

Project Report

Team Members:

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Execution Time of the Baseline Application

The execution time of the baseline application was measured using the `time` command. The results are as follows:

Total Training time: 22.301s

```
bscs-22i-1094@FHP:~/cuda_projects/Project/src$ make
gcc -Wall -O2 -o nn.exe nn.c -lm
./nn.exe
MNIST Neural Network

Epoch 1 - Loss: 0.2672 - Train Accuracy: 91.91% - Time: 7.509s
Epoch 2 - Loss: 0.1039 - Train Accuracy: 96.89% - Time: 7.399s
Epoch 3 - Loss: 0.0707 - Train Accuracy: 97.92% - Time: 7.394s
Total training time: 22.301s
Test Accuracy: 97.11%

bscs-22i-1094@FHP:~/cuda_projects/Project/src$ make
./nn.exe
MNIST Neural Network

Epoch 1 - Loss: 0.2694 - Train Accuracy: 91.97% - Time: 7.449s
Epoch 2 - Loss: 0.1079 - Train Accuracy: 96.77% - Time: 7.398s
Epoch 3 - Loss: 0.0743 - Train Accuracy: 97.75% - Time: 7.420s
Total training time: 22.267s
Test Accuracy: 96.80%

bscs-22i-1094@FHP:~/cuda_projects/Project/src$
```

Gprof Profile of the Application

The application was compiled with `-pg` for profiling, executed, and analyzed using `gprof`. Below is a summarized profiling report:

Flat Profile:

Flat profile:

Each sample counts as 0.01 seconds.

%	cumulative	self	seconds	calls	self	total	s/call	s/call	name
67.53	15.41	15.41	190000	0.00	0.00	forward			
31.95	22.70	7.29	180000	0.00	0.00	backward			
0.48	22.81	0.11	2	0.06	0.06	loadMNISTImages			
0.04	22.82	0.01	1	0.01	21.99	train			
0.00	22.82	0.00	2	0.00	0.00	loadMNISTLabels			
0.00	22.82	0.00	1	0.00	0.00	createNetwork			
0.00	22.82	0.00	1	0.00	0.81	evaluate			
0.00	22.82	0.00	1	0.00	0.00	freeNetwork			

Call Graph:

Call graph (explanation follows)

granularity: each sample hit covers 4 byte(s) for 0.04% of 22.82 seconds

index	% time	self	children	called	name
[1]	100.0	0.00	22.82		main [1]
		0.01	21.89	1/1	train [2]
		0.00	0.81	1/1	evaluate [5]
		0.11	0.00	2/2	loadMNISTImages [6]
		0.00	0.00	2/2	loadMNISTLabels [7]
		0.00	0.00	1/1	createNetwork [8]
		0.00	0.00	1/1	freeNetwork [9]
[2]	96.0	0.01	21.89	1	main [1]
		0.01	21.89	1	train [2]
		14.50	0.00	180000/190000	forward [3]
		7.29	0.00	180000/180000	backward [4]
		0.81	0.00	10000/190000	evaluate [5]
		14.60	0.00	180000/190000	train [2]
[3]	67.5	15.41	0.00	190000	forward [3]
		7.29	0.00	180000/180000	train [2]
		7.29	0.00	180000	backward [4]
		0.00	0.81	1/1	main [1]
		0.00	0.81	1	evaluate [5]
		0.81	0.00	10000/190000	forward [3]
		0.11	0.00	2/2	main [1]
[6]	0.5	0.11	0.00	2	loadMNISTImages [6]
		0.00	0.00	2/2	main [1]
		0.00	0.00	2	loadMNISTLabels [7]
		0.00	0.00	1/1	main [1]
[8]	0.0	0.00	0.00	1	createNetwork [8]
		0.00	0.00	1/1	main [1]
[9]	0.0	0.00	0.00	1	freeNetwork [9]