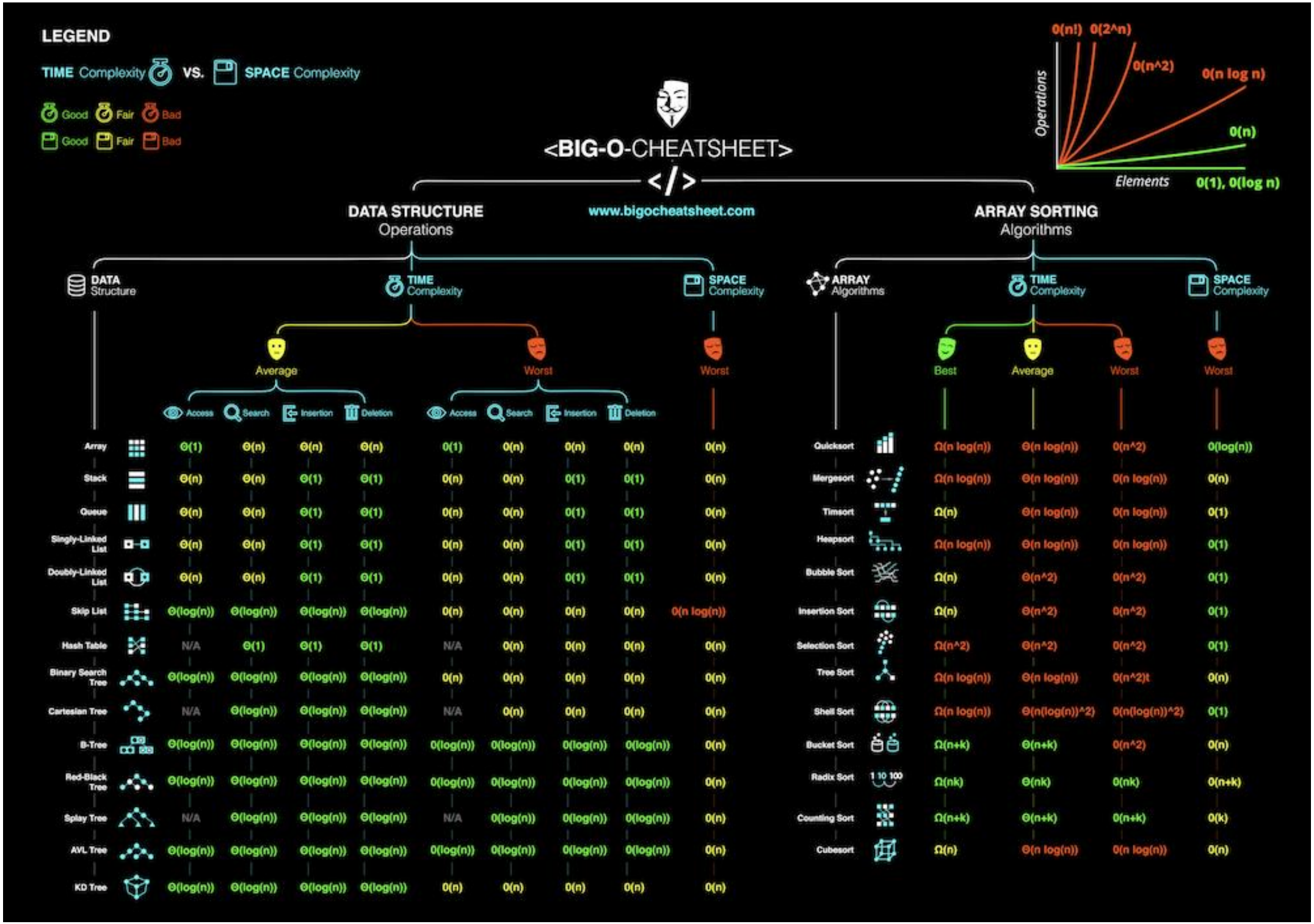
Array Sorting Algorithms

Algorithm	Time Complexity			Space Complexity
	Best	Average	Worst	Worst
Quicksort	Ω(n log(n))	θ(n log(n))	O(n^2)	O(log(n))
Mergesort	Ω(n log(n))	θ(n log(n))	O(n log(n))	O(n)
Timsort	Ω(n)	θ(n log(n))	O(n log(n))	O(n)
Heapsort	Ω(n log(n))	θ(n log(n))	O(n log(n))	O(1)
Bubble Sort	Ω(n)	θ(n^2)	O(n^2)	O(1)
Insertion Sort	Ω(n)	θ(n^2)	O(n^2)	O(1)
Selection Sort	Ω(n^2)	θ(n^2)	O(n^2)	O(1)
Tree Sort	Ω(n log(n))	θ(n log(n))	O(n^2)	O(n)
Shell Sort	Ω(n log(n))	θ(n(log(n))^2)	O(n(log(n))^2)	O(1)
Bucket Sort	Ω(n+k)	θ(n+k)	O(n^2)	O(n)
Radix Sort	Ω(nk)	θ(nk)	O(nk)	O(n+k)
Counting Sort	Ω(n+k)	θ(n+k)	O(n+k)	O(k)
Cubesort	Ω(n)	θ(n log(n))	O(n log(n))	O(n)

Common Data Structure Operations

Data Structure	Time Complexity								Space Complexity
	Average				Worst				Worst
	Access	Search	Insertion	Deletion	Access	Search	Insertion	Deletion	
Array	Θ(1)	Θ(n)	Θ(n)	Θ(n)	O(1)	O(n)	O(n)	O(n)	O(n)
Stack	Θ(n)	Θ(n)	Θ(1)	Θ(1)	O(n)	O(n)	O(1)	O(1)	O(n)
Queue	Θ(n)	Θ(n)	Θ(1)	Θ(1)	O(n)	O(n)	O(1)	O(1)	O(n)
Singly-Linked List	Θ(n)	Θ(n)	Θ(1)	Θ(1)	O(n)	O(n)	O(1)	O(1)	O(n)
Doubly-Linked List	Θ(n)	Θ(n)	Θ(1)	Θ(1)	O(n)	O(n)	O(1)	O(1)	O(n)
Skip List	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(n)	O(n)	O(n)	O(n)	O(n log(n))
Hash Table	N/A	Θ(1)	Θ(1)	Θ(1)	N/A	O(n)	O(n)	O(n)	O(n)
Binary Search Tree	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(n)	O(n)	O(n)	O(n)	O(n)
Cartesian Tree	N/A	Θ(log(n))	Θ(log(n))	Θ(log(n))	N/A	O(n)	O(n)	O(n)	O(n)
B-Tree	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(log(n))	O(log(n))	O(log(n))	O(log(n))	O(n)
Red-Black Tree	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(log(n))	O(log(n))	O(log(n))	O(log(n))	O(n)
Splay Tree	N/A	Θ(log(n))	Θ(log(n))	Θ(log(n))	N/A	O(log(n))	O(log(n))	O(log(n))	O(n)
AVL Tree	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(log(n))	O(log(n))	O(log(n))	O(log(n))	O(n)
KD Tree	Θ(log(n))	Θ(log(n))	Θ(log(n))	Θ(log(n))	O(n)	O(n)	O(n)	O(n)	O(n)


LEGEND
TIME Complexity VS. SPACE Complexity
Good Fair Bad
Good Fair Bad
<BIG-O-CHEATSHEET>
</>
www.bigocheatsheet.com
0(n!) 0(2^n)
0(n^2)
0(n log n)
0(n)
0(1), 0(log n)
Operations
Elements
DATA STRUCTURE Operations
ARRAY SORTING Algorithms
DATA Structure
TIME Complexity
SPACE Complexity
Average
Worst
Access Search Insertion Deletion
Access Search Insertion Deletion
Worst
ARRAY Algorithms
TIME Complexity
SPACE Complexity
Best
Average
Worst
Worst
Array Θ(1) Θ(n) Θ(n) Θ(n) 0(1) 0(n) 0(n) 0(n) 0(n)
Stack Θ(n) Θ(n) Θ(1) Θ(1) 0(n) 0(n) 0(1) 0(1) 0(n)
Queue Θ(n) Θ(n) Θ(1) Θ(1) 0(n) 0(n) 0(1) 0(1) 0(n)
Singly-Linked List Θ(n) Θ(n) Θ(1) Θ(1) 0(n) 0(n) 0(1) 0(1) 0(n)
Doubly-Linked List Θ(n) Θ(n) Θ(1) Θ(1) 0(n) 0(n) 0(1) 0(1) 0(n)
Skip List Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(n) 0(n) 0(n) 0(n) 0(n log(n))
Hash Table N/A Θ(1) Θ(1) Θ(1) N/A 0(n) 0(n) 0(n) 0(n)
Binary Search Tree Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(n) 0(n) 0(n) 0(n) 0(n)
Cartesian Tree N/A Θ(log(n)) Θ(log(n)) Θ(log(n)) N/A 0(n) 0(n) 0(n) 0(n)
B-Tree Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(n)
Red-Black Tree Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(n)
Splay Tree N/A Θ(log(n)) Θ(log(n)) Θ(log(n)) N/A 0(log(n)) 0(log(n)) 0(log(n)) 0(n)
AVL Tree Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(log(n)) 0(n)
KD Tree Θ(log(n)) Θ(log(n)) Θ(log(n)) Θ(log(n)) 0(n) 0(n) 0(n) 0(n) 0(n)
Quicksort Ω(n log(n)) Θ(n log(n)) 0(n^2) 0(log(n))
Mergesort Ω(n log(n)) Θ(n log(n)) 0(n log(n)) 0(n)
Timsort Ω(n) Θ(n log(n)) 0(n log(n)) 0(1)
Heapsort Ω(n log(n)) Θ(n log(n)) 0(n log(n)) 0(1)
Bubble Sort Ω(n) Θ(n^2) 0(n^2) 0(1)
Insertion Sort Ω(n) Θ(n^2) 0(n^2) 0(1)
Selection Sort Ω(n^2) Θ(n^2) 0(n^2) 0(1)
Tree Sort Ω(n log(n)) Θ(n log(n)) 0(n^2)t 0(n)
Shell Sort Ω(n log(n)) Θ(n(log(n))^2) 0(n(log(n))^2) 0(1)
Bucket Sort Ω(n+k) Θ(n+k) 0(n^2) 0(n)
Radix Sort 1 10 100 Ω(nk) Θ(nk) 0(nk) 0(n+k)
Counting Sort Ω(n+k) Θ(n+k) 0(n+k) 0(k)
Cubesort Ω(n) Θ(n log(n)) 0(n log(n)) 0(n)