

CS 4000
Homework # 1: Introduction to OpenMP
due Friday, February 12th, 2021
(25 pts.)

Introduction

This homework provides some practice with features of OpenMP.

1. (5 pts.) Consider the program `hello_world.cc` as your first attempt at building an OpenMP parallel program. You compile this program (using `g++ -fopenmp hello_world.cc`) and run it. It should print

```
Greetings from Thread 0
There are 4 threads
Greetings from Thread 1
There are 4 threads
Greetings from Thread 3
There are 4 threads
.....
```

Unfortunately, it only prints:

```
Greetings from Thread 0
There are 1 threads
```

So, there is clearly an error in the program. Find it and fix it. Provide appropriate documentation in your program that indicates the location and cause of the error. (Hint: try to use the compiler to help you find the error.)

2. (20 pts.) I have written a program called `count_primes.cc` that counts the number of prime numbers between two numbers `a` and `b`. For example, if you input the values 2 and 10, it will output 4 (those primes are 2, 3, 5, and 7). This program can also find the number of primes between two large numbers, e.g., 5 billion and 5 billion plus 500,000. But, it's slow. Using those two numbers as input, this program takes 38 seconds to complete (and return the answer 22266). Your task is to modify this program using OpenMP to make it faster.

For this assignment, modify this program using OpenMP to count the number of primes between `a` and `b`. You are required to use the OpenMP **reduction** clause somewhere in your program for this assignment.

Please provide appropriate documentation in your program that describes how your program computes the solution in parallel.

Submission and Grading

Implement each program as a single C++ file. Make sure to provide adequate documentation. You should have a header comment with your name, date, etc. You should also document any functions within your code.

Submit your code via Blackboard.