Shiraz University	**Shiraz University** **Department of Computer Science & Engineering**
	Professor: *Dr. Farshad Khunjush*
	TAs: *Alireza Rostami*
	Course: GPU Programming **Semester:** Fall, 2024
	Due Date: December 10th
	Homework #2

1. (100 points) Parallelize the given code for `ImageProcessingTask` in HW #1 using `pthread` and profile it.

   The specifications are as follows:

   (a) Explain why a multi-threaded design would theoretically improve performance. If your code's performance is not better than the sequential program despite your new design, you should be able to explain why.

   (b) Try to change only the necessary parts of the code. Then profile your program and compare it to the previous program.

   (c) You may create your threads for different files: each thread processing a different file; or, multiple threads for a single file; or, a combination of both. Discuss the advantages and drawbacks of each approach and analyze them from various criteria (granularity, load balance, etc.). You may use profiling to justify your selected design.

   (d) Profile your code with different thread sizes. Discuss the effect of thread size on performance.

   (e) Compare different memory schemes (shared, local, etc.).

   (f) Report every command you use. If you wish to write a bash script, then include it in the files you send.

   (g) Report the profiling results and try to justify and make sense of them. Raw results are of no value. Agglomerate your benchmarks' results. Use plots and other tools to visualize data.