

Approximation Algorithms

Course definition:

Approximation algorithms are efficient algorithms that solve optimization problems approximately such that guarantee a fixed ratio of the optimal solution. Generally, however there are algorithms to find the global optimal solution, they spend an exponential amount of time. So, approximation algorithms find near-optimal solutions within polynomial time in term of the input size. A known approximation algorithm is 2-approximation of traveling salesman problem which runs in quadratic time and guarantees finding a tour which is at most two times longer than the optimal solution in the worst case.

In this course we assume the students had the data structures and algorithm design courses and are comfortable with the mathematical proof of complexity and correctness of algorithms. We start this course by the definition of approximation and its types in terms of complexity and error ration. We study the deterministic and heuristic approximation algorithms on NP-hard/ NP-complete problems such as Vertex Cover, Set Cover, superstring, Steiner tree, Traveling Salesman, Knapsack, (Euclidean), Partitioning, Job Scheduling, P-center, Coverage and Clustering.

Resources:

- Text Book:
 - Approximation Algorithms (by V. V. Vazirani, 1997)
 - The Design of Approximation Algorithms (by D. P. Williamson, D. B. Shmoys, 2011)
 - Design and Analysis of Approximation Algorithms (by, D. Z. Du, K. I. Ko, X. Hu 2012)
- Papers in topic of randomness

Prerequisites: Algorithms and data structures, complexity analysis.

Lectures: Sunday and Tuesday 15: 30-17: 00

Extra class for homework solving: Tuesday 11:00-12:30

Evaluating:

- 30% Presentation
- 30% Homework
- 40% Final exam

For further information about the course visit me in my office or send an email to mdmonfared@iasbs.ac.ir.