Time Complexity Table for Data Structures and Algorithms

Data Structures

Concept / Data Structure	Access	Search	Insertion	Deletion	Comments
Array (Static)	O(1)	O(n)	O(n)	O(n)	Fixed size
Dynamic Array	O(1)	O(n)	O(1) amortized	O(n)	Resize when full
Singly Linked List	O(n)	O(n)	O(1)	O(1)	Head operations only
Doubly Linked List	O(n)	O(n)	O(1)	O(1)	Can delete from both end
Stack	O(n)	O(n)	O(1)	O(1)	LIFO
Queue	O(n)	O(n)	O(1)	O(1)	FIFO
Deque	O(1)	O(n)	O(1)	O(1)	Double-ended
Hash Table	N/A	O(1)/O(n)	O(1)/O(n)	O(1)/O(n)	Collision resolution matte
BST	O(log n)	O(log n)	O(log n)	O(log n)	Unbalanced worst O(n)
AVL Tree	O(log n)	O(log n)	O(log n)	O(log n)	Balanced BST
Red-Black Tree	O(log n)	O(log n)	O(log n)	O(log n)	Balanced BST
Segment Tree	O(log n)	O(log n)	O(log n)	O(log n)	Range queries
Fenwick Tree	N/A	O(log n)	O(log n)	O(log n)	Prefix sums
Heap	O(n)	O(n)	O(log n)	O(log n)	Priority queue use
Trie	O(L)	O(L)	O(L)	O(L)	L = length of word
Graph (Adj. List)	O(V+E)	O(V+E)	O(1)	O(1)	Space-efficient
Graph (Adj. Matrix)	O(1)	O(1)	O(1)	O(1)	Space: O(V^2)

Algorithms

Algorithm	Best Case	Average Case	Worst Case	Remarks
Linear Search	O(1)	O(n)	O(n)	Unsorted
Binary Search	O(1)	O(log n)	O(log n)	Sorted array
Bubble Sort	O(n)	$O(n^2)$	$O(n^2)$	Simple but inefficient
Insertion Sort	O(n)	$O(n^2)$	$O(n^2)$	Good for small data
Selection Sort	$O(n^2)$	$O(n^2)$	$O(n^2)$	In-place
Merge Sort	O(n log n)	O(n log n)	O(n log n)	Stable sort
Quick Sort	O(n log n)	O(n log n)	$O(n^2)$	In-place, fast avg
Heap Sort	O(n log n)	O(n log n)	O(n log n)	In-place

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Counting Sort	O(n + k)	O(n + k)	O(n + k)	k = range of input
Radix Sort	O(nk)	O(nk)	O(nk)	k = number of digits
KMP	O(n + m)	O(n + m)	O(n + m)	Efficient pattern matching
DFS / BFS	O(V + E)	O(V + E)	O(V + E)	
Dijkstra's	$O(V^2)$/O((V+E)logV)	Same	Same	PQ speeds it up
Bellman-Ford	O(VE)	O(VE)	O(VE)	Handles negatives
Floyd-Warshall	$O(V^3)$	$O(V^3)$	$O(V^3)$	All-pairs shortest path
Kruskal's	O(E log E)	O(E log E)	O(E log E)	MST
Prim's	O(E + log V)	O(E + log V)	O(E + log V)	MST with PQ