

DSA Patterns

Array

When preparing for Data Structures and Algorithms (DSA) interviews, it's crucial to master certain patterns that frequently arise in array problems.

1 Sliding Window

Maximum sum subarray of size K

Longest substring without repeating characters

Count of anagrams in a string

2 Two Pointers

✓ Key Problems:

Pair with a given sum

Merge two sorted arrays

Trapping Rain Water

3 Kadane's Algorithm

✓ Key Problems:

Maximum Sum Subarray

Maximum Circular Subarray Sum

4 Sorting-based Problems

✓ Key Problems:

Find triplets that sum to zero

Minimum platforms required for trains

Largest number formed from an array

5 Binary Search on Arrays

✓ Key Problems:

Search in a rotated sorted array

Find the first and last position of an element

Median of two sorted arrays

6 Prefix Sum & Difference Array

✓ Key Problems:

Subarray sum equals K

Range addition using difference array

Equilibrium index of an array

7 Greedy Techniques

Used when making local optimal choices leads to global optimal solutions.

✓ Key Problems:

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Maximum meetings in one room
Minimum number of platforms required
Candy distribution

8 Matrix Variations (2D Arrays)

2D problems often include pathfinding and dynamic programming.

✓ Key Problems:

Spiral matrix traversal
Rotate a matrix by 90 degrees
Search in a 2D matrix

9 Hashing in Arrays

Involves optimizing searches and pair/group detections.

✓ Key Problems:

Two-sum problem
Longest consecutive subsequence
Count distinct elements in every window

10 Advanced Techniques

These are critical for tougher questions often seen in top-tier interviews.

✓ Key Problems:

Maximum product subarray
Subarray with XOR K
Partition array into disjoint intervals

Strings

1. Sliding Window Pattern

- **Key Idea:** Maintain a sliding window to check substrings or character frequencies.
- **Problems:**
 - Longest Substring Without Repeating Characters
 - Minimum Window Substring
 - Longest Substring with At Most K Distinct Characters
 - Check if String Contains All Anagrams of Another String

2. Two Pointers Pattern

- **Key Idea:** Use two pointers to manipulate string indices.
- **Problems:**

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- Valid Palindrome
 - Reverse Words in a String
 - Longest Palindromic Substring
 - Compare Backspaced Strings
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3. Prefix Sum / Cumulative Frequency

- **Key Idea:** Use prefix sums or hashmaps for cumulative frequency calculations.
 - **Problems:**
 - Substring with Equal 0s and 1s (Binary Strings)
 - Longest Substring with Balanced Parentheses
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4. Hashing (Frequency Count)

- **Key Idea:** Use hashmaps to store character frequencies or substrings.
 - **Problems:**
 - Group Anagrams
 - First Unique Character in a String
 - Longest Substring with K Unique Characters
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5. Dynamic Programming (DP)

- **Key Idea:** Solve complex problems by breaking them into subproblems.
 - **Problems:**
 - Longest Palindromic Subsequence
 - Edit Distance
 - Longest Common Subsequence
 - Wildcard Matching
 - Regular Expression Matching
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6. Backtracking

- **Key Idea:** Explore all possibilities by making choices and backtracking.

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- **Problems:**
 - Generate All Permutations of a String
 - Word Break Problem
 - Palindrome Partitioning
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7. String Searching Algorithms

- **Key Idea:** Efficient algorithms to search substrings or patterns in strings.
 - **Problems:**
 - Implement KMP Algorithm (Knuth-Morris-Pratt)
 - Implement Rabin-Karp Algorithm
 - Z-Algorithm for Pattern Searching
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8. Trie (Prefix Tree)

- **Key Idea:** Data structure for efficient prefix searching.
 - **Problems:**
 - Longest Word in Dictionary
 - Search Suggestions System
 - Implement Autocomplete
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9. Bit Manipulation for Strings

- **Key Idea:** Use bitmasking for unique character operations.
 - **Problems:**
 - Maximum Length of Concatenated String with Unique Characters
 - Subsets with Unique Characters Using Bitmask
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10. Regular Expressions

- **Key Idea:** Use regex-like approaches to handle string pattern matching.
- **Problems:**
 - Regular Expression Matching (DP-based)

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- Wildcard Matching
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11. Mathematical String Problems

- **Key Idea:** Strings that involve numerical computations or encodings.
 - **Problems:**
 - Add Binary Strings
 - Multiply Strings
 - Decode Ways
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12. Greedy Algorithms

- **Key Idea:** Solve problems by making optimal choices at every step.
 - **Problems:**
 - Rearrange Characters to Avoid Repetition
 - Minimum Swaps to Make Strings Equal
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13. Compression and Encoding

- **Key Idea:** Work with compressing or encoding strings.
 - **Problems:**
 - Run-Length Encoding
 - Count and Say Problem
 - Decode String
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14. Miscellaneous Patterns

- **Rotations and Shifts:**
 - Check if Two Strings are Rotations of Each Other
 - Minimum Shifts to Match Strings
- **String Multiplication and Power:**
 - Implement String to Integer Conversion (atoi)
 - Power of Strings (Repeated Substrings)

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2. Stack and Queue

- **Monotonic Stack/Queue**
 - Next Greater Element
 - Largest Rectangle in Histogram
 - Sliding Window Maximum
 - **Stack Operations**
 - Valid Parentheses
 - Evaluate Reverse Polish Notation
 - **Queue Operations**
 - Implement LRU Cache
 - Circular Queue
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3. Linked List

- **Classic Problems**
 - Reverse a Linked List
 - Detect and Remove Cycle in a Linked List
 - Merge Two Sorted Lists
 - **Advanced Patterns**
 - Flatten a Multilevel Doubly Linked List
 - Add Two Numbers Represented as Linked Lists
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4. Binary Search

- **Search Problems**
 - Search in Rotated Sorted Array
 - Median of Two Sorted Arrays
- **Range Problems**
 - Kth Smallest/Largest Element in Sorted Matrix

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- **Allocate Minimum Pages**
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5. Graph

- **Graph Traversals**
 - **BFS and DFS**
 - **Connected Components**
 - **Shortest Path**
 - **Dijkstra's Algorithm**
 - **Bellman-Ford Algorithm**
 - **Advanced Graph Problems**
 - **Minimum Spanning Tree (Prim/Kruskal)**
 - **Topological Sorting**
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6. Trees

- **Basic Tree Traversals**
 - **Inorder, Preorder, Postorder**
 - **Tree Algorithms**
 - **Lowest Common Ancestor**
 - **Diameter of Binary Tree**
 - **Zigzag Level Order Traversal**
 - **Binary Search Trees**
 - **Validate BST**
 - **Kth Smallest Element**
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7. Hashing

- **Frequency Count**
 - **Two Sum**
 - **Longest Substring with K Unique Characters**
- **Subarray Problems**

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- **Count Subarrays with Sum Divisible by K**
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8. Recursion and Backtracking

- **Classic Problems**
 - **Subset Sum**
 - **N-Queens Problem**
 - **String Backtracking**
 - **Word Search**
 - **Generate All Permutations of a String**
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9. Dynamic Programming

- **Knapsack Problems**
 - **0/1 Knapsack**
 - **Subset Sum**
 - **String DP**
 - **Longest Common Subsequence**
 - **Edit Distance**
 - **Grid-Based DP**
 - **Unique Paths**
 - **Minimum Path Sum**
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10. Greedy Algorithms

- **Interval Problems**
 - **Activity Selection Problem**
 - **Minimum Platforms**
 - **Optimization Problems**
 - **Huffman Encoding**
 - **Fractional Knapsack**
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Advanced DSA Patterns

1. Tries

- **Prefix Matching**
 - Implement Trie
 - Longest Word in Dictionary
 - **Pattern Searching**
 - Word Search II
 - Replace Words
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2. Segment Trees and Fenwick Trees

- **Range Queries**
 - Range Sum Query
 - Range Minimum Query
 - **Lazy Propagation**
 - Range Updates in Segment Tree
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3. Heap (Priority Queue)

- **K Problems**
 - Kth Largest Element in Array
 - Merge K Sorted Lists
 - **Advanced Problems**
 - Top K Frequent Elements
 - Sliding Window Median
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4. Bit Manipulation

- **Single Number Problems**
 - Find the Single Number (XOR Logic)
 - Power of Two
- **Subsets Using Bitmasking**

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- **Generate All Subsets**
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5. Mathematical Problems

- **Number Theory**
 - **Sieve of Eratosthenes**
 - **Modular Arithmetic**
 - **String and Numbers**
 - **Multiply Strings**
 - **Add Binary**
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Practice Approach

1. **Solve 250+ curated problems covering these patterns.**
2. **Target platforms like LeetCode, Codeforces, and InterviewBit.**
3. **Focus on company-specific problems, especially from Google, Amazon, Flipkart, etc.**
4. **Analyze problems to identify pattern overlaps (e.g., Sliding Window + Hashing).**

Top DSA Creator on YouTube

1. APNA College(6.23M) - [\(749\) Apna College - YouTube](#) (Baap k Baap)
 2. Abdul Bari(1 M)
 3. Aditya Verma - Focuses on solving problems step-by-step, with special emphasis on Dynamic Programming (DP).
 4. Love Babbar - Covers DSA problems with a practical approach and also has the famous "450 DSA Questions" series.
 5. triver (Take U Forward) - Offers playlists on DSA, competitive programming, and system design.
 6. CodeWithHarry - Beginner-friendly tutorials on DSA and coding.
 7. Pepcoding- Comprehensive coverage of DSA and coding problems.
 8. NeetCodeIO - [\(749\) NeetCodeIO - YouTube](#)
 9. NeetCode (874 K) - [My Brain after 569 Leetcode Problems](#)
 10. Gaurav Sen (System Design and Algorithm)(607 k) - [\(749\) Gaurav Sen - YouTube](#)
 11. Anuj Bhaiya(507k) - [\(749\) Anuj Bhaiya - YouTube](#)
 12. Neso Academy
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