

Divide-and-conquer, Dynamic Programming and Greedy: Review

Examples in lectures, labs and homeworks:

Divide-and-conquer:

- Mergesort, Karatsuba large-integer multiplication, Strassen
- Counting inversions, maximum subarray, finding majority element
- Also, binary-search-like algorithms: finding peak element, finding singleton element

Dynamic programming:

- Fibonacci, Playing a board game, Rod cutting
- Robbing a house (lab 8)
- Knapsack
- Pharmacist, Skis and skiers (lab 9)
- LCS: longest common subsequence
- Subset sum, String shuffling, Unbounded knapsack

Greedy:

- Activity selection
- Fractional knapsack; pharmacist problem when all bottles have same cost
- Skis and skiers (when $n = m$); art gallery guarding
- (Matching points on a line, Turkeys)

Python notebooks:

- Rod cutting with both memo-ization and iterative solution, also full solution.
- House robber
- Subset-sum and string shuffling (hw)
- LCS

That's a lot of problems. The technique and the principles are the same, but instantiated differently, and creatively, for each specific problem. Go through this list and reflect on each problem. Use the python notebooks to step through the algorithms and understand the details.