Topics in Theoretical CS: Approximation Algorithms
http://www.cs.ust.hk/faculty/golin/COMP670J.html
COMP670J Fall 2001

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Class Hours: Tu 10:30-11:50, Th 10:30-11:50

Office Hours: Feel free to knock on my door any time to ask questions. I will also have office hours by appointment.

Course description and objective: Most computer science researchers have given up on the possibility of finding techniques that always yield optimal solutions to NP-hard problems.

This still leaves us with the task of finding 'good' solutions to these problems. The theory of approximation algorithms is devoted to developing techniques that yield provably good ('approximate') solutions to these problems.

In this course we will learn about the theory and practice of designing such algorithms.

Preliminary Syllabus

1. Quick review of NP completeness and an introduction to approximation algorithms.
   Hardness of Approximations
   Polynomial Time Approximation Schemes
2. Approximation algorithms for various 'hard' combinatorial problems
3. Linear-Programming based algorithms
4. Randomized techniques for designing approximation algorithms
5. Semi-definite-programming based algorithms
6. Polynomial Time Approximation Schemes for the Travelling Salesman and related problems.

Text book: available in the HKUST bookstore.
Approximation Algorithms by Vijay Vazirani. Springer-Verlag, 2001

Reference books: all available in the library.

1. *Approximation algorithms* by Dorit Hochbaum (ed). PWS Pub. Co., 1997 .
2. *Complexity and approximation : combinatorial optimization problems and their approximability properties* by G. Ausiello et al. Springer-Verlag, 1999.
3. *Lectures on proof verification and approximation algorithms* by Ernst W. Mayr, Hans Jurgen Promel, Angelika Steger (eds.). Springer-Verlag, 1998.
4. *Algorithms on strings, trees, and sequences: computer science and computational biology* by Dan Gusfield. Cambridge University Press, 1997.
5. *Randomized algorithms* by Rajeev Motwani and Prabhakar Raghavan. Cambridge University Press, 1995.
6. *Computers and intractability : a guide to the theory of NP-completeness* Michael R. Garey and David S. Johnson. W. H. Freeman, 1979
7. *Introduction to algorithms* by Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest McGraw-Hill, 1990.

PLAGIARISM : All materials submitted for grading must be your own work. You are advised against being involved in any form of copying (either copying other people's work or **allowing others to copy yours**). If you are found to be involved in an incident of plagiarism, **you will receive a failing grade for the course and the incident will be reported for appropriate disciplinary actions**.

COLLABORATION : On the written assignments you are encouraged to collaborate in groups of two or three. However, you must write up solutions on your own. **You must also acknowledge your collaborators in the write-up for each problem, whether or not they are classmates.** If you copy a solution from a book or article you must acknowledge the source. Other cases will be dealt with as plagiarism.

GRADING SCHEME (tentative) : Sixty percent of your grade will depend upon your solutions to homeworks. There will also be a reading or implementation project that will count for the other forty percent of the grade.