

C Sc. - Topics in Algorithm and their Analysis Solving NP-Complete problems with Approximation and randomized algorithms.

Prerequisites: A Course in Computer Theory and in Analysis of Algorithms

Professor Stathis Zachos

Several techniques for solving NP-complete problems will be discussed, in particular randomized and approximation algorithms.

Randomized and approximation algorithms are interesting for their elegance, efficiency, simplicity and usefulness for solving many computational problems.

Topics include:

Las Vegas vs. Monte Carlo probabilistic algorithms; Arthur-Merlin protocols; Relaxing one of three requirements: algorithm has polynomial time complexity / finds exact solutions / works for all instances; the Approximation Hierarchy; Linear Programming, Primal Dual method; Semidefinite Programming; The Probabilistic Method; Markov Chains, Random Walks, Expander Graphs; Algebraic techniques; Derandomization; Online and Game-theoretic problems; PCP and efficient proof verification;

TEXTS:

V.V. Vazirani. Approximation Algorithms. 2001. Springer-Verlag.

M. Mitzenmacher & E. Upfal.

Probability and Computing: Randomized Algorithms and Probabilistic Analysis.

R. Motwani & P. Raghavan. Randomized Algorithms. 1995.

Cambridge University Press.

N. Alon & J. Spencer. The Probabilistic Method, 2nd ed. 2001 Wiley.

B. Chazelle. The Discrepancy Method. 2001. Cambridge University Press.