



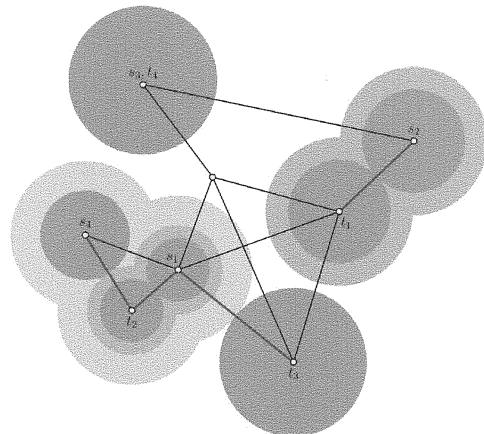
Advanced course
Approximation Algorithms

Winter term 2008/09

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| Time and Room: | tuesdays 12-14 in E1 4 room 024 thursdays 12-14 in E1 3 room 003 |
| Lecturer: | Spyros Angelopoulos, Nicole Megow, and Rajiv Raman Max-Planck-Institut für Informatik, 3rd floor {sangelop,nmegow,rraman}@mpi-inf.mpg.de |
| Format & Credit: | Advanced course with integrated exercises (3+1 hours) for 6 LPs. |
| Course page: | http://www.mpi-inf.mpg.de/~rraman/approxCoursePage.html |

Content. Most of the interesting problems in discrete optimization are known to be \mathcal{NP} -hard. Therefore finding an optimal solution may be prohibitively time consuming, following the widely believed conjecture that $\mathcal{P} \neq \mathcal{NP}$. When the efficiency of algorithms (polynomial running time) is an important issue, one is willingly to sacrifice the optimality of solutions – up to a certain extent. In the area of approximation algorithms, we design polynomial time algorithms that provide a guaranteed performance on the quality of their solutions.

This course aims to provide a broad introduction into the design and analysis of approximation algorithms. We will focus on fundamental techniques and problems in this area. Topics include: the greedy method, approximation schemes and dynamic programming, linear programming (LP) based relaxations, the (LP based) primal-dual method, randomized rounding, semidefinite programming relaxations, metric methods, and PCP and hardness of approximation. We will cover problems, such as set cover, vertex cover, TSP, knapsack, bin-packing, scheduling, facility location, Steiner tree and other connectivity and network design problems, cut and flow problems, clustering problems, etc.



The lectures will roughly follow the book "Approximation Algorithms", by Vijay Vazirani, which will be supplemented with up-to-date research papers.