CS 535: Design and Analyses of Algorithms

What you will learn in this course

- How to abstract messy, real-world problems by clean algorithmic problems

- How to solve those algorithmic problems
  - Examine problem structure
  - Pick and choose from different algorithm design strategies

- How to mathematically analyze algorithms
  - Quantify different design choices

Prerequisite (~CS430): Algorithmic Paradigms

Greed. Build up a solution incrementally, myopically optimizing some local criterion.

Divide-and-conquer. Break up a problem into multiple sub-problems, solve each sub-problem independently, and combine solution to sub-problems to form solution to original problem.

Dynamic programming. Break up a problem into a series of overlapping sub-problems, and build up solutions to larger and larger sub-problems.

Prerequisite (~CS430): Graph Algorithms

Traversal: BFS, DFS, topological ordering.

Shortest paths: Dijkstra, Bellman-Ford.

Minimum spanning tree: Prim, Kruskal.

Maximum flow: Ford-Fulkerson, Capacity Scaling

Unweighted bipartite matching: Flow-based

Prerequisite (~CS430): Computational Complexity

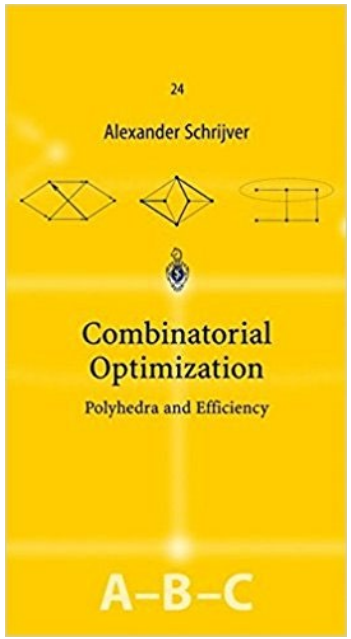
NP-completeness

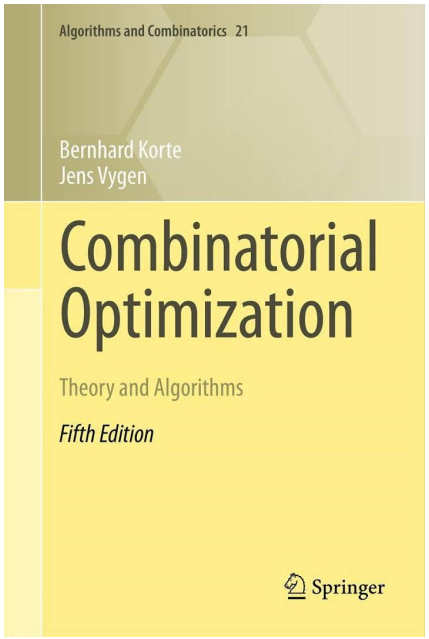
Polynomial reduction

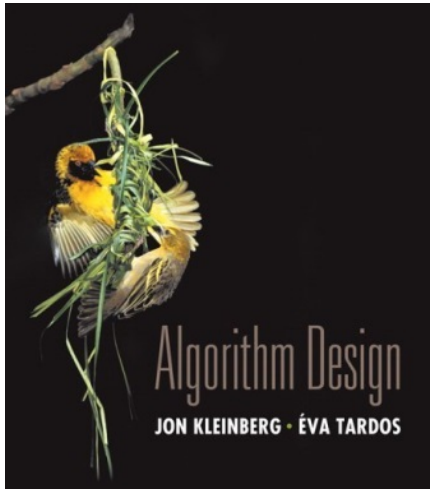
What you will learn in this course

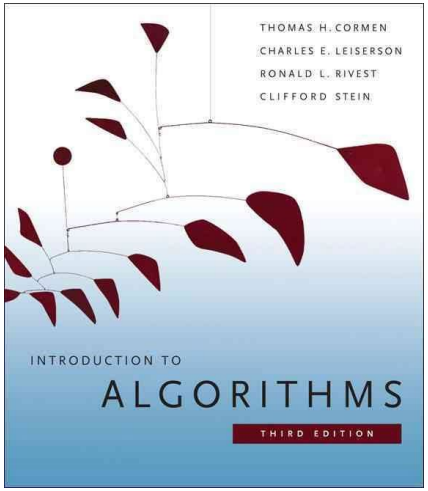
- Shortest path, minimum-mean circuit
- Bipartite matching, stable set, vertex cover, edge cover
- Weighted bipartite matching, edge Cover
- Maximum flow
- Min-cost flow/circulation
- General matching
- Weighted general matching, min-cost T-join, Chinese postman problem
- Minimum spanning arborescence
- Submodular functions and polymatroids
- Approximation algorithms

Reference Books









… and YOU

- Attending lectures
- Solving lots of practice problems
  - About 6 assignments (50%)
  - Additional questions for PhD sessions.
- Two in-class exams (20% midterm, 30% final)

Administrative matters

My email: wan@iit.edu
Office hours: 4-6pm, Tuesdays

TA: Yi Zhang (yzhan257@hawk.iit.edu)
Office hours: TBD

Course website: blackboard.iit.edu

- Lecture slides and assignments will be posted here.
- Your completed assignments and exams in pdf format will be submitted here.
- Questions, discussions, announcements
- Also restricted material such as solutions to exercises.