Introduction into Data Structure

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1 Introduction into Data Structures.

1.1 Introduction

What is a Data Structure?

A data structure is a particular way of organizing data in a computer to increase speed and efficiency while reducing space. Data structures are classified into different structures. They are Linear data structures, hierarchical data structures

1.2 Linear data structures

1. Arrays: An array is a data structure used to store different element of the same data type.
2. Linked List: A linked list is a linear data structure like arrays where each element is a separate object.
3. Stack: A stack or LIFO (last in, first out) is an abstract data type that serves as a collection of elements, with two principal operations: push, which adds an element to the collection, and pop which removes the last element that was added.
4. Queue: A queue or FIFO (first in, first out) is an abstract data type that serves as a collection of elements, with two principal operations: enqueue, the process of adding an element to the collection (the element is added from the rear side) and dequeue, the process of removing the first element that was added (the element is removed from the front side).

1.3 Hierarchical Data Structures

1. Binary Tree: A binary tree is a tree structure in which each node has at most two children, which are referesd to as the left child and the right child. it is implemented mainly using links.

2. Binary search tree: A binary search tree is a binary tree with the following properties;

    - The left subtree of a node contains only nodes with keys less than the node's key
    - The right subtree of a node contains only nodes with keys greater than the node's key.
    - The left and right subtree each must also be a binary search tree.

3. Binary Heap: A binary heap is a binary tree with the following properties

    - It's a complete tree i.e. all the levels are completely filled except possibly the last leve; and the last level and the last level has all keys as left possible
    - A binary heap is niether a max heap or amin heap

4. Hashing / Hashing function: A hashing function is a function that converts a given big input key to a small practical integer value. A hash table is an array that stores pointers to record corresponding to a given phone number.