Week 3
Dynamic Programming

INFSCI 2591

Spring 2023

Learning Objectives

- Describe the dynamic programming technique

- Contrast the divide-and-conquer and dynamic programming approaches to solving problems

- Identify when dynamic programming should be used to solve a problem

- Define the principle of optimality

- Apply the principle of optimality to solve optimization problems

Reading Materials

- Chapter 3
  - Sections 3.1-3.4 (pages 95-120)
  - Section 3.6 (pages 131-138)

The Binomial Coefficient

- Algorithm 3.1 (pages 96-98)
  - Divide-and-conquer approach
- Algorithm 3.2 (pages 99-100)
  - Dynamic programming approach

Floyd's Algorithm

- Explain Floyd's algorithm (pages 100-107)
- Analysis of Algorithm 3.3: Every-Case Time Complexity (Floyd's Algorithm for Shortest Paths) (page 107)
- Algorithm 3.4 (pages 107-108)
- Algorithm 3.5 (page 109)

Dynamic Programming

- Example 3.4 (pages 110-111)
- Chained matrix multiplication (pages 111-114)
- Example 3.5 (pages 114-115)
- Example 3.6 (pages 115-117)
- Algorithm 3.6 (pages 117-118)
- Analysis of Algorithm 3.6: Every-Case Time Complexity (Minimum Multiplications) (pages 118-119)
- Algorithm 3.7 (page 120)

The Travelling Salesperson Problem

- Explain the Travelling Salesperson Problem (pages 131-132)
- Example 3.10 (pages 132-133)
- Example 3.11 (pages 133-134)
- Algorithm 3.11 (page 134)
- Analysis of Algorithm 3.11: Every-Case Time and and Space Complexity (The Dynamic Programming Algorithm for the Travelling Salesperson Problem) (pages 135-136)
- Example 3.12 (pages 136-138)