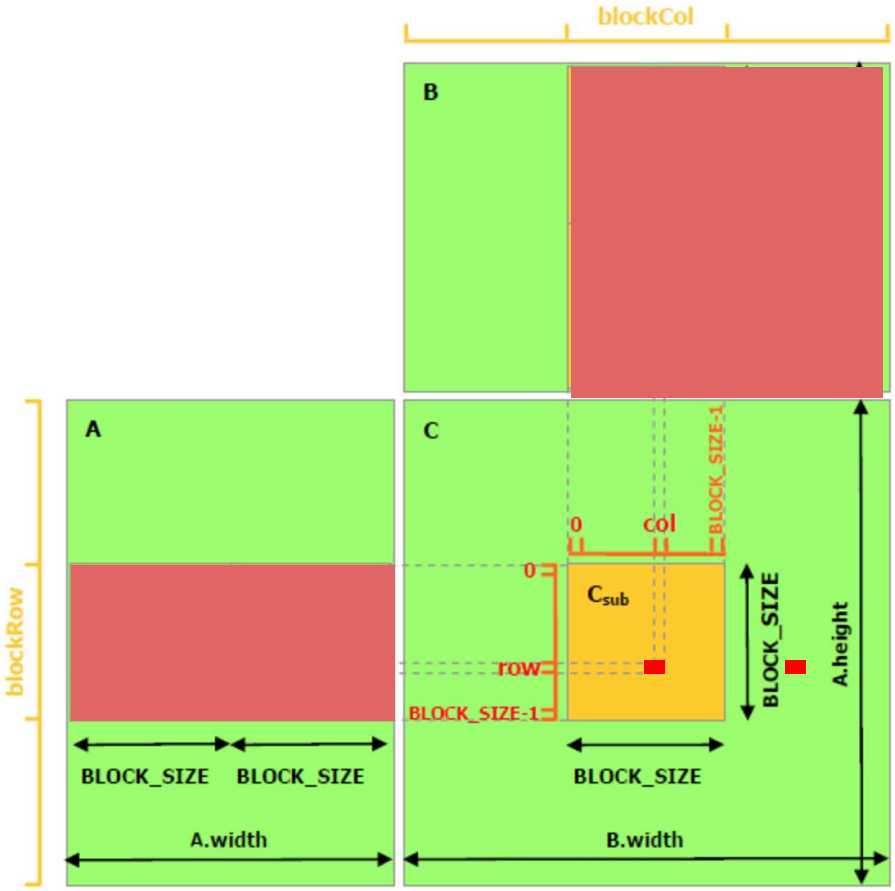
Run test on larger dataset

Matrix Multiplication Optimization



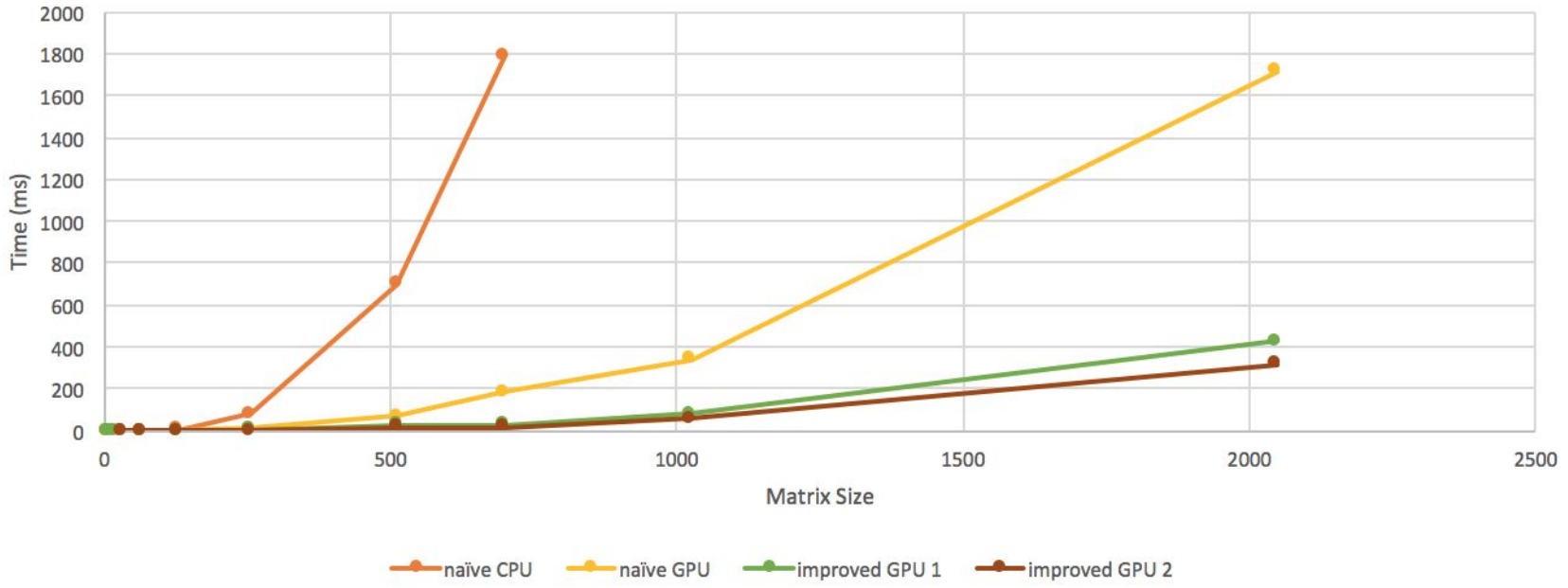
Each element is read N/Block_size times from global memory.
Threads access elements form faster shared memory.

Matrix Multiplication Optimization



Each block stores more elements in the shared memory, so each thread can compute two elements. Number of threads is reduced to half!

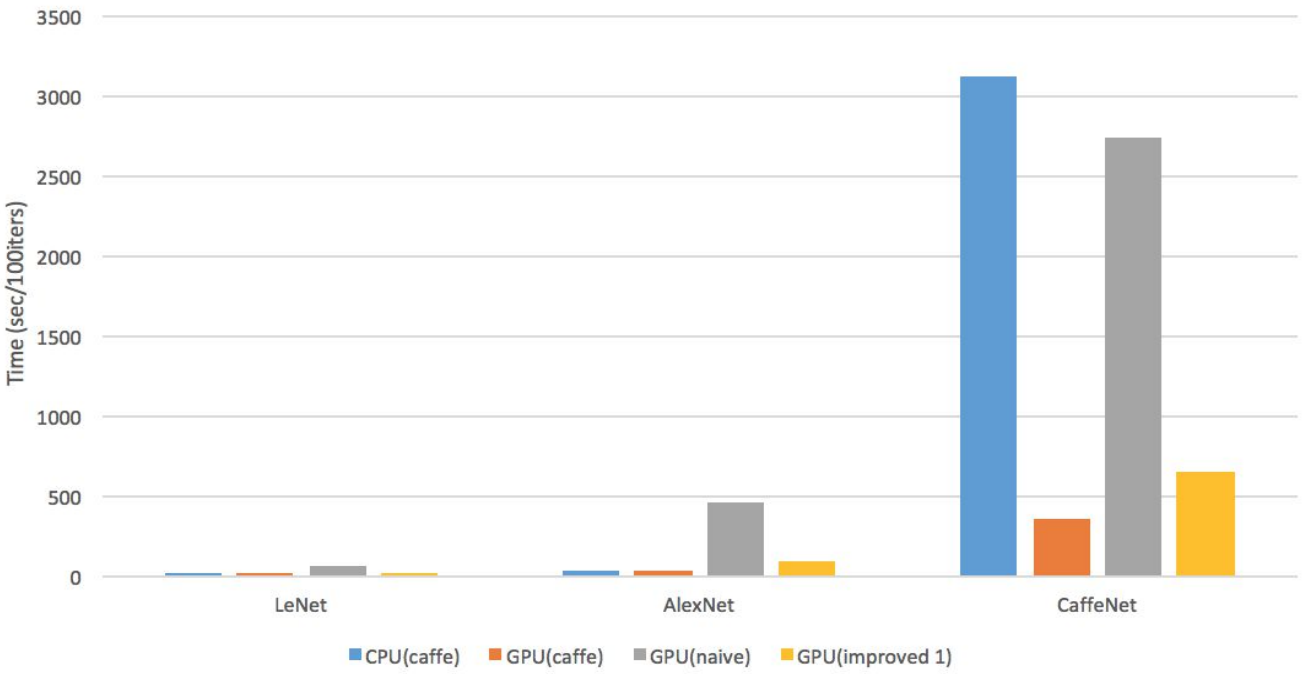
Results after Optimization



	4	8	16	32	64	128	256	512	1024	2048
naïve CPU	0.0030	0.0050	0.0240	0.1690	0.8350	7.2370	80.2250	698.8210	13206.3710	151433.4680
naïve GPU	0.0370	0.0630	0.0578	0.0412	0.1948	1.0418	8.5202	66.1688	340.0051	1714.5858
improved GPU 1	0.0314	0.0407	0.0291	0.0385	0.0769	0.3827	4.3128	25.8006	78.8657	429.3831
improved GPU 2				0.0415	0.0782	0.3212	2.4473	16.8405	56.2364	317.9467

(ms)

Performance

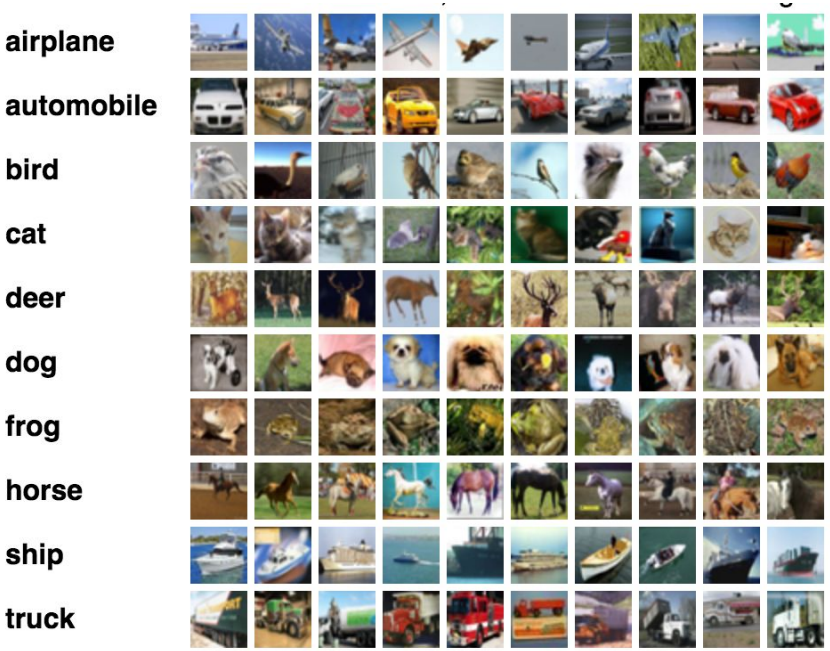


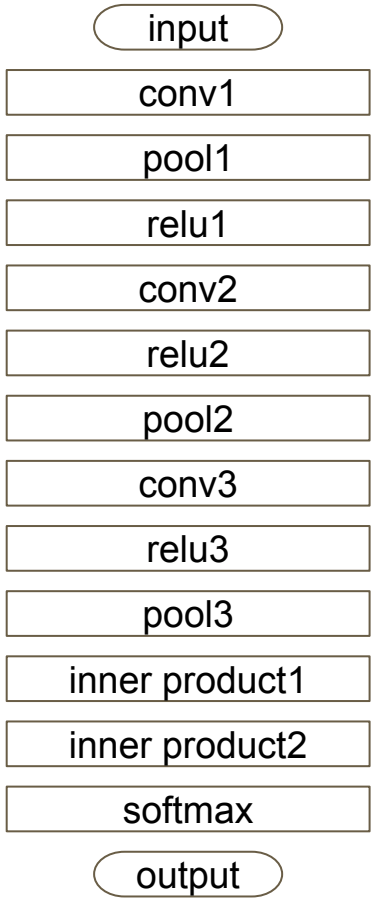
	LeNet	AlexNet	CaffeNet
CPU(caffe)	6.11	42.89	3119.48
GPU(caffe)	6.89	30.67	365.7
GPU(naive)	64.78	456.11	2742.8
GPU(improved 1)	15.82	89.06	653.04

(seconds/100 training iters)

Object Recognition

The CIFAR-10 dataset






```
I1207 17:07:34.491516 2071388928 solver.cpp:320] Iteration 5000, loss = 0.481036
I1207 17:07:34.491554 2071388928 solver.cpp:340] Iteration 5000, Testing net (#0)
I1207 17:07:44.542856 2071388928 solver.cpp:408]     Test net output #0: accuracy = 0.7621
I1207 17:07:44.542901 2071388928 solver.cpp:408]     Test net output #1: loss = 0.722371 (* 1 = 0.722371 loss)
I1207 17:07:44.542912 2071388928 solver.cpp:325] Optimization Done.
I1207 17:07:44.542920 2071388928 caffe.cpp:215] Optimization Done.
```

Accuracy = 76.21%

Final Results

- CUDA implementation of 5 neural network layers under Caffe framework
- A trained deep CNN model for object recognition
- Performance Analysis
- Optimized matrix multiplication

Thanks!