

Exercise 5 - Theory Answers

1. Did you get a speed-up? Why or why not?

The host calculations took 2733.360 ms, while the device calculations were completed in just 85.424 ms.

```
selbu:~/ex05$ ./mandelbrot 1
Device compute capability: 7.5
Device calculations are correct.

Host time: 2733.360 ms
Device calculation: 85.424 ms
Copy result: 15.570 ms
```

This speed-up is possible due to the GPU's ability to execute thousands of threads in parallel, while the CPU operates in a more sequential way.

2. Which GPU did you use? (Info from system).

The GPU used was an **NVIDIA Tesla T4**.

```
selbu:~/ex05$ nvidia-smi
Sat Oct 19 19:09:41 2024
```

NVIDIA-SMI 555.42.06			Driver Version: 555.42.06			CUDA Version: 12.5		
GPU	Name	Perf	Persistence-M	Bus-Id	Disp.A	Volatile	Uncorr.	ECC
Fan	Temp		Pwr:Usage/Cap		Memory-Usage	GPU-Util	Compute	M.
							MIG	M.
0	Tesla T4	P8	Off	00000000:88:00:0	Off	0		
N/A	36C		15W / 70W	1MiB / 15360MiB		0%	Default	N/A

Processes:							
GPU	GI	CI	PID	Type	Process name	GPU Memory	
	ID	ID				Usage	
No running processes found							

3. Explain the differences between SIMD and SPMD. Which one is CUDA?

SIMD (Single Instruction, Multiple Data) executes the same instruction on multiple data elements simultaneously, while SPMD (Single Program, Multiple Data) allows multiple processors to execute the same program independently on different data. As noted in Lecture 25-26 (Oct 15: CUDA Basics & Memory, slide 28), CUDA extends SIMD (called SIMT) by allowing multiple register sets, parallel memory access, and divergent execution paths.