CSC721 Spring 2013
Theory of Algorithms

Professor: Torgersen

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Office Hours: Monday, Wednesday, and Friday 3:30 to 5:00 and by appointment.

Text: Aho, Hopcroft, and Ullman, The Design and Analysis of Computer Algorithms.

Goals:

1. The Classes $\mathcal{P}$ and $\mathcal{NP}$, $\mathcal{NP}$-complete problems. Polynomial time mapping reductions.
2. Overview of Algorithm design strategies
   (a) Divide and conquer / Balancing
   (b) Backtracking
   (c) Greedy algorithms
   (d) Dynamic Programming
   (e) Branch and bound
3. Review of Complexity
   (a) Asymptotic measures
4. Commonly used algorithms for important problems.
   (a) Graph Algorithms, minimal spanning tree, single-source, and all-points shortest paths, strongly connected components
   (b) The Fast Fourier Transform and applications. 2-D FFT
   (c) Matrix multiplication and related problems
   (d) LUP decomposition and implications to matrix operations
   (e) QR Factorization (if time allows).
   (f) Newton's method, Quasi-Newton type methods, (if time allows)
   (g) Integer multiplication (Karatsuba)
   (h) Pattern matching, e.g., Knuth-Morris-Pratt.
   (i) Union-Find problem, application to Kruskal's Algorithm
5. Correctness proofs and time complexity analysis

Expectations:

1. Class participation.
2. Communicate if things get complicated.
3. Your best effort.

Grading:
Three exams (70%), programming assignments (10%), and take home problem sets (20%). Programming assignment(s) **must** be submitted ready to compile and run on Linux (x86) or Solaris (sparc or x86). Approximate dates for the first two exams are Monday, Feb. 11, and Monday, Mar. 18. The final exam (per Registrar) is Monday, May 6 at 9:00 AM.

Disability Notice:
If you have a disability that may require an accommodation for taking this course, then please contact the Learning Assistance Center (758-5929) within the first two weeks of the semester.

Pandemic Planning Notice:
The University has requested that faculty collect personal contact information as part of emergency planning and preparation. The information you provide is strictly confidential.