BRAB University, Muzaffarpur

Unit - 1

Introduction to Data Structure

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Basic Idea of Data Structure:

A data structure is a way of organizing and storing data in a computer so that it can be accessed and manipulated efficiently. It defines a particular way of organizing data in the memory of a computer so that it can be used effectively. Data structures provide a means to manage large amounts of data efficiently for various computational tasks.

Data structure ek tarika hai data ko computer mein organize aur store karne ka, taaki woh efficiently access aur manipulate kiya ja sake. Ye ek vishesh tareeke se data ko computer ki memory mein organize karne ka tareeka hai taaki woh effectively istemal kiya ja sake. Data structures ek zariya pradan karte hain bade maatra mein data ko various computational tasks ke liye efficient tareeke se manage karne ka.

Data Structure Definition:

A data structure is a collection of data elements organized in a particular way to facilitate efficient operations such as insertion, deletion, searching, and manipulation. It defines the relationship between the data elements and the operations that can be performed on them.

Data structure ek collection hai data elements ka jo ek vishesh tareeke se organize kiya gaya hai taaki efficient operations jaise ki insertion, deletion, searching, aur manipulation kiya ja sake. Ye data elements ke beech ka sambandh aur un par kiye jaane waale operations ko define karta hai.

Types of Data Structures:

Data structures can be broadly classified into two main categories:

1. **Linear Data Structures:**
    a. Array
    b. Linked List
    c. Stack
    d. Queue
2. **Non-Linear Data Structures:**
    a. Tree
    b. Graph

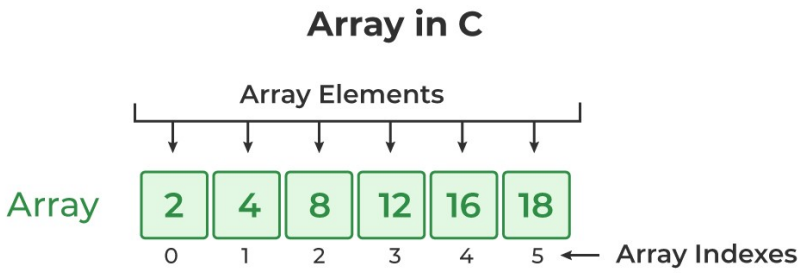
1. Linear Data Structures:

Linear data structures are those in which data elements are arranged in a linear sequence, with each element connected to its previous and next elements.

Linear data structures mein data elements ek linear sequence mein arrange kiye jaate hain, jahan har element apne pichle aur agle elements se jude hote hain.

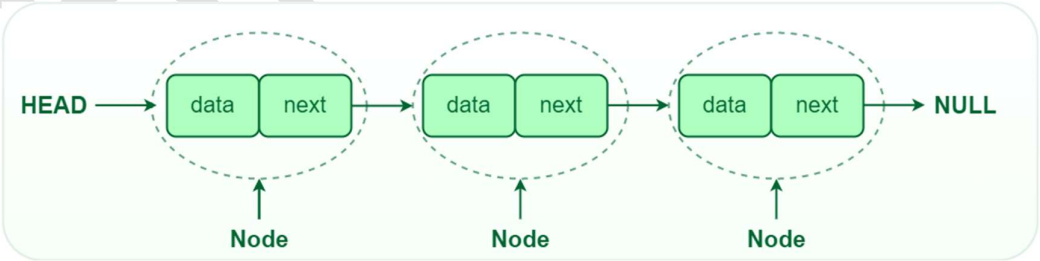
Examples of linear data structures include:

1. **Array:** An array is a collection of elements stored at contiguous memory locations, allowing efficient random access to elements using their index.



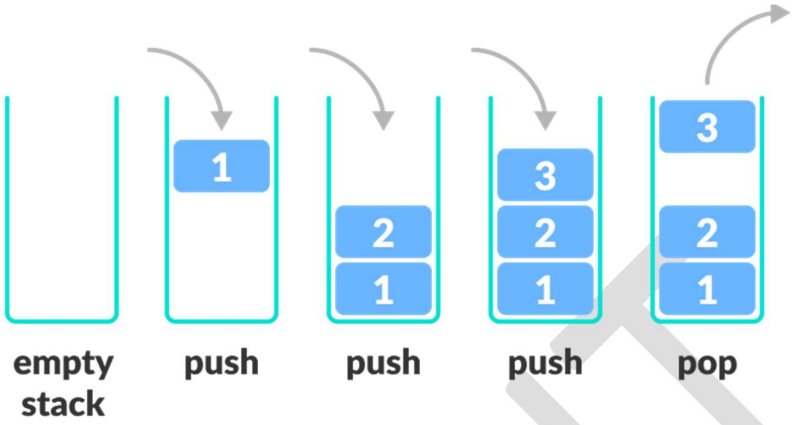
Ek array ek collection hai elements ka jo contiguous memory locations par store hota hai, jo unke index ka istemal karke unhein efficiently access karne ki anumati deta hai.

2. **Linked List:** A linked list is a collection of nodes where each node contains data and a reference (link) to the next node in the sequence.



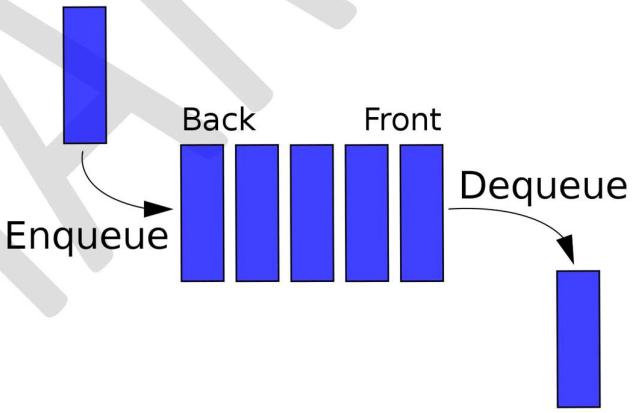
Ek linked list ek collection hai nodes ka jahan har node data aur next node ke reference (link) ko contain karta hai.

3. **Stack:** A stack is a collection of elements with a Last In, First Out (LIFO) order of access, where elements are inserted and removed from the same end called the top.



Ek stack ek collection hai elements ka jiska Last In, First Out (LIFO) order hota hai, jahan elements ko ek hi end se insert aur remove kiya jaata hai jo top kehlaya jata hai.

4. **Queue:** A queue is a collection of elements with a First In, First Out (FIFO) order of access, where elements are inserted at the rear and removed from the front.



Ek queue ek collection hai elements ka jiska First In, First Out (FIFO) order hota hai, jahan elements ko rear par insert aur front se remove kiya jaata hai.

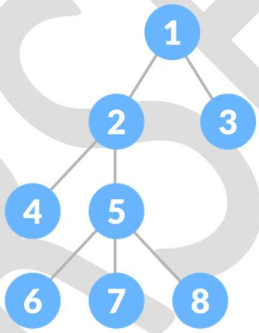
2. Non-linear Data Structures:

Non-linear data structures are those in which data elements are not arranged sequentially, and each element may be connected to multiple other elements.

Non-linear data structures mein data elements linear sequence mein arrange nahi hote, aur har element multiple aur dusre elements se connect ho sakta hai.

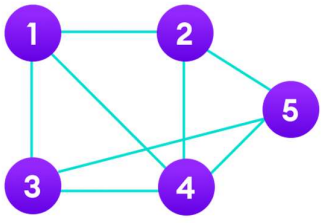
Examples of non-linear data structures include:

1. **Tree:** A tree is a hierarchical data structure consisting of nodes connected by edges, with a single root node and branches leading to leaf nodes.



Ek tree ek hierarchial data structure hai jo nodes ko edges se jodta hai, jahan ek single root node aur branches leaf nodes tak jaate hain.

2. **Graph:** A graph is a collection of nodes (vertices) and edges (connections) between them, representing relationships or connections between the nodes.



Ek graph ek collection hai nodes (vertices) aur unke beech ke edges (connections) ka, jo nodes ke beech ke sambandh ya connections ko represent karta hai.

Understanding the characteristics and operations associated with each type of data structure is fundamental to effective problem-solving and software development. In subsequent sections, we will delve deeper into each type of data structure, exploring their properties, implementations, and algorithms.

Har data structure ke prakar aur unke saath jude guno aur operations ko samajhna karyawahi mein prabhavi hota hai. Agle sections mein, hum har prakar ke data structure ke baare mein aur gehrai se jaanenge, unke guno, implementations, aur algorithms ko explore karenge.

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