Big-O Cheat Sheet

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1 Searching

Algorithm	Data Structure	Time Complexity		Space Complexity
		Average	Worst	
Depth First Search (DFS)	Graph of $|V|$ vertices and $|E|$ edges	-	$O\left(|E|+|V|\right)$	$O\left(|V|\right)$
Breadth First Search (BFS)	Graph of $|V|$ vertices and $|E|$ edges	-	$O\left(|E|+|V|\right)$	$O\left(|V|\right)$
Binary search	Sorted array of n elements	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(1\right)$
Linear (Brute Force)	Array	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$
Shortest path by Dijkstra, using a Min-heap as priority queue	Graph with $|V|$ vertices and $|E|$ edges	$O\left((|V|+|E|)\log|V|\right)$	$O\left((|V|+|E|)\log|V|\right)$	$O\left(|V|\right)$
Shortest path by Dijkstra, using an unsorted array as priority queue	Graph with $|V|$ vertices and $|E|$ edges	$O\left(|V|^2\right)$	$O\left(|V|^2\right)$	$O\left(|V|\right)$
Shortest path by Bellman-Ford	Graph with $|V|$ vertices and $|E|$ edges	$O\left(|V||E|\right)$	$O\left(|V||E|\right)$	$O\left(|V|\right)$

2　Sorting

Algorithm	Data Structure	Time Complexity			Worst Case Auxiliary Space Complexity
		Best	Average	Worst	
Quicksort	Array	$O\left(n\log(n)\right)$	$O\left(n\log(n)\right)$	$O\left(n^2\right)$	$O\left(n\right)$
Mergesort	Array	$O\left(n\log(n)\right)$	$O\left(n\log(n)\right)$	$O\left(n\log(n)\right)$	$O\left(n\right)$
Heapsort	Array	$O\left(n\log(n)\right)$	$O\left(n\log(n)\right)$	$O\left(n\log(n)\right)$	$O\left(1\right)$
Bubble Sort	Array	$O\left(n\right)$	$O\left(n^2\right)$	$O\left(n^2\right)$	$O\left(1\right)$
Insertion Sort	Array	$O\left(n\right)$	$O\left(n^2\right)$	$O\left(n^2\right)$	$O\left(1\right)$
Select Sort	Array	$O\left(n^2\right)$	$O\left(n^2\right)$	$O\left(n^2\right)$	$O\left(1\right)$
Bucket Sort	Array	$O\left(n+k\right)$	$O\left(n+k\right)$	$O\left(n^2\right)$	$O\left(nk\right)$
Radix Sort	Array	$O\left(nk\right)$	$O\left(nk\right)$	$O\left(nk\right)$	$O\left(n+k\right)$

3　Data Structures

Data Structure	Time Complexity								Space Complexity
	Average				Worst				
	Indexing	Search	Insertion	Deletion	Indexing	Search	Insertion	Deletion	
Basic Array	$O\left(1\right)$	$O\left(n\right)$	-	-	$O\left(1\right)$	$O\left(n\right)$	-	-	$O\left(n\right)$
Dynamic Array	$O\left(1\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$
Singly-Linked List	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$	$O\left(1\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$	$O\left(1\right)$	$O\left(n\right)$
Doubly-Linked List	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$	$O\left(1\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(1\right)$	$O\left(1\right)$	$O\left(n\right)$
Skip List	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\log(n)\right)$
Hash Table	-	$O\left(1\right)$	$O\left(1\right)$	$O\left(1\right)$	-	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$
Binary Search Tree	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$
Cartresian Tree	-	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	-	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$	$O\left(n\right)$
B-Tree	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$
Red-Black Tree	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$
Splay Tree	-	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	-	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$
AVL Tree	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(\log(n)\right)$	$O\left(n\right)$