COMP 4007: Parallel Processing and Computer Architecture

**Programming Assignment 1**

Due date: **20 September 2024**

**Notes**

1. All submitted code will be compiled and tested on the lab 1 machine to evaluate the assignments.
2. Points may be deducted if your programs consistently achieve no speedup over the serial program or a much slower speed than the linear speedup.
3. Please zip all your codes and reports into one file, named “ID_Name_Lab1.zip”, and send it to the TA’s email (869259303@qq.com).
4. Please strictly follow the format for the input and output files.

**Problem 1: Matrix Multiplication**

Write an OpenMP parallel program to do the matrix multiplication of two $N \times N$ matrices.

Your program should be able to

(1) Read N from the file named "input1.txt" (format:"5").

(2) correctly add the necessary pragma to parallelize the program.

(3) print the running time of your solution T1 (miliseconds) and the serial solution T2 to the file named "output1.txt" (format:"1.23,2.34"). Do not print any other characters.

You are recommended to scale up to different matrix shapes by changing the matrix size $N$.
Sample code of the serial program can be found in “matrix.c”.

Sample input and output files can be found in "input1.txt" and "output1.txt".

**Problem 2: Histogram**

Write an OpenMP parallel program that generates the histogram of an array of floating-point numbers. Your program should do the followings:

(1) Read in an integer *n* from the file named "input2.txt" who only has one integer.

(2) Generate an array of *n* floating point numbers, whose values are randomly generated between 0.0 and 10.0;

(3) Print how many numbers are in the range of [0,1),[1,2),[2,3),...,[9,10], respectively.

(4) Print the running time of your solution T1 (miliseconds) and the serial solution T2.

(5) Resultes should be printed to the file named "output2.txt".

(format:"1,1,1,2,0,3,4,0,0,1,1.23,2.34"). Do not print any other characters.

Sample code of the serial program can be found in “hist.c”.

Sample input and output files can be found in "input2.txt" and "output2.txt"