CS 430
Week 3: Lecture

Objectives:

1. To further discuss Dynamic Programming and its use in the development of algorithms.
2. To introduce the concept of the Greedy Approach & Optimization and its applications.

Reading Assignment:

Neapolitan and Naimipour: Chapters 3-4.

Contents:

1. Development of an Algorithm (1/2 hour)
2. Principle of Optimality (1/2 hour)
3. Chained Matrix Multiplication. (1 hour)
4. Introduction to the Greedy Approach (1/2 hour)
5. Minimum Spanning Trees (1/2 hour)
6. Kruskal’s Algorithm (1/2 hour)
7. Scheduling (1/4 hour)
8. Scheduling with Deadlines (1/4 hour)
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Time

1. Development of an Algorithm (1/2 hour)
   - Establish a recursive property that gives the optimal solution to an instance of the problem.
   - Compute the value of an optimal solution in a bottom-up fashion.
   - Construct an optimal solution in a bottom-up fashion.

2. Principle of Optimality (1/2 hour)
   - Define the principle.
   - Work through example.

3. Chained Matrix Multiplication. (1 hour)
   - Work through example matrices and their optimal solutions.
   - Discuss development of an algorithm that determines the optimal order for multiplying n matrices.
   - Work through various examples.

4. Introduction to the Greedy Approach (1/2 hour)
   - Describe Greedy Approach and define a greedy algorithm.
   - Describe relationship to Dynamic Programming.
   - Work through an example problem.

5. Minimum Spanning Trees (1/2 hour)
   - Describe and define graph terms: undirected, path, connected, cycle, acyclic, tree, rooted tree, spanning tree, minimum spanning tree.
   - Outline algorithm to select an edge according to some locally optimal consideration.

6. Kruskal’s Algorithm (1/2 hour)
   - Outline Kruskal’s Algorithm for the Minimum Spanning Tree Problem.
   - Work through an example using the algorithm.
   - Analyze time-complexity of the algorithm.

7. Scheduling (1/4 hour)
   - Describe Scheduling and the problem of minimizing total time in the system.
   - Work through example.

8. Scheduling with Deadlines (1/4 hour)
   - Describe difference between Scheduling and Scheduling with Deadlines.
   - Work through example.
Handouts, etc. for Lecture.