Category	Algorithm/Technique	Description	Practical Applications	Best Content to Learn	Problems to Solve
Sorting Algorithms	Bubble Sort	Repeatedly swaps adjacent elements if they are in t	Learning algorithm behavior; rarely used in practice	GeeksforGeeks: Bubble Sort Tutorial	Sort an array, Detect nearly sorted arrays
	Selection Sort	Selects the smallest element and places it in the sc	Memory write optimization.	GeeksforGeeks: Selection Sort	Sort array by selection method
	Insertion Sort	Places each element in its correct position in the sc	Small or nearly sorted datasets.	CS50 Lecture: Sorting Visualized	Insertion sort animations, Median of a sorted array
	Merge Sort	Divides array into halves, sorts each, and merges th	Sorting linked lists, external sorting.	Coursera: Divide and Conquer Algorithms	Count inversions in an array
	Quick Sort	Partitions array around a pivot, sorts recursively.	General-purpose sorting; efficient average-case per	Udemy: Sorting Techniques Masterclass	Kth smallest/largest element
	Heap Sort	Uses a binary heap to sort elements.	Priority queues, memory-constrained environments	GeeksforGeeks: Heap Sort Explanation	Find median from a stream of numbers
Searching Algorithms	Linear Search	Checks every element until the target is found.	Simple search in unsorted data.	Khan Academy: Searching Algorithms Basics	Find a missing number in an array
	Binary Search	Divides the search range in half (sorted data).	Searching in sorted arrays/lists.	Neetcode Binary Search Playlist	Search in rotated sorted array
	Exponential Search	Extends binary search for unbounded or very large	Searching in infinite streams of data.	TutorialsPoint: Exponential Search Algorithm	Find bounds of target in an infinite array
Dynamic Programming	Fibonacci Numbers	Efficient computation of nth Fibonacci number.	Financial modeling, biological computations.	YouTube: DP Basics by Tushar Roy	Nth Fibonacci number, Climbing stairs
	Longest Common Subsequence	Finds longest subsequence present in both sequen	File diff tools, DNA sequence alignment.	Dynamic Programming Course by MIT	LCS of two strings, Compare file versions
	Knapsack Problem	Optimizes item selection within a weight limit.	Resource allocation, budget planning.	Dynamic Programming by Aditya Verma	0/1 Knapsack, Fractional Knapsack
	Matrix Chain Multiplication	Finds the optimal way to multiply matrices.	Compiler optimization.	DP Series by Love Babbar on YouTube	Optimal matrix multiplication
	Subset Sum Problem	Checks if a subset adds up to a given value.	Cryptography, finance.	Algorithms for Competitive Programming - CP Han	Partition array into equal subsets
Graph Algorithms	Breadth-First Search (BFS)	Explores all neighbors at the current depth before n	Shortest path in unweighted graphs, social network	YouTube: Graph Algorithms by Abdul Bari	Number of islands, Word ladder
	Depth-First Search (DFS)	Explores as far as possible along a branch before b	Detecting cycles, solving mazes.	Graph Theory Basics by GeeksforGeeks	Find connected components in a graph
	Dijkstra's Algorithm	Finds shortest path in weighted graphs.	GPS navigation, network routing.	Coursera: Shortest Path Algorithms	Shortest path in a weighted graph
	Bellman-Ford Algorithm	Handles negative weights in shortest path problem	Currency arbitrage, transportation.	Brilliant.org: Advanced Algorithms	Detect negative weight cycles in graphs
	Floyd-Warshall Algorithm	Finds shortest paths between all vertex pairs.	Network analysis, finding transitive closure.	TutorialsPoint: Floyd-Warshall Explanation	Find all-pairs shortest paths
	Kruskal's Algorithm	Finds minimum spanning tree using edge sorting.	Designing networks like electrical grids.	Spanning Tree Algorithms on HackerRank	Connect all points with minimum cost
	Prim's Algorithm	Builds minimum spanning tree incrementally.	Network optimization.	Prim's Algorithm Visualization Tools	Minimum cost to connect all cities
	Topological Sort	Orders vertices in a Directed Acyclic Graph (DAG).	Task scheduling, dependency resolution.	Kahn's Algorithm by Tushar Roy	Course scheduling
Divide and Conquer	Binary Search	Efficient searching in sorted arrays.	As above.	Binary Search Playlist by Neetcode	Aggressive cows, Allocate books
	Merge Sort	Sorting using divide-and-conquer strategy.	As above.	Merge Sort Explained with Animations	Count inversions
	Quick Sort	Sorting using partitioning.	As above.	Quick Sort Explained	Find the kth largest element
	Closest Pair of Points	Finds the closest pair in a set of points.	Computational geometry, clustering.	Computational Geometry Course on Coursera	Closest pair of points
Greedy Algorithms	Activity Selection Problem	Maximizes non-overlapping activities.	Scheduling, resource allocation.	Udemy: Greedy Algorithms Course	Maximum meetings in a room
	Huffman Coding	Constructs prefix-free code for data compression.	File compression (e.g., ZIP, JPEG).	Huffman Coding Visualization	Encode and decode strings using Huffman
	Kruskal's and Prim's	Greedy approach for minimum spanning tree.	As above.	As above.	As above.
	Fractional Knapsack Problem	Optimizes profit for fractional weights.	Resource allocation.	Fractional Knapsack Explained	Maximize profit from a knapsack
Backtracking	N-Queens Problem	Places N queens on NxN board without attacking e	Constraint satisfaction problems.	Backtracking Series by Tushar Roy	N-Queens, Rat in a maze
	Sudoku Solver	Solves Sudoku using recursion and backtracking.	Puzzle solvers, constraint logic.	Sudoku Solvers on GeeksforGeeks	Sudoku grid filling
	Hamiltonian Path	Checks if a path visits each vertex exactly once.	TSP (Traveling Salesman Problem).	Hamiltonian Path Videos by Abdul Bari	Find Hamiltonian path in graphs

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String Algorithms	KMP Algorithm	Efficiently finds a pattern in a string.	Text editors, search engines.	KMP Pattern Matching Tutorial	Find all occurrences of a pattern in a string
	Rabin-Karp Algorithm	Finds patterns using hashing.	Plagiarism detection, substring search.	Rabin-Karp Visualization	Find plagiarism in text
	Longest Palindromic Substring	Finds the largest palindrome in a string.	DNA analysis, data encryption.	Palindromic Strings by Tushar Roy	Find palindromic substrings
Computational Geometry	Convex Hull	Finds smallest convex polygon containing all points	Computer graphics, GIS.	Convex Hull Algorithms by Brilliant.org	Construct the convex hull of points
	Line Sweep Algorithm	Detects intersecting line segments.	CAD tools, map overlays.	Line Sweep Tutorials	Find line intersections
Other Techniques	Sliding Window Technique	Optimizes problems involving contiguous subarrays	Maximum sum subarray, longest substring without	Sliding Window Patterns on Neetcode	Longest substring, Maximum sum subarray
	Two-Pointer Technique	Solves problems with two markers moving through	Pair sum problems, merging sorted arrays.	Two Pointers Explained	3-sum problem, Container with most water
	Union-Find (Disjoint Set)	Manages dynamic connectivity efficiently.	Network connectivity, Kruskal's Algorithm.	Union-Find Tutorials by Codeforces	Detect cycles in a graph
	Bit Manipulation	Solves problems using binary operations.	Subset generation, fast computation.	Bit Manipulation on Leetcode	Subsets, Find missing numbers using XOR.