



In the Name of God

## Parallel Algorithms, Spring 2020

### Homework #4: CUDA

Due date:

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The Conversion of rows into columns, or columns into rows in a matrix is called Transpose of a Matrix.

In this homework, you are supposed to write the code to transpose an  $m \times n$  matrix in C and CUDA.

First, you should receive  $m$  and  $n$  from the input, then generate a random  $m \times n$  matrix, and finally, print the transposed matrix in the output or in a file. Your codes should support both “integer” and “double” numbers.

To present your result, you are supposed to run both sequential and parallel codes, with different dimensions (10\*10, 100\*100, 1000\*1000) with integer and double numbers. It is recommended that you present your runtimes in bar charts.

In addition, you should profile your codes using NVIDIA Visual Profiler or nvprof and analyze the results provided, and determine what have you done to improve the performance according to your analyze.

- You should write a complete report in **PDF** format, including:
  - Your computer’s specifications (including your GPU model and its specifications like the number of CUDA cores, dynamic RAM, etc.)
  - A complete analyze of your profiling
  - An explanation of how to run your code (Linux command to run your code)
  - An explanation of your approach for parallelizing the program.
  - A comparison between the execution time of your code before and after parallelizing in milliseconds, and speed-up value for each input configurations.

### Reminders:

- Each HW has to be done individually (**For assignments that are similar to each other, the grade is 0.**)
- 50% of your points belong to the report.
- Your codes and the report should only be submitted before the due date through email to TA ([majidsalimib@gmail.com](mailto:majidsalimib@gmail.com)) with the “homework number” as the subject of email.
- In-person delivery will be announced.