CS 524 High Performance Computing

Course Description
High-performance computer architecture, enhancement of performance on single and multi processor computers, parallelization overheads; performance evaluation; introduction to parallel algorithms

Course Objectives
• understand the architecture of several types of high-performance computers and the implications on the performance of algorithms on these architectures.
• be able to design and implement efficient algorithms for high-performance computers.
• understand the current state-of-the art in parallel programming environments, portable software libraries and program development.

Prerequisites
CS 223 Computer organization and assembly language, CS 213 Data structures and algorithms. Senior or higher standing; CS 423 Computer architecture (recommended)

Text
Outline

Grading
Assignments (including programming): 25%
Project: 10%
Quizzes: 10%
Mid-term exam: 25%
Final exam: 30%

Policy on Sharing
Discussions are encouraged. However, each individual must submit his or her own work.

Content Overview

*Emphasis on algorithm development and programming issues for high performance.*

- Cache effect, data locality, data dependency.
- Concurrency/parallelism in high performance computing
- Analysis, design and development of parallel algorithms
- High performance programming environments and libraries
- Trends in high performance computing
Hardware and Software Environment

Hardware
- PCs and workstations
- Distributed-memory parallel computer (Linux cluster @ 172.28.40.10)
- Shared-memory parallel computer (Sun server @ suraj.lums.edu.pk)

Software
- C/C++ and FORTRAN (visual studio, gcc/g++, cc, g77)
- MPI library (LAM/MPI on cluster)
- POSIX threads (on suraj and linux cluster)
- OpenMP library (Omni’s on suraj and linux cluster)