

# Time Complexity

## Project Introduction:

We are group of 5, and this is our show-and-tell project on Time Complexity. Time Complexity is a concept in computer science that helps measure the efficiency of an algorithm by analyzing how its runtime grows with the size of the input. Understanding time complexity is crucial for optimizing code, as it allows us to predict how well an algorithm will perform as data scales. In this project, we will explore various types of time complexities and their impact on algorithm efficiency.

## Team Introduction:

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## Umar Noon : The Basics

- **What is Time Complexity?**
  - A simple explanation of what time complexity measures.
  - Why it's important in programming.
- **Big O Notation:**
  - Introduction to Big O notation.
  - Common time complexities:  $O(1)$ ,  $O(\log n)$ ,  $O(n)$ ,  $O(n \log n)$ ,  $O(n^2)$ .
  - Examples of algorithms with different time complexities (e.g., linear search, binary search).

## Ahmad Asim Khan : Analyzing Simple Algorithms

- **Loop Analysis:**

## Time Complexity

- How to analyze loops to determine time complexity.
- Examples: nested loops, single loops.
- **Recursive Function Analysis:**
  - Basic understanding of recursion.
  - Analyzing recursive functions (e.g., factorial, Fibonacci).

## CH Muhammad Asif : Data Structures and Time Complexity

- **Arrays and Linked Lists:**
  - Time complexity of basic operations (access, search, insertion, deletion).
- **Stacks and Queues:**
  - Time complexity of push, pop, enqueue, and dequeue operations.
- **Trees and Graphs:**
  - Basic understanding of trees and graphs.
  - Time complexity of common tree and graph algorithms (e.g., traversal, search).

## Hassan Javed: Sorting and Searching Algorithms

- **Sorting Algorithms:**
  - Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort.
  - Time complexity analysis of each algorithm.
- **Searching Algorithms:**
  - Linear Search and Binary Search.
  - Time complexity analysis of each algorithm.

## Talha Murtaza : Practical Applications and Case Studies

- **Real-world examples:**
  - How time complexity affects performance in real-world applications.
  - Case studies of algorithms with different time complexities.
- **Optimization Techniques:**
  - Basic optimization techniques to improve algorithm efficiency.