

HPC: Heterogeneous Computing

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Assignment 1. Matrix Scaling

Considerations:

1. I took the opportunity to also use OpenMP for the processing related to initialize the matrices
2. I took the opportunity to also use OpenMP for the processing related to the validation between CPU and GPU results

For the environment and compiling

```
$ compute -gpu
```

```
$ export OMP_NUM_THREADS=4
```

```
$ nvcc -o mfactorscaling_omp mfactorscaling_omp.cu -Xcompiler -fopenmp -lcudart
```

For the execution with 5 repetitions

```
time ./mfactorscaling_omp threads n m "0.1,0.2,0.3,0.4,0.5"
```

For the execution with 10 repetitions

```
time ./mfactorscaling_omp threads n m "0.05,0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9"
```

Table for the total time processing in seconds of the jobs given the configuration

		Matrix Size (s)		
		4000x4000	10000x10000	20000x20000
Thread per Block	32th, 5rep	0.71	2.43	8.55
	32th, 10rep	0.90	3.74	13.67
	64th, 5rep	0.73	2.43	8.54
	64th, 10rep	0.90	3.74	13.66
	128th, 5rep	0.71	2.46	8.53
	128th, 10rep	0.91	3.76	13.66

Runing 5 executions per job to calculate the average

	4000x4000	10000x10000	20000x20000
32th, 5rep	0.773	2.462	8.542
	0.768	2.451	8.545
	0.698	2.408	8.532
	0.671	2.409	8.539
	0.66	2.408	8.571
<i>32th, 5rep - avg</i>	0.714	2.4276	8.5458
32th, 10rep	0.979	3.751	13.684
	0.904	3.761	13.666
	0.943	3.76	13.656
	0.828	3.753	13.669
	0.864	3.684	13.669
<i>32th, 10rep - avg</i>	0.9036	3.7418	13.6688
64th, 5rep	0.776	2.451	8.519
	0.766	2.463	8.606
	0.695	2.378	8.55
	0.7	2.471	8.513
	0.696	2.391	8.519
<i>64th, 5rep - avg</i>	0.7266	2.4308	8.5414
64th, 10rep	0.96	3.758	13.647
	0.889	3.756	13.654
	0.876	3.755	13.705
	0.869	3.696	13.647
	0.896	3.751	13.66
<i>64th, 10rep - avg</i>	0.898	3.7432	13.6626
128th, 5rep	0.762	2.476	8.537
	0.742	2.461	8.521
	0.675	2.475	8.534
	0.692	2.402	8.53

	0.673	2.468	8.526
<i>128th, 5rep - avg</i>	0.7088	2.4564	8.5296
<i>128th, 10rep</i>	0.96	3.761	13.662
	0.968	3.754	13.667
	0.9	3.757	13.656
	0.89	3.757	13.662
	0.852	3.755	13.661
<i>128th, 10rep - avg</i>	0.914	3.7568	13.6616