COMP 4901Q: High Performance Computing (HPC)

Final Project
Due date: **8 May 2022 23:59**

Project Instructions

1. **Problem statement**: Find a problem which is computing-intensive/time-consuming to solve with a single processor. It can be any science or engineering area you like.
2. **Literature review**: Search a few (~2) pieces of related work to understand how they address the problem and what are the main issues of the existing methods.
3. **Methodology**: Propose your own methods to address the problem and compare your methods with existing ones. Implement your parallel solutions with learnt parallel programming techniques (e.g., OpenMP, CUDA, MPI, etc.). Implement your solutions, and evaluate the improvement on specific hardware (e.g., multi-core CPU, GPU, or clusters) over the baselines (e.g., the serial solution, the existing parallel solutions, etc.)
4. **Code:** Implement your methods using existing frameworks to run on specific hardware experiments to evaluate the performance. The code should be submitted together with the project report.
5. **Documentation:** Finalize the project report.
   - **Page limit:** no more than 10 A4 pages in the normal A4 page layout of Microsoft word (i.e., 2.54cm margin), single column, 11pt font size, and single line spacing.
6. **Presentation**: You are required to demonstrate your work (7 minutes presentation + 2 minutes Q&A). Each student should attend its assigned group presentation and submit peer evaluation forms. The detailed schedule of the presentation will be released later.
   - **Presentation time: 13:30-15:30, 11 May 2022** (2 parallel groups: ~15 projects per group)

Grading

Below are components that will make up your project grade and the first two components are the most important:
- **Practical content/creativity; implementation/tuning effort; design/analysis of algorithms.**
- **Experimental data: scaling/performance analysis.**
- Theoretic content/creativity.
- Impact: difficulty and timeliness of the contribution.

We understand that not all projects will have all four components, but it is expected that the first two components will be present in all projects. As such, we expect the majority of your final report to be about parallelism and performance optimization, and not the problem description.