

Homework 2

These should be run on the scholar queue or a machine that you have access to. Note that timings will only be accurate if running on a machine that your program is the only application running on it, which will be the case with Scholar.

A. Write and run an OpenMP program that:

Determines the number of processors available to run the program on a Scholar node machine using a version of the script provided for HW1. Print out a unique threadId for each thread using an OpenMP built-in function Determine which thread executes a *master* and one instance of a *single* statement of a parallel region.

B. Write and time 3 programs, two of which will be parallel. To time a program, use double `omp_get_time()` for timing. See <https://www.openmp.org/spec-html/5.0/openmps160.html> for details.

Program 1: Initialize within the program a single-dimensioned array with 1,000,000 elements. The program will:

1. Perform a sequential sum reduction on the array and time and print the execution time.
2. Perform a reduction such as what is shown below, and time and print the execution time:

```
int nt = numberofthreads // use omp_get_max_threads( );
int res[nt*8];
#pragma omp parallel for
for (i=0; i < 1,000,000; i++) {
    res[mythread*8] += a[i];
}
```
3. Perform a reduction using the OpenMP reduction, and time and print the execution time.

C. Write two sequential loops that sums the sequence $1.0/i$ into a float (not a double).

The first loop should be for `(int i=1; i<= 10,000,000; i++) {...}`

The second loop should be for `(int i=10,000,000; i>0; i--) {...}`

The third summation should use an OpenMP reduction of the first ($1 = 1$ to 10,000,000) loop.

Answer briefly why you think the answers differ.

D. Run the programs `slow.c` and `verySlow.c` included in the directory MM answer briefly why they are so different in their running times. You can run these on your laptop.

What to turn in:

Turn in a file called <login>.zip, where <login> is your Purdue career account ID. Please use .zip and not 7z, or other compressions programs – it slows down the grading. Also do not include binary files, i.e., executables, of your program – it just bloats the download file of the homeworks.

In a subdirectory of <login> called A, put the code for your program for Part A and the output of the execution in a .txt file.

In a subdirectory of <login> called B, put the code for your program for Part B and the output, with timings, for the program in a .txt file.

In a subdirectory of <login> called C, put the code for Part C, and a file that shows the output of the program and a brief explanation of why the answers differ for the three ways of adding the numbers. Also state which one(s) should be most correct.

In the <login> subdirectory, have a .txt file called *D.txt* that contains your brief answer on why *verySlow.c* is much slower than *slow.C*.