

LAB 03: Searching Algorithms

CS211 – Data Structures and Algorithms

Usman Institute of Technology

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- **How to submit:**

- Online: Submit on your respective MS Team.

- A. Write a Function **LinearSearch** that takes two arguments List and value. The function should search the value in the list and returns the location of the value.

For Example: if data = [1,2,3,4,5,6] then LinearSearch(data, 4) should return 3

```
def LinearSearch(List, Value):  
    // your code goes here
```

The pseudocode for Linear Search algorithm is given below:

```
procedure linear_search (list, value)  
  
    for each item in the list  
        if match item == value  
            return the item's location  
        end if  
    end for  
  
end procedure
```

Source: Tutorials Point

- B. Write a Function **BinarySearch** that takes three arguments List,n and value and returns the location of the value in the given list.

```
def BinarySearch(List,n, Value):  
    // your code goes here
```

The pseudocode for Binary Search algorithm is given below:

```
function binary_search(A, n, T):  
    L := 0  
    R := n - 1  
    while L <= R:  
        m := floor((L + R) / 2)  
        if A[m] < T:  
            L := m + 1  
        else if A[m] > T:  
            R := m - 1  
        else:  
            return m  
    return unsuccessful
```

Source: Wikipedia

- C. Create a class **List** and write functions in Python whose parameters and return value are given below. The List class must have an empty list to store the data.
- Write a function **InsertAtFirst** which takes a parameter value and inserts at the start of the list.
 - Write a function **InsertAtEnd** which takes a parameter *value* and inserts at the end of the list.
 - Write a function **DeleteFromFirst** which removes the first element from the list and returns the value
 - Write a function **DeleteFromEnd** which removes the last element from the list and returns the value
 - Write a function **LinearSearch** which takes a parameter value and returns the location of the value in the list. The function must run in $O(n)$.
 - Write a function **BinarySearch** which takes a parameter value and returns the location of the value in the list. The function must run in $O(\lg n)$.
 - Write a function **IsSorted** which returns True if the data containing in the list is sorted, otherwise returns False.
 - Write a function **Search** which takes a parameter value and returns the location of the value in the list. The function should use Binary Search if the data is sorted, otherwise it can use Linear Search.