DSA Syllabus

Introduction

- What are Data Structures?
- What is an algorithm?
- Why are Data Structures and Algorithms important?
- Types of Data Structures
- Types of Algorithms

Big O Notation

- Big O, Big Theta and Big Omega
- Time complexity examples
- Space Complexity
- How to measure the codes using Big O?
- Relationships Between Various Notations
- Best, Worst and Average Case Analysis

Arrays

- Array
- One-Dimensional Array
- Multi-Dimensional Array
- Dynamic Arrays
- Why do Arrays fail?
- Problems Solving in Array

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Linked List

- Singly Linked List
- List(Insertion, Deletion and Traversal)
- Doubly Linked List
- Circular Linked List
- Arrays Vs Linked List

Stack

- Introduction to Stack
- Push and Pop
- Expression Evaluation (Infix,Prefix and Postfix)

Queue

- Why do we need Queue?
- Enqueue and Dequeue
- Linear and Circular Queue
- Practise Question on Queues and Stack

Sort Algorithms

- What is Sorting?
- Types of Sorting
- Sorting Terminologies
- Bubble Sort

- Time Complexity of Bubble Sort
- Selection Sort
- Time Complexity of Selection Sort
- Insertion Sort
- Time Complexity of Insertion Sort
- Merge Sort
- Time Complexity of Merge Sort Quick Sort
- Heap Sort
- Time Complexity of Quick Sort
- Time Complexity of Heap Sort
- Comparison of Sorting Algorithms

Searching Algorithms

- Introduction to Searching Algorithms Linear Search
- Time Complexity of Linear Search
- Binary Search
- Time Complexity of Binary Search

Trees

- Logical Structure and Implementations
- Terminologies and Traversals
- Types of Binary Search Tree
- Properties of a Tree: Depth, Nodes and
  Leafs Maximum Depth of a Binary tree in Python

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Balanced Trees: AVL Trees

- AVL Trees: What and Why?
- Hashing
- Hash Tables
- Direct access table
- Hash Function and collisions
- Chaining and Load Factor

Graphs Algorithm

- Graph Representation Graph Traversal
- Adjacency Matrix
- Graph traversal - BFS
- Graph Traversal - DFS
- BFS Traversal vs DFS Traversal
- Minimum Spanning Tree
- Kruskal's Algorithm
- Prim's Algorithm

Shortest Path

- Dijikstra's Algorithm
- Bellman Ford Algorithm

Recursion

- Recursion Programming
- Recursion Tree Method
- Master Theorem
- Extended Master Theorem
- Cracking Recursion Interview Question

Dynamic Programming

- What is Dynamic Programming? (Overlapping property)
- Where does the name of DC come from?
- Top Down with Memoization
- Bottom Up with Tabulation
- Top Down vs Bottom Up
- Is Merge Sort Dynamic Programming?
- Number Factor Problem using Dynamic Programming
- Longest Common Subsequence
- Knapsack
- Bellman Ford Algorithm as Dynamic Programming
- Matrix Chain Multiplication
- Subset Sum Problem
- Floyd Marshall Algorithm

Greedy Algorithm

- Introduction
- Activity Selection Problem
- Fractional Knapsack Problem
- Huffman Coding For Data Compression
- Minimum Spanning Tree: Greedy Kruskal's Algorithm Greedy Algorithm: Dijkstra's Algorithm