Assignment 1

September 2025

1 Introduction

This assignment requires you to convert a single-threaded C++ program into a multithreaded version. You will then conduct experiments to compare the performance of both versions.

2 Submission Format

Your submission should include the following two files:

- A C++ source code file (`.cpp`).
- A PDF document organized as described below.

2.1 Description of Single-Threaded Version

Provide a brief description (one or two sentences) of the functionality of the original single-threaded code.

2.2 Experimental Results

Include a table comparing the runtime of the original single-threaded program with your multithreaded version. Use the average runtime from at least three runs for accuracy.

Specify the CPU specifications and the compile command used for your experiments. The recommended compile command is:

```
g++ assignment1.cpp -o assignment1 -O2 -std=c++14
```

Measure the running time of your program using the `time` command. For instance, if your executable is named `assignment1`, execute:

```
time ./assignment1
```

2.3 Multithreading Approach

Describe your multithreading strategy in no more than 100 words. Include your source code here, even though you will also submit the `.cpp` file.