Site Reliability Engineering

Enhancing Software Engineering Skills through Algorithms and Data Structures Mastery

A quick intro of myself

- Michael A Johnson
- 10+ years experience
- Meta, Adyen, Wise (Formerly TransferWise)

Why is it important to become proficient in algorithms and data structure?

- ★ Build scalable and resilient applications
- ★ Catalyst for innovation
- ★ Application adoption time is reducing
- ★ Better collaboration between SWE and SRE

Common Terminologies

- **Algorithm**: Step by step process of solving a problem
- **Data Structures**: Data organization and storage in a computer
- **Time / Space complexity**: Time / memory space required by an algorithm to run with respect to the input size.
  - Big O: O(1), O(LogN), O(N), O(NLogN), O(N^2)...

Complexity

	Constant	Logarithm	Linear	Linearithmic	Quadratic
Input Size	O(1)	O(LogN)	O(N)	O(NLogN)	O(N^2)
10	1	4	10	40	100
1000	1	10	1000	10000	1000000
100000	1	17	100000	1700000	10000000000
10000000	1	24	10000000	240000000	100000000000000
1000000000	1	30	1000000000	30000000000	1000000000000000000
1000000000000	1	40	1000000000000	40000000000000	1000000000000000000000000

Data Structures

Common Operations

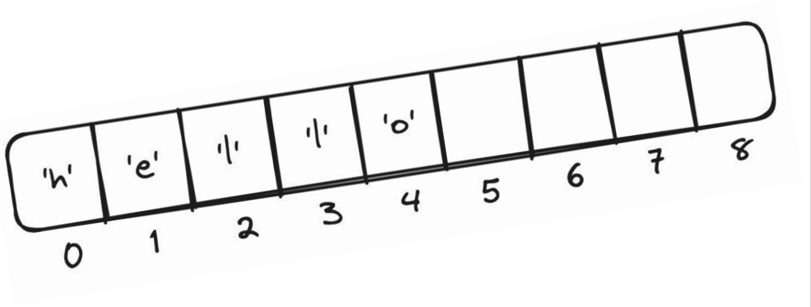
- Insert
- Retrieve
- Remove
- Search

Basic Data Structures

- Arrays / ArrayList
- LinkedList
- Hash Tables

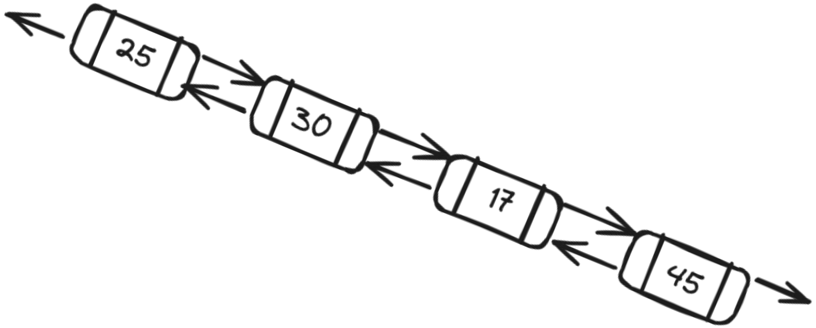
Arrays / ArrayList

- Insert
  - Front - O(N)
  - End - O(1)
  - Middle - O(N)
- Retrieve: O(1)
- Remove
  - Front - O(N)
  - End - O(1)
  - Middle - O(N)
- Search
  - Sorted - O(LogN)
  - Unsorted - O(N)



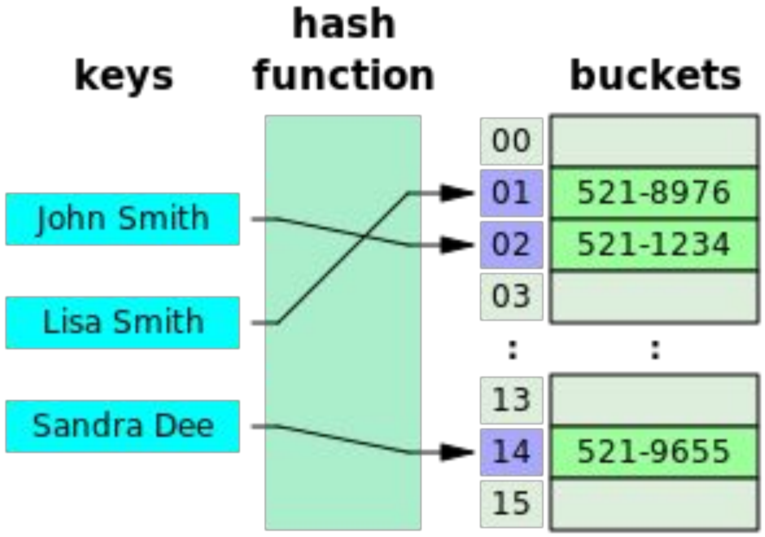
LinkedList

- Insert
  - Front - O(1)
  - End - O(1)
  - Middle - O(N)
- Remove
  - Front - O(1)
  - End - O(1)
  - Middle - O(N)
- Retrieve / Search
  - Sorted - O(N)
  - Unsorted - O(N)



Hash Table

- Insert - O(1)
- Retrieve - O(1)
- Remove - O(1)
- Search - O(1)



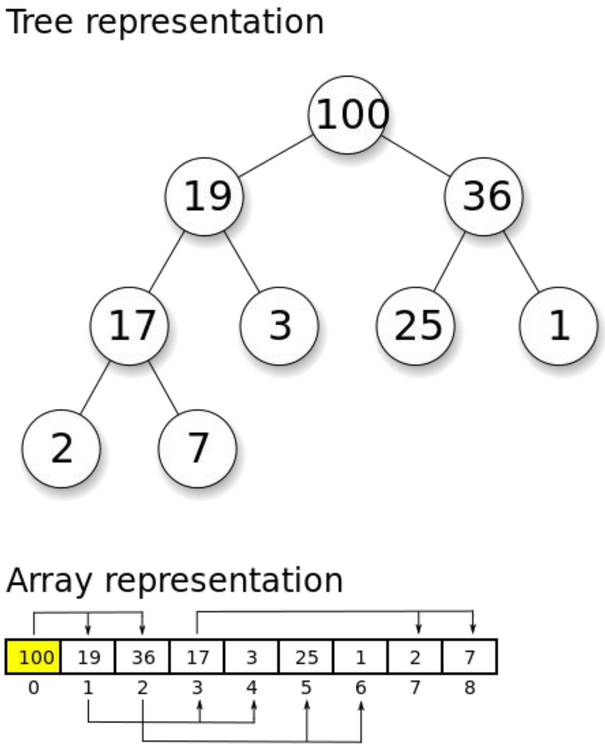
Source: Wikipedia

Advanced Data Structures

- Heaps
- Tries
- Graphs

Heaps

- ❖ Insert - O(LogN)
- ❖ Remove - O(LogN)
- ❖ Search - O(LogN)

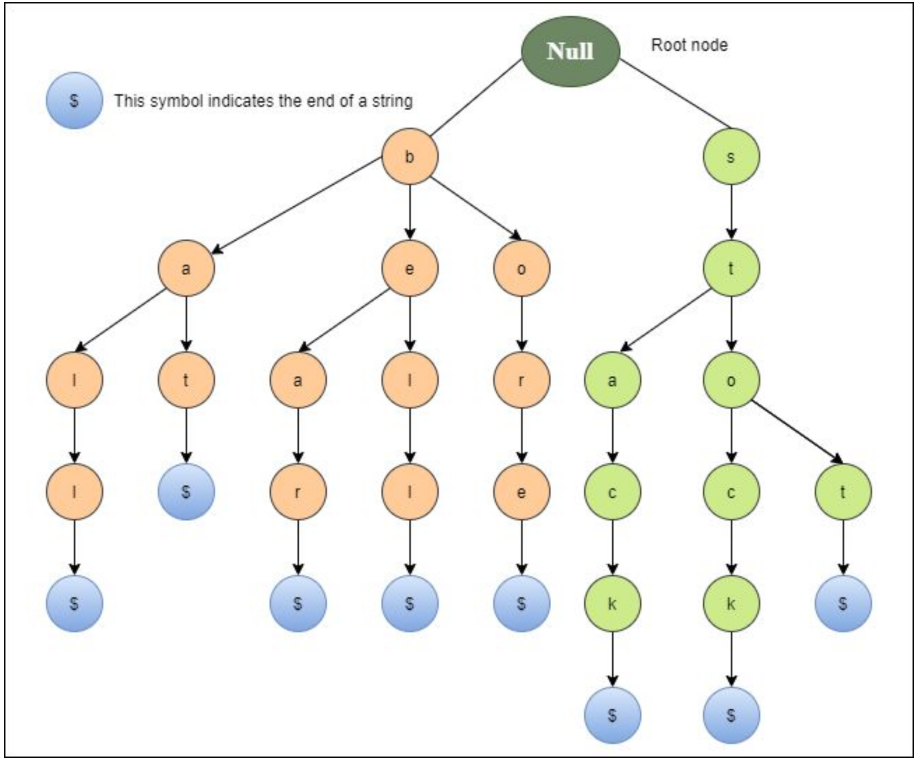


100	19	36	17	3	25	1	2	7
0	1	2	3	4	5	6	7	8

Source: Wikipedia

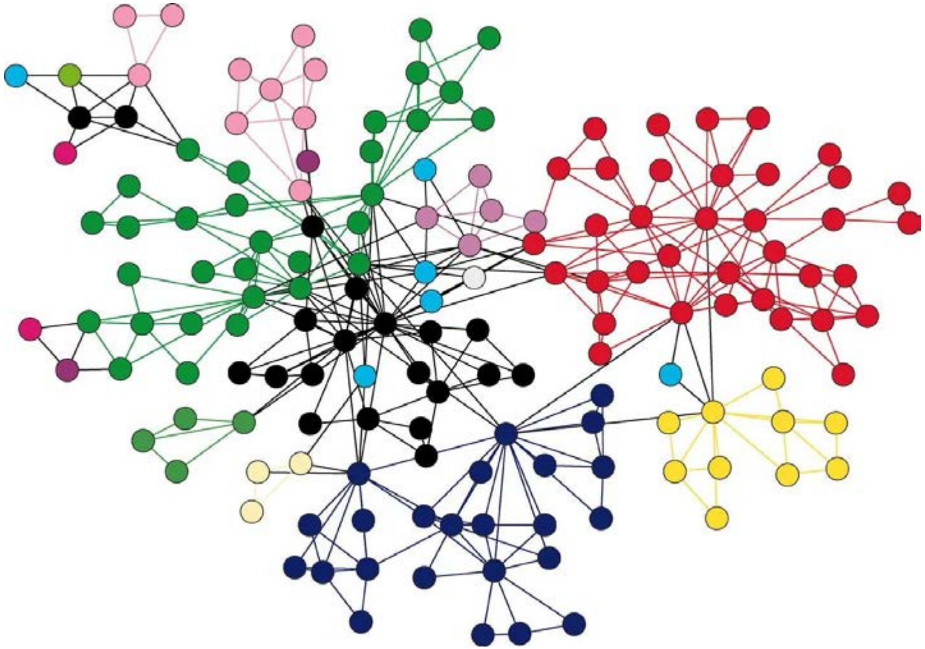
Tries

- ❖ Insert - O(N)
- ❖ Remove - O(N)
- ❖ Search - O(N)



Source: Javatpoint

Graphs



Source: Medium

"I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships."

- Linus Torvalds (creator of Linux)

Algorithms

Algorithms

- Sorting Algorithms
  - Insertion sort
  - Merge sort
  - Quick sort
- Search Algorithms
  - Linear search
  - Binary Search
  - Breadth first & Depth first search (Graphs and Trees)
- Graph Algorithms
  - Union Find algorithm
  - Dijkstra’s Algorithm
  - A* search algorithm

Path to proficiency

Path to proficiency

- Educational Platforms
  - Coursera
  - Udacity
  - Educative.io
  - Youtube
- Participate in Coding Challenges
  - Leetcode
  - Hackerrank
- Harness Generative AI
  - ChatGPT
  - Gemini

It is a marathon, and not a sprint.

Thank you!