EECS 336: Introduction to Algorithms **Lecture X**
Midterm Review

Reading: Chapters 1-6

Problems and Algorithms

- Stable Marriage
  - Men Propose
  - $O(n^2)$
- interval scheduling
  - greedy by finish time
  - $O(n \log n)$
- MST
  - Kruskal (greedy by value)
  - Prim (like Dijkstra)
  - $O(m \log n)$
- weighted matroid
  - greedy by value
  - $O(n \log n)$ usually
- shortest paths
  - Dijkstra
  - $O(m \log n)$
- sorting
  - mergesort
  - $O(n \log n)$
- exponentiation
  - repeated squaring
  - $O(n)$ ($n = \#$ bits)
- integer multiply
  - D&C alg
  - $O(n^{\log_2^3})$
- convolution, poly mult
  - FFT based alg.
  - $O(n \log n)$
- weighted interval scheduling
  - DP
  - $O(n \log n)$
- integer knapsack
  - DP
  - $O(nC)$

Techniques

- greedy
  - runtime: by progress.
  - correctness: greedy stays ahead or greedy is optimal.
- divide and conquer
  - correctness: by induction.
  - runtime: by recurrences
  - subproblems form tree
- dynamic programming
  - correctness: by induction.
  - runtime: count subproblems (size of memoization table $\times$ cost to combine)
  - subproblems form DAG.

Algorithm Design Flow Chart