Assignment 6: Medians and Order Statistics

Part 1: Selection Algorithms

Implementation

The deterministic algorithm implemented is the Median of Medians, achieving O(n) worst-case time complexity.

The randomized algorithm implemented is Randomized Quickselect, achieving O(n) expected time complexity.

Performance Analysis

1. Deterministic Algorithm (Median of Medians):
   - **Time Complexity**: O(n) in worst-case.
   - **Space Complexity**: O(n) due to recursion overhead.

2. Randomized Algorithm (Quickselect):
   - **Time Complexity**: O(n) expected, O(n^2) worst-case.
   - **Space Complexity**: O(log n) for stack space.

Empirical Analysis

Empirical analysis demonstrates that the Randomized Quickselect performs better on average for most inputs.

Observations

- Median of Medians is more robust for adverse cases.

- Randomized Quickselect is faster for average scenarios.

Code Details

- Implemented in Python.

- Functions `median_of_medians` and `randomized_quickselect` handle the algorithms.