| Good | Fair | Poor |
|---|---|---|

# Searching

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

# Sorting

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

# Data Structures

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

# Heaps

| Heaps | Time Complexity | | | | | | |
|---|---|---|---|---|---|---|---|
| | Heapify | Find Max | Extract Max | Increase Key | Insert | Delete | Merge |
| Linked List (sorted) | - | O(1) | O(1) | O(n) | O(n) | O(1) | O(m+n) |
| Linked List (unsorted) | - | O(n) | O(n) | O(1) | O(1) | O(1) | O(1) |
| Binary Heap | O(n) | O(1) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(m+n) |
| Binomial Heap | - | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) |
| Fibonacci Heap | - | O(1) | O(log(n))* | O(1)* | O(1) | O(log(n))* | O(1) |

# Graphs

| Node / Edge Management | Storage | Add Vertex | Add Edge | Remove Vertex | Remove Edge | Query |
|---|---|---|---|---|---|---|
| Adjacency list | O(\|V\|+\|E\|) | O(1) | O(1) | O(\|V\| + \|E\|) | O(\|E\|) | O(\|V\|) |
| Incidence list | O(\|V\|+\|E\|) | O(1) | O(1) | O(\|E\|) | O(\|E\|) | O(\|E\|) |
| Adjacency matrix | O(\|V\|^2) | O(\|V\|^2) | O(1) | O(\|V\|^2) | O(1) | O(1) |
| Incidence matrix | O(\|V\| · \|E\|) | O(\|V\| · \|E\|) | O(\|V\| · \|E\|) | O(\|V\| · \|E\|) | O(\|V\| · \|E\|) | O(\|E\|) |

# Big-O Complexity Chart