Advanced Algorithms

Lecture 28: Course review

Announcements

- HW 6 due **tomorrow (Friday)**
- Final exam next Wednesday (**10:30 AM - 12:30 PM**)

- Specific questions from old HWs, pls post on Piazza!

Course in a slide

- Divide and Conquer, analysis via recurrences (linear time selection)
- Dynamic programming (will see)
- Greedy algorithms (easy to come up with, tricky to analyze) — saw set + vertex cover; other basic problems like MST
- Shortest path in graphs (Dijkstra, “Bellman-Ford”)
- Randomized algorithms: can give unexpected power! balls-and-bins (hashing), sampling & estimation (analysis tools)
- Optimization formulations of discrete problems (HW 6)
- Complexity classes: what are P, NP, NP-complete and NP-hard, notion of reductions

Review, dynamic programming

- Key to solving using DP: what is the right "sub-problem"? how many *different* sub-problems are there?
- Examples: cake cutting, subset sum, TSP

Recap - optimization

Instance of problem

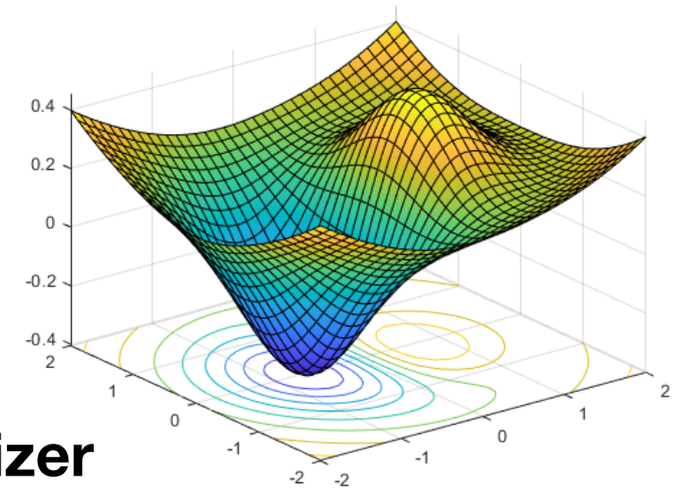
Optimization formulation

variables x_1, x_2, …
constraints
objective

Solution to problem instance

opt solution:
$x_1 = 0$, $x_2 = 1$, …

Optimizer



Recap - relax and round

Instance of problem

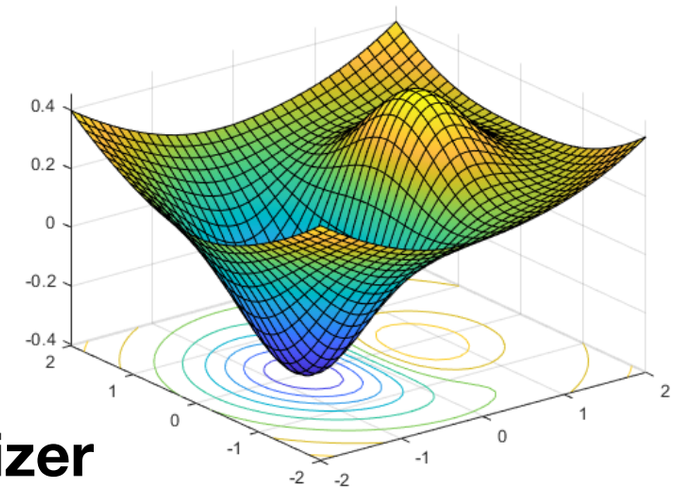
Optimization formulation

variables x_1, x_2, …
constraints
objective

Solution to problem instance

opt solution:
$x_1 = 0$, $x_2 = 1$, …

Optimizer



Recap: vertex cover