

## Common Algorithms - Time & Space Complexity

### Sorting Algorithms

Algorithm	Best	Average	Worst	Space	Stable
Bubble Sort	$O(n)$	$O(n^2)$	$O(n^2)$	$O(1)$	Yes
Selection Sort	$O(n^2)$	$O(n^2)$	$O(n^2)$	$O(1)$	No
Insertion Sort	$O(n)$	$O(n^2)$	$O(n^2)$	$O(1)$	Yes
Merge Sort	$O(n \log n)$	$O(n \log n)$	$O(n \log n)$	$O(n)$	Yes
Quick Sort	$O(n \log n)$	$O(n \log n)$	$O(n^2)$	$O(\log n)$	No
Heap Sort	$O(n \log n)$	$O(n \log n)$	$O(n \log n)$	$O(1)$	No
Counting Sort	$O(n + k)$	$O(n + k)$	$O(n + k)$	$O(k)$	Yes
Radix Sort	$O(nk)$	$O(nk)$	$O(nk)$	$O(n + k)$	Yes
Bucket Sort	$O(n + k)$	$O(n + k)$	$O(n^2)$	$O(n + k)$	Yes

### Searching Algorithms

Algorithm	Best	Average	Worst	Space
Linear Search	$O(1)$	$O(n)$	$O(n)$	$O(1)$
Binary Search	$O(1)$	$O(\log n)$	$O(\log n)$	$O(1)$

### Graph Algorithms

Algorithm	Time	Space
BFS	$O(V + E)$	$O(V)$
DFS	$O(V + E)$	$O(V)$
Dijkstra (Heap)	$O((V + E) \log V)$	$O(V)$
Bellman-Ford	$O(VE)$	$O(V)$
Floyd-Warshall	$O(V^3)$	$O(V^2)$
Prim's (Heap)	$O(E \log V)$	$O(V)$
Kruskal's	$O(E \log E)$	$O(V)$
Topological Sort	$O(V + E)$	$O(V)$

### Dynamic Programming

Problem	Time	Space
0/1 Knapsack	$O(nW)$	$O(nW)$
LCS	$O(nm)$	$O(nm)$
LIS	$O(n \log n)$	$O(n)$
Matrix Chain	$O(n^3)$	$O(n^2)$
Edit Distance	$O(nm)$	$O(nm)$
Coin Change	$O(n * \text{amount})$	$O(\text{amount})$

### Greedy Algorithms

## Common Algorithms - Time & Space Complexity

Algorithm	Time	Space
Activity Selection	$O(n \log n)$	$O(1)$
Fractional Knapsack	$O(n \log n)$	$O(1)$
Huffman Coding	$O(n \log n)$	$O(n)$

### Backtracking

Problem	Time	Space
N-Queens	$O(N!)$	$O(N^2)$
Sudoku Solver	$O(9^{\text{empty}})$	$O(1)$
Subset Sum	$O(2^n)$	$O(n)$
Permutations	$O(n!)$	$O(n)$

### String Algorithms

Algorithm	Time	Space
Naive Matching	$O(nm)$	$O(1)$
KMP	$O(n + m)$	$O(m)$
Rabin-Karp	$O(n + m)$	$O(1)$
Trie Ops	$O(L)$	$O(\text{ALPHABET} * L)$
Suffix Array	$O(n \log n)$	$O(n)$
Manacher's	$O(n)$	$O(n)$