🚀 DSA Master

InstaByte
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Welcome, Interview Masters!

Today we have curated a list of the *Top Data Structures and Algorithms* to study for interviews.

These concepts will teach you the core techniques you need to know to crush any technical interview.

Algorithms are divided into 2 broad categories:

1. Data Structure specific algorithms
2. General algorithms/techniques

Implement all the algorithms unless otherwise specified.

We will be using some of these algorithms in next editions of Interview Master (if not already covered in the previous editions).

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THE ULTIMATE DSA GUIDE

Data Structure specific algorithms

1. Arrays

- Sorting:
  - QuickSort: Efficient average-case time complexity (O(nlog n))
  - MergeSort: Stable sort, useful when order matters (O(nlog n))
- Searching:
  - Binary Search: Fast search in sorted arrays (O(log n))
- Two Pointers:
  - In-place manipulation, often for sorted arrays (e.g., removing duplicates)
- Sliding Window:
  - Subarray problems, finding maximum/minimum within a window

2. Linked Lists

- Traversal:
  - Iterate through the list, understand the node structure
- Insertion/Deletion:
  - At beginning, end, or at a specific position
- Reversal:
  - In-place reversal, recursive and iterative approaches

- Floyd's Tortoise and Hare algorithm

3. Hash Tables (Hash Maps/Sets)

- Implementation not needed. Just understand following:
  - Understand how hash functions work
  - Insertion/Deletion/Lookup
  - Collision Handling

4. Trees (Binary Trees, Binary Search Trees, etc.)

- Traversal:
  - Inorder, Preorder, Postorder (recursive and iterative)
- Searching:
  - Find a node with a given value (especially in BSTs)

5. Stacks

- Implementation not needed. Just understand following:
  - Push/Pop/Peek Operations

6. Queues

- Implementation not needed. Just understand following:
  - Enqueue/Dequeue Operations

7. Heaps (Priority Queues)

- Implementation not needed. Just understand following:
  - Insertion/Deletion (extract-min/max)
  - Building a Heap
- Top K Elements:
  - Using a heap to find k largest/smallest elements

8. Graphs

- Traversal:
  - Breadth-First Search (BFS)
  - Depth-First Search (DFS)
- Shortest Path:
  - Dijkstra's Algorithm
- Cycle Detection:
  - DFS

9. Tries

- Implement Trie from scratch
- Insertion/Searching:
  - For words/prefixes
- Autocompletion:
  - Using a trie for word suggestions

10. Union-Find (Disjoint Set)

- Implement Union-Find from scratch
- Find/Union Operations
- Cycle Detection in undirected graphs

General algorithms/techniques

1. Recursion

- Defining a problem in terms of itself, often leading to elegant and concise solutions.
- Solve: Factorial calculation, tree traversals, depth-first search.

2. Dynamic Programming

- Breaking down a problem into overlapping subproblems and storing solutions to avoid recomputation.
- Solve: Fibonacci sequence, Knapsack problem, Longest Common Subsequence.

3. Greedy Algorithms

- Making locally optimal choices at each step with the hope of finding a global optimum.
- Implement: Kruskal's algorithm for minimum spanning trees.

4. Backtracking

- Incrementally building solutions, exploring all possible paths, and abandoning invalid ones.
- Solve: Sudoku solver, N-Queens problem, generating permutations.

WHAT'S NEXT?

Once you have implemented the above algorithms, solve *Interview Master 100*, which contains top 100 interview problems.

Each problem builds upon previous problems so that you can gradually

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Until next time, take care! 🚀

Cheers,

Sahil + Sarra

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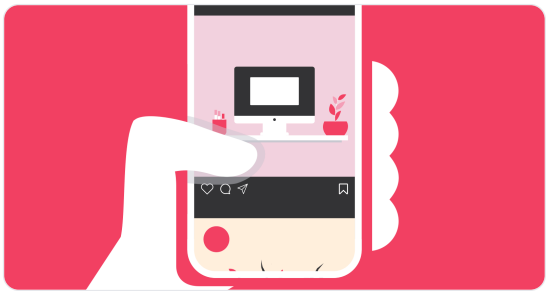

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