High Performance Computing with GPUs
Neural Network Acceleration
Deliverable 1 : Github Repo

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Execution Time of Baseline Application

```
./nn.exe
MNIST Neural Network

Epoch 1 - Loss: 0.2671 - Train Accuracy: 91.88% - Time: 14.116s
Epoch 2 - Loss: 0.1070 - Train Accuracy: 96.84% - Time: 14.139s
Epoch 3 - Loss: 0.0744 - Train Accuracy: 97.80% - Time: 14.136s
Total training time: 42.391s
Test Accuracy: 97.15%
gprof -b nn.exe gmon.out > profile_results.txt
```

Gprof Profile

Flat Profile:
Total execution time: 43.851 seconds.

	Functions	Time (%)	Run time (12.45s)	Calls
Most Expensive	forward()	61.45%	(26.946s)	190,000
Secondary	backward()	36.06%	(15.812s)	180,000
Negligible	loadMNISTLabels, createNetwork, evaluate, freeNetwork	2.01%	(0.88s)	Not more than twice
Most time taking overall	train()	0.16%	(43.081s total)	once

- ➔ forward() and backward() dominate execution time.
- ➔ train() is the most time-intensive function, consuming 94.4% of total execution.
- ➔ train: 11.74s, calls forward (190,000 times) and backward (180,000 times).