**Big-O Algorithm Complexity Cheat Sheet**

**Searching**

| **Algorithm** | **Data Structure** | **Time Complexity** | | **Space Complexity** | | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Average** | **Worst** | **Worst** |  |  |
| [Depth First Search (DFS)](http://en.wikipedia.org/wiki/Depth-first_search) | Graph of |V| vertices and |E| edges | - | O(|E| + |V|) | O(|V|) |  |  |
| [Breadth First Search (BFS)](http://en.wikipedia.org/wiki/Breadth-first_search) | Graph of |V| vertices and |E| edges | - | O(|E| + |V|) | O(|V|) |  |  |
| [Binary search](http://en.wikipedia.org/wiki/Binary_search_algorithm) | Sorted array of n elements | O(log(n)) | O(log(n)) | O(1) |  |  |
| [Shortest path by Dijkstra, using a Min-heap as priority queue](http://en.wikipedia.org/wiki/Dijkstra's_algorithm) | 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](http://en.wikipedia.org/wiki/Dijkstra's_algorithm) | Graph with |V| vertices and |E| edges | O(|V|^2) | O(|V|^2) | O(|V|) |  |  |

**Sorting**

| **Algorithm** | **Data Structure** | **Time Complexity** | | | **Worst Case Auxiliary Space Complexity** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Best** | **Average** | **Worst** | **Worst** |  |  |
| [Quicksort](http://en.wikipedia.org/wiki/Quicksort) | Array | O(n log(n)) | O(n log(n)) | O(n^2) | O(log(n)) |  |  |
| [Mergesort](http://en.wikipedia.org/wiki/Merge_sort) | Array | O(n log(n)) | O(n log(n)) | O(n log(n)) | O(n) |  |  |
| [Heapsort](http://en.wikipedia.org/wiki/Heapsort) | Array | O(n log(n)) | O(n log(n)) | O(n log(n)) | O(1) |  |  |
| [Insertion Sort](http://en.wikipedia.org/wiki/Insertion_sort) | Array | O(n) | O(n^2) | O(n^2) | O(1) |  |  |
| [Selection Sort](http://en.wikipedia.org/wiki/Selection_sort) | Array | O(n^2) | O(n^2) | O(n^2) | O(1) |  |  |

**Data Structures**

| **Data Structure** | **Time Complexity** | | | | | | | | **Space Complexity** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Average** | | | | **Worst** | | | | **Worst** |
|  | **Indexing** | **Search** | **Insertion** | **Deletion** | **Indexing** | **Search** | **Insertion** | **Deletion** |  |
| [Basic Array](http://en.wikipedia.org/wiki/Array_data_structure) | O(1) | O(n) | - | - | O(1) | O(n) | - | - | O(n) |
| [Dynamic Array](http://en.wikipedia.org/wiki/Dynamic_array) (Array List) | O(1) | O(n) | O(n) | - | O(1) | O(n) | O(n) | - | O(n) |
| [Linked List](http://en.wikipedia.org/wiki/Singly_linked_list#Singly_linked_lists) | O(n) | O(n) | O(1) | O(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| [Doubly-Linked List](http://en.wikipedia.org/wiki/Doubly_linked_list) | O(n) | O(n) | O(1) | O(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| [Hash Table](http://en.wikipedia.org/wiki/Hash_table) | - | O(1) | O(1) | O(1) | - | O(n) | O(n) | O(n) | O(n) |
| [Binary Search Tree](http://en.wikipedia.org/wiki/Binary_search_tree) | - | O(log(n)) | O(log(n)) | O(log(n)) | - | O(n) | O(n) | O(n) | O(n) |
| [AVL Tree](http://en.wikipedia.org/wiki/AVL_tree) | - | 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)](http://en.wikipedia.org/wiki/Linked_list) | - | O(1) | O(1) | O(n) | O(n) | O(1) | O(m+n) |  |
| [Linked List (unsorted)](http://en.wikipedia.org/wiki/Linked_list) | - | O(n) | O(n) | O(1) | O(1) | O(1) | O(1) |  |
| [Binary Heap](http://en.wikipedia.org/wiki/Binary_heap) | O(log(n)) | O(1) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(m+n) |  |

**Graphs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Node / Edge Management** | **Storage** | **Add Vertex** | **Add Edge** | **Remove Vertex** | **Remove Edge** | **Query** |
| [Adjacency list](http://en.wikipedia.org/wiki/Adjacency_list) | O(|V|+|E|) | O(1) | O(1) | O(|V| + |E|) | O(|E|) | O(|V|) |
| [Adjacency matrix](http://en.wikipedia.org/wiki/Adjacency_matrix) | O(|V|^2) | O(|V|^2) | O(1) | O(|V|^2) | O(1) | O(1) |