Design and Analysis of Algorithms

CoSc3012

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Course Description

This is an intermediate algorithms course with an emphasis on teaching techniques for the design and analysis of efficient algorithms. Topics include divide-and-conquer, dynamic programming, and greedy algorithms.

Course Objectives

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.

Textbook

The primary written reference for the course is:

Cormen, Thomas, Charles Leiserson, et al. Introduction to Algorithms. 3rd ed. MIT Press, 2009.

Course Outline

Chapter One: Introduction to Algorithms

Chapter Two: Algorithm Analysis

- Proof of Correctness
- Efficiency Analysis
    - Model of Computation
    - Asymptotic Analysis and Bounding Functions

Chapter Three: Graphs

- Graph Representation
- Graph Traversal (BFS and DFS)

Chapter Four: Divide and Conquer

- Problem Breakdown
- Algorithm Analysis
- Solving Recurrences

Chapter Five: Dynamic Programming

Chapter Six: Greedy Algorithms