

**CS 540: High Performance Computing**  
**Spring 2017**  
**OpenMP Mini Project**  
**Due: March 24<sup>th</sup>, 2017. 11:59pm**

**The Assignment**

For this mini-project, you will have to either (a) develop an interesting OpenMP parallel program, or (b) systematically explore an existing OpenMP program. More specifically, you must research and develop an algorithm that pertains to your current graduate research topic or choose an existing program to parallelize.

Below are some hints that are intended to help you in your research and choice.

- Explore a sequential and parallel program
  - A comprehensive list of algorithms is available in Wikipedia. Many of these algorithms are described in pseudo-code and some are readily implemented in C.
- If you are researching for an existing sequential program/algorithm to parallelize, pursue a program/algorithm with at least one computationally intensive for-loop.

**Requirements**

If you choose to **develop** an algorithm, you may choose to:

- convert an existing sequential program into a parallel C++ OpenMP program, or
- expand / modify an existing parallel C++ OpenMP program, or
- use OpenMP to implement a computationally intensive algorithm from scratch that might benefit your own research.

For the systematic **exploration** of an existing OpenMP program:

- research OpenMP programs developed and published by others on the web or in printed resources, then
- choose one program that solves a meaningful problem and that you believe is well-documented and understandable.
  - study your chosen program, its algorithm and the OpenMP techniques employed in the application.
    - compile program
    - run the program on a shared-memory computer with test data of realistic size.

Technical Write-Up:

You will prepare a final project write-up 4-6 pages in length (12 pt. font, 1 inch margins, double spaced). Your report should introduce the algorithm/program your project is wishing to address, describe related work in the area (if any), discuss the elements of your solution and performance.

Make sure to include the following in your write-up.

- If you chose to **develop** an OpenMP program, and:

- if you converted an existing sequential program into a parallel OpenMP program, specify the source of the sequential program and the changes you made to it.
- If you expanded / modified an existing parallel OpenMP program, specify the source of the original parallel program and the changes you made to it,
- if you used OpenMP to implement a computationally intensive algorithm from scratch, describe the original algorithm and give details on the implementation.
- If you chose to **systematically explore** an existing OpenMP program:
  - specify the source of the parallel program, and
  - describe the problem solved by the program, and
  - describe the algorithm, and
  - describe the principal OpenMP techniques employed in the program, and
  - describe how you compiled and ran the program, and
  - describe the test data and the corresponding results.
- Share any challenges that you faced.

### **Due Date**

This assignment is due at 11:59pm on 3-24-2017. Submit it using Blackboard. We'll spend a few minutes discussing your experience with this assignment in class.

### **Grading**

Grades will be based on correctness, adherence to the guidelines, proper use of the OpenMP framework, originality and code quality (including the presence of meaningful comments) and the quality of the final report.