# Your Ultimate Guide To Landing Top AI roles

DECODE AiML

2.2

# Introduction to DSA

→ DSA → Data Structures and Algorithms

→ DSA involves using data structures ( list, stacks, trees etc) to store and access data and applying algorithms (step by step procedures) to solve problem efficiently.

→ Course Structure

① Learn about Time and space Complexity

② Data Structures in detail + Implementation in Python

③ Algorithms in details + Implementation in Python

④ Problem Practice in Python

## Problem : Search for a number x

```
def linear_search(nums, x):

    for val in nums:
        if val == x:
            return True

    return False
```

→ Data Structure → List

Algorithm → Linear Search

```
nums = [5, 15, 10, 6]
  x = 12
is_found = linear_search(
                   nums, x)
if is_found == True:
    print("numbu exist")
else:
    print("no. don't exists")
```

→ what is a better program ?

↳ A program which takes less memory and less time

→ How to find how much $\boxed{\text{space}}$ and $\boxed{\text{time}}$ a program takes?

↑ Space Complexity

↑ Time Complexity.

→ A better program takes

① Less memory in RAM (Space Complexity ↓)

② Less time for execution (Time Complexity ↓)

① $P_1 \rightarrow$ 10 ms, 20 KB
$P_2 \rightarrow$ 10 ms, 10 KB

② $P_1 \rightarrow$ 10 ms, 50 KB
$P_2 \rightarrow$ 15 ms, 50 KB

## Data Structures

* Python

→ A data structure is a way of storing and organizing data so that it can be used efficiently.

### * Important data structures

1. Array
2. Linked lists
3. Strings
4. Stack
5. Queue
6. Hash Table (Hashing)
7. Priority Queue (Heap)
8. Tree
9. Graph
10. Trie (Prefix tree)
11. Fenwick Tree (BIT)
12. Segment Tree
13. Disjoint sets

# Algorithms

→ An algorithm is a step-by-step set of instructions used to solve a problem or perform a task.

## * Important Algorithms

1. Searching Algorithms
2. Sorting Algorithms
3. Greedy Algorithms
4. Divide and Conquer Algorithms
5. Dynamic Programming Algorithms
6. Recursion & Backtracking
7. BFS/DFS Traversal
8. Minimum Spanning Tree
9. Single Source Shortest path
10. All pair shortest path
11. Bridges / Articulation Point
12. String pattern matching

## * Algorithm Vs Program

→ Algorithm : A step-by-step procedure or set of rules to solve a problem.

→ Program : A set of Instructions written in a programming language.

→ First we decide the algorithm. Then we write the Program.

→ Computer can only execute the program. It can't execute the algorithms.

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