High-Performance Computing with GPUs

Project: Deliverable #01

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Execution Time

```
bscs-22i-0977@FHPC:~/Project/src$ make
./nn.exe
MNIST Neural Network

Epoch 1 - Loss: 0.2659 - Train Accuracy: 91.89% - Time: 7.407s
Epoch 2 - Loss: 0.1053 - Train Accuracy: 96.80% - Time: 7.412s
Epoch 3 - Loss: 0.0714 - Train Accuracy: 97.89% - Time: 7.384s
Total training time: 22.203s
Test Accuracy: 96.56%
bscs-22i-0977@FHPC:~/Project/src$
```

Execution Number	Time
1	21.869
2	22.092
3	22.234
4	22.283

Average Execution Time: **22.1195s**

Profiling using GPROF

This is done after the makefile is updated to include a profile to be generated after the code is run.

```
Flat profile:

Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls  s/call   s/call  name
 64.72    14.60     14.60   190000    0.00     0.00  forward
 34.84    22.46      7.86   180000    0.00     0.00  backward
  0.35    22.54      0.08        2    0.04     0.04  loadMNISTImages
  0.09    22.56      0.02                              _init
  0.00    22.56      0.00        2    0.00     0.00  loadMNISTLabels
  0.00    22.56      0.00        1    0.00     0.00  createNetwork
  0.00    22.56      0.00        1    0.00     0.77  evaluate
  0.00    22.56      0.00        1    0.00     0.00  freeNetwork
  0.00    22.56      0.00        1    0.00    21.69  train
```

Using gmon.out, a call graph can be generated.

This indicates that most of the computation takes place inside the forward and backward propagation functions.