THE DATA STRUCTURES AND ALGORITHMS SAGA

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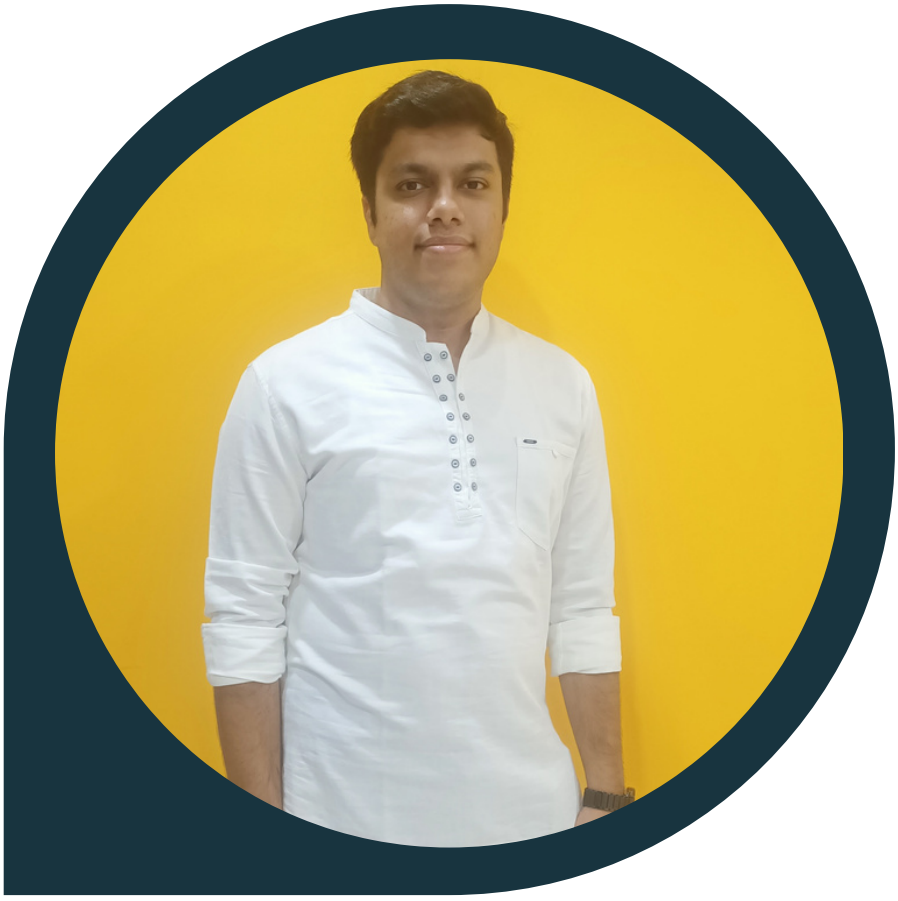

200+ HOURS SESSIONS

DOUBT SUPPORT

1:1 MENTORING

500+ PROBLEMS

THE CODING SAGA

WEBSITE

LINKEDIN

YOUTUBE

ARCHIT AGGARWAL

COURSE CURRICULUM

I. PROGRAMMING BASICS

Input & Output
Variables & Datatypes
If-Else (Ladder & Nested)
Loops & Pattern Printing
Functions or Methods
Digit Traversals
Basic Math Problems

II. ARRAYS & STRINGS

Linear Traversal Algorithms
Subarrays & Substrings
Prefix Sum Problems
Matrix or 2D Arrays
Big Integers as Arrays
Indexing Based Hashing
String Immutability
String Matching Problems

III. NUMBER THEORY & MATHS

Euclid's Algorithm (GCD & LCM)
Prime Numbers & Prime Sieve
Factorization & Prime Factorization
Modular Arithmetic
Inclusion-Exclusion Principle

COURSE CURRICULUM

IV. RECURSION & BACKTRACKING

Head & Tail Recursion
Subset or Subsequences
Maze Path Problems
Keypad Sequence Problems
Permutations & Combinations
Coin Change Problems
N Queens & Knight's Tour
Sudoku & Puzzle Problems

V. COMPLEXITY ANALYSIS

Asymptotic Analysis vs Amortized Analysis
Time Complexity Chart
Space Complexity

VI. SORTING ALGORITHMS

Basic Sorting Algorithms
(Bubble, Selection & Insertion)
Divide & Conquer Algorithms
(Merging and Merge Sort)
Partitioning Based Algorithms
(Quick Select, Quick Sort, Dutch
National Flag Sort, Wiggle Sort)
Counting Based Algorithms
(Count, Radix, Bucket, Frequency)

COURSE CURRICULUM

VII. SEARCHING ALGORITHMS

- Binary Search Basics
(Lower and Upper Bound, First and Last Occurrence, Floor and Ceil)
- Binary Search Variations
(Rotated Sorted Array, Nearly Sorted Array, Mountain Array, Sorted Grids)
- Binary Search on Answer
(Book Allocation/Painter's Partition, Koko Eating Bananas, Aggressive Cows)

VIII. CLASSES & OBJECTS

Encapsulation (Classes & Objects)
Inheritance & Composition
Polymorphism (Overloading vs Overriding)
Abstraction (Abstract class vs Interface)

IX. LINKED LIST

Design Singly, Doubly, Circular List
Two Pointer Technique
Floyd's Cycle Detection
Reversing, Sorting & Rearranging
Big Integers as List
Design LRU Cache

COURSE CURRICULUM

X. STACK & QUEUE

Design Stack & Queue
Doubly Ended Queue (Deque)
Parentheses Matching
Expression Evaluation
Monotonic Stack

XI. HEAP & GREEDY ALGORITHM

Design Priority Queue or Binary Heap
Heap Sort Algorithm
Comparable vs Comparator
Lambda Expression (Arrow Functions)
Heap Order Statistics
Huffman Encoding & Decoding
Meeting Rooms & Activity Selection
Array Permutations & Partitions

XII. HASHING ALGORITHMS

Design HashMap and HashSet
Separate Chaining vs Open Addressing
Intersection & Union
Subarray Sum Problems
Basic Geometry Problems

COURSE CURRICULUM

XIII. TWO POINTER ALGORITHM

Target Sum Pairs, Triplets, Quadruplets
Static Sliding Window
Dynamic Sliding Window

XIV. BINARY TREES & BST

Depth First Search (DFS)
(Height, Diameter, Subtree Problems)
Breadth First Search (BFS) - Level Order
Vertical, Diagonal, Boundary Traversals
LRTB Views of Tree
Lowest Common Ancestor
Morris Traversal - Threaded Tree
Construct Trees from Traversals
Generic or Nary Trees
Binary Search Trees
Rerooting Technique or DP on Trees

XV.TRIE OR PREFIX TREE

Design or Implementation
Dictionary or Suggestion Systems
Binary Trie Problems

COURSE CURRICULUM

XVI. DYNAMIC PROGRAMMING

- Recursive DP or Memoization

- Iterative DP or Tabulation

- *Fibonacci Sequence*
- *Climbing Stairs*
- *House Robber*
- *Knapsack Problems*
- *Coin Change Problems*
- *Stock Buying & Selling*
- *Target Sum Subset*
- *DP on Grids or Matrix*
- *Longest Increasing Subsequence*
- *Longest Common Subsequence*
- *Catalan Numbers*
- *Kadane's Algorithm*
- *DP on Game Theory*
- *Matrix Chain Multiplication*

XVII. BIT MANIPULATION

Number System Conversions

Bitmasking & Bitsets

Hamming Code & Weights

Unique Numbers, Gray Codes

XOR Operation Problems

COURSE CURRICULUM

XVIII. GRAPH ALGORITHMS

- *Graph Data Structure*
- *Types of Graphs & Representation*
- *Basic BFS and DFS Problems*
- *Hamiltonian Path & Cycle*
- *Euler Path & Circuit*
- *Connected Components*
- *Cycle Detection*
- *Topological Sorting*
- *Graph Coloring Algorithm*
- *Unweighted Graph Shortest Path*
- *Dijkstra's Algorithm*
- *Bellman Ford Algorithm*
- *Floyd Warshall Algorithm*
- *Directed Acyclic Graph Shortest Path*
- *Disjoint Set Union (DSU)*
- *Minimum Spanning Tree (Prim's and Kruskal's Algorithm)*
- *Articulation Point & Bridges*

AND.. BONUS CONTENT:

Low Level System Design

Competitive Programming

Pointers in C++