COSC 6365, Fall 2017

Final Project

Proposal due: November 9, 2017

Project Report and slides due: December 6, 2017

Project Presentation: December 7, 2 – 5 pm

The objective of the final project is for you to explore areas in HPC that may be of particular interest to you and to allow you to gain a deeper insight than what you have gained through the lectures and assignments.

Your project should consist of a HPC code implementation, an analysis of the efficiency and energy efficiency of the implementation, a report, and a presentation. The implementation should be done on one of the platforms you have used for assignments, unless another agreement is reached prior to the start of the project. You can use OpenMP and/or OpenMPI or equivalent programing paradigms available on the platform of choice.

The report should explain the problem, describe the implementation, and discuss/analyze the results you obtained. You should prepare a 15 min presentation of your project.

The project proposal should describe the problem you will address, your approach for implementation and validation, the platform(s) you plan to use, and data sets to be used for validation and assessment of efficiency and energy consumption. The project should be approved by the instructor prior to start in order to establish proper scope and content for the course.

The report, the code and the presentation slides should all be handed in electronically no later than December 6th. Presentations will take place during the time assigned for course final, December 7, 2 - 5 pm.

Below is a list of projects by students in previous years.

- LU with MPI
- Vector Dips based on Trace Analysis
- Gene sequence alignment
- Heat equation solver using OpenCL
- Sparse FFT using OpenMP
- AdaBoost Machine Learning Algorithm in OpenCL

- Database Selection using OpenCL
- Comparison of Different Iterative Methods for Solving Navier-Stokes equations
- Optimizing Hybrid Parallelism in Sweep3D
- Parallel Computation of Eigenvalues
- Superlinear speedup in randomized algorithms
- Parallel multigrid algorithms
- Parallelization of network simulator
- Using Randomization to Improve Routing Performance
- A Comparison of Parallel Sorting Algorithms
- String Matching on Parallel Computers
- Emulation on the Fat–Tree Under Various Models of Communication
- A Parallel Learning Algorithm for Radial Basis Function Networks
- Elastic Nets and the Travelling Salesman Problem: A Massively Parallel Approach
- Parallel Backpropagation Networks
- Parallel Ray Tracing
- Parallel Monte Carlo
- An Implementation of Conway’s Game of Life in Three Dimensions
- Towards Binary Pulsar Searches
- Simulation of Earthquake Rupture Process
- Work Towards a Parallel Extended Kalman Filter for Data Assimilation in the Harvard 3D Primitive Equation Model
- Parallelizing the Harvard Open Ocean Model
- Parallelizing WI–BEM Ocean Acoustic Scattering and Reverberation Code
- A Fast Parallel Solver for Partial Differential Equations on Irregular Domains
- Parallel Loglinear Decomposition of Mobility Matrices
- Parallel Computation of Eigenvalues

- Comparison of Different Methods for Solving Eigenvalues and Eigenvectors
- Diagonalizing Real Symmetric Matrices
- Parallel Multipole Methods
- Parallel Computation of Velocity and Position Distributions in One–dimensional N–body Systems
- An Implementation of Eye Location for Face Recognition
- Calculating Eigenfaces for Image Recognition
- Edge Detection and Segmentation
- A Study of Parallel Simulation on Discrete Event Dynamic Systems
- A Method for Simulation of Rare Events in Discrete Event Dynamic Systems
- Standard Clock Technique to Simulate a Large Number of Queueing Networks
- Parallel Simulation of Discrete Event Systems: A Comparison between Standard Clock and Event Synchronization Methods.
- Creating and Matching Random Dot Stereograms
- Sound Dilation: A Parallel Implementation of Multirate Digital Filtering Algorithms
- Parallel Protein Folding
- Parallel Ocean Program
- Unstructured Mesh Computations
- Implementation of Fast Multipole algorithms using MPI/Open-MP mixed mode programming