Contact Information

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Course Web Page: http://www.cis.njit.edu/~alexg/courses/cis668/index.html

Course Information

The course is intended for computer science and engineering students who are interested in parallel computing. CIS 668 introduces aspects of parallel algorithm design and the same time emphasizes the practicality and programmability of these designs. Various fixed-connection networks are introduced and SIMD (Single Instruction Multiple Data) algorithms are developed for them; routing algorithms are introduced. The PRAM model is presented and shared-memory algorithms are introduced and analyzed. Realistic models of parallel computation are introduced such as the LogP and the BSP and architecture independent design and analysis of algorithms is introduced. Numerical and combinatorial algorithms are presented and their parallel performance analyzed. Implementation issues on clusters of PC workstations will also be discussed. Such clusters will also be used for the programming part of this course.

Topics the will be covered are.

a. Introduction- Parallel computers and models- Fixed interconnection networks - The Parallel Random Access Machine (PRAM) - PRAM algorithms - Advanced PRAM algorithms - List coloring and List ranking - Lower bound techniques.

b. Linear arrays and binary trees - Sorting on a linear array - Bit and Word Models - Complexity issues

c. Parallel prefix on trees - Integer arithmetic on arrays - Division - Matrix algorithms - Sorting on meshes - 3-d arrays - Meshes of Trees (MOT)

d. Hypercubes and hypercubic networks - Embeddings - Routing algorithms on networks - Routing on butterflies - FFT - Odd-even merge-sort

e. Practical models for parallel computing - The Bulk Synchronous Parallel Model - The LogP model - BSPlib: A small library for BSP programming - Matrix Algorithms on the BSP model - Sorting on the BSP model.

Textbook	F.T. Leighton "Introduction to Parallel Algorithms and Architectures: Arrays - Trees - Hypercubes", Morgan-Kaufmann Publishers.
Other Books	Algorithms Sequential and Parallel: A unified approach by Russ Miller and Laurence Boxer, Prentice Hall.
Grading scheme:	1000 points total can be collected in two quizzes and the best four of five assignments.
Quizzes:	Quiz 1 is scheduled for **Wed Oct 18**. Quiz 2 is scheduled for **Wed Dec 6**. Each Quiz is worth 300 points. The duration of each quiz is 1h20min. Quiz 1 covers the first part of the course, and Quiz 2 the remainder. There is **no final** exam.
PS1-PS3:	Three homerwork assignments will be given throughout the semester. Each one is worth 100 points.
PA1-PA2:	Two programming assignments will be giventhroughout the semester. Each one is worth 100 points. Elementary knowledge of C/C++ is required for the completion of the assignments (eg pointer manipulation).
Prerequisites	Familiarity with the concept of a matrix, matrix multiplication and sorting (eg insertion sort, quick-sort, merge-sort) are helpful though not necessary to attend this course.