CISC 830. Foundations of Cyberinfrastructure

Term Project

Synopsis

As the culmination of the course, you will select a scientific problem that are computationally challenging, design and implement its solution using cyberinfrastructure, and evaluate the performance to demonstrate the benefits of cyberinfrastructure. Your solution should be developed in four different modes: 1) sequential, 2) multicore, 3) cluster, and 4) GPU. You will use the computing facilities in Research Computing here at RIT: see http://rc.rit.edu/ for details. We are interested in significantly (5-10 times) or fundamentally (100 or more times) faster computing. To this end, it is important to select a proper problem and to optimize your solution significantly.

Suggested topics

Some popular computationally challenging problems are, but not limited to:

- Cryptography, malware detection
- Image processing, digital video and audio processing
- Biomedical informatics
- Data analytics
- Computer vision like face detection and recognition
- Ray tracing rendering
- Numerical methods like matrix multiplication
- Medical imaging
- Engineering simulation
- Statistical modeling

Check also http://impact.crhc.illinois.edu/parboil/parboil.aspx for more interesting problems.

Grading policy

Your work will be graded in terms of performance, correctness, difficulty, and completeness:

1. Project proposal: problem definition, challenges, solution design and implementation including progress on parallel computing (just a plan is not sufficient) (25 pts)
2. Final presentation on demo and performance evaluation (50 pts)
3. Term paper (25 pts)

Your presentations will also be considered for the grade.

Report writing

Your term paper must strictly follow the guidelines indicated below. Any paper that does not abide by the constraints in the guidelines will not be graded. Be advised that your goal is to produce a clearly readable term paper within these constraints.

- Your paper must be written in single-spaced, double column format.
- Your paper must be at least 2 pages and no more than 3 pages in 10 point in ACM format. This length includes everything (figures, tables, references), but appendices.
- Your paper must be submitted in PDF and formatted for 8.5x11-inch paper.

The writing of the paper will also be considered for your grade, thus do your best to create a well-written paper. You are highly recommended to seek advice on technical writing, e.g., http://www.cs.columbia.edu/~hgs/etc/writing-style.html. Adding figures, pseudo-code for algorithm description, and plots is always encouraged, but certainly no trivial or unrelated figures, plots, or pseudo-code should be included.