Federal University of Ouro Preto
PCC104 - Design and Analysis of Algorithms
Divide and Conquer

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November 25, 2024

Instructions

- For each set of algorithms, the student must choose one.
- The student must create a public GitHub repository with all the developed codes.
- For each implementation, the student must:
  - Present 3 test cases.
  - Be prepared to develop the cost analysis.
  - Be prepared to answer questions about their own code, the algorithm, and the problem the algorithm solves.
- The interviews will take place between

1 Set 1 - Divide and Conquer

Chapter 5 - *Introduction to the Design and Analysis of Algorithms (3rd Edition)* by Anany Levitin

1. Implement the MergeSort algorithm.
2. Implement the QuickSort algorithm.
3. Implement a binary tree and its traversal algorithms:
   (a) Pre-order
   (b) Post-order
   (c) In-order

2 Set 2 - Dynamic Programming

Chapter 8 - *Introduction to the Design and Analysis of Algorithms (3rd Edition)* by Anany Levitin

1. Implement the two dynamic programming algorithms for the knapsack problem. (Section 8.2)

3 Set 3 - Greedy Algorithms

Chapter 9 - *Introduction to the Design and Analysis of Algorithms (3rd Edition)* by Anany Levitin

1. Implement Prim's algorithm.
2. Implement Kruskal's algorithm.
3. Implement Dijkstra's algorithm.

4 Set 4 - Backtracking

Section 12.1 - *Introduction to the Design and Analysis of Algorithms (3rd Edition)* by Anany Levitin

1. Implement a backtracking algorithm for the n-queens problem.
2. Implement a backtracking algorithm for the *subset-sum* problem.

5 Set 5 - Branch and Bound

Section 12.2 - *Introduction to the Design and Analysis of Algorithms (3rd Edition)* by Anany Levitin

1. Implement a branch and bound algorithm for the knapsack problem.
2. Implement a branch and bound algorithm for the traveling salesman problem.