Time complexities of different data structures

Time Complexity is a concept in computer science that deals with the quantification of the amount of time taken by a set of code or algorithm to process or run as a function of the amount of input. In other words, the time complexity is how long a program takes to process a given input. The efficiency of an algorithm depends on two parameters:

- Time Complexity
- Space Complexity

Time Complexity: It is defined as the number of times a particular instruction set is executed rather than the total time taken. It is because the total time taken also depends on some external factors like the compiler used, the processor's speed, etc.

Space Complexity: It is the total memory space required by the program for its execution.

Best case time complexity of different data structures for different operations

Data structure	Access	Search	Insertion	Deletion
Array	O(1)	O(1)	O(1)	O(1)
Stack	O(1)	O(1)	O(1)	O(1)
Queue	O(1)	O(1)	O(1)	O(1)
Singly Linked list	O(1)	O(1)	O(1)	O(1)
Doubly Linked List	O(1)	O(1)	O(1)	O(1)
Hash Table	O(1)	O(1)	O(1)	O(1)
Binary Search Tree	O(log n)	O(log n)	O(log n)	O(log n)
AVL Tree	O(log n)	O(log n)	O(log n)	O(log n)
B Tree	O(log n)	O(log n)	O(log n)	O(log n)
Red Black Tree	O(log n)	O(log n)	O(log n)	O(log n)

Worst Case time complexity of different data structures for different operations

Data structure	Access	Search	Insertion	Deletion
Array	O(1)	O(N)	O(N)	O(N)
Stack	O(N)	O(N)	O(1)	O(1)
Queue	O(N)	O(N)	O(1)	O(1)
Singly Linked list	O(N)	O(N)	O(N)	O(N)
Doubly Linked List	O(N)	O(N)	O(1)	O(1)
Hash Table	O(N)	O(N)	O(N)	O(N)
Binary Search Tree	O(N)	O(N)	O(N)	O(N)
AVL Tree	O(log N)	O(log N)	O(log N)	O(log N)
Binary Tree	O(N)	O(N)	O(N)	O(N)
Red Black Tree	O(log N)	O(log N)	O(log N)	O(log N)

The average time complexity of different data structures for different operations

Data structure	Access	Search	Insertion	Deletion
Array	O(1)	O(N)	O(N)	O(N)
Stack	O(N)	O(N)	O(1)	O(1)
Queue	O(N)	O(N)	O(1)	O(1)
Singly Linked list	O(N)	O(N)	O(1)	O(1)
Doubly Linked List	O(N)	O(N)	O(1)	O(1)
Hash Table	O(1)	O(1)	O(1)	O(1)
Binary Search Tree	O(log N)	O(log N)	O(log N)	O(log N)
AVL Tree	O(log N)	O(log N)	O(log N)	O(log N)
B Tree	O(log N)	O(log N)	O(log N)	O(log N)
Red Black Tree	O(log N)	O(log N)	O(log N)	O(log N)