# Data Structures

# Introduction

- Data may be organized in many ways; the logical or mathematical model of a particular organization of data is called a data structure.
- The choice of a particular data model depends on two considerations. First it must be rich enough in structure to mirror the actual relationships of the data in real world.
- On the other hand, the structure should be simple enough that one can effectively process the data when necessary.

*“Data Structure is a way to store and organize data so that it can be used efficiently. Here, we the word efficiently is used in terms of both the space and time.”*

# Classification of Data Structures

Data structure can be classified into two forms:

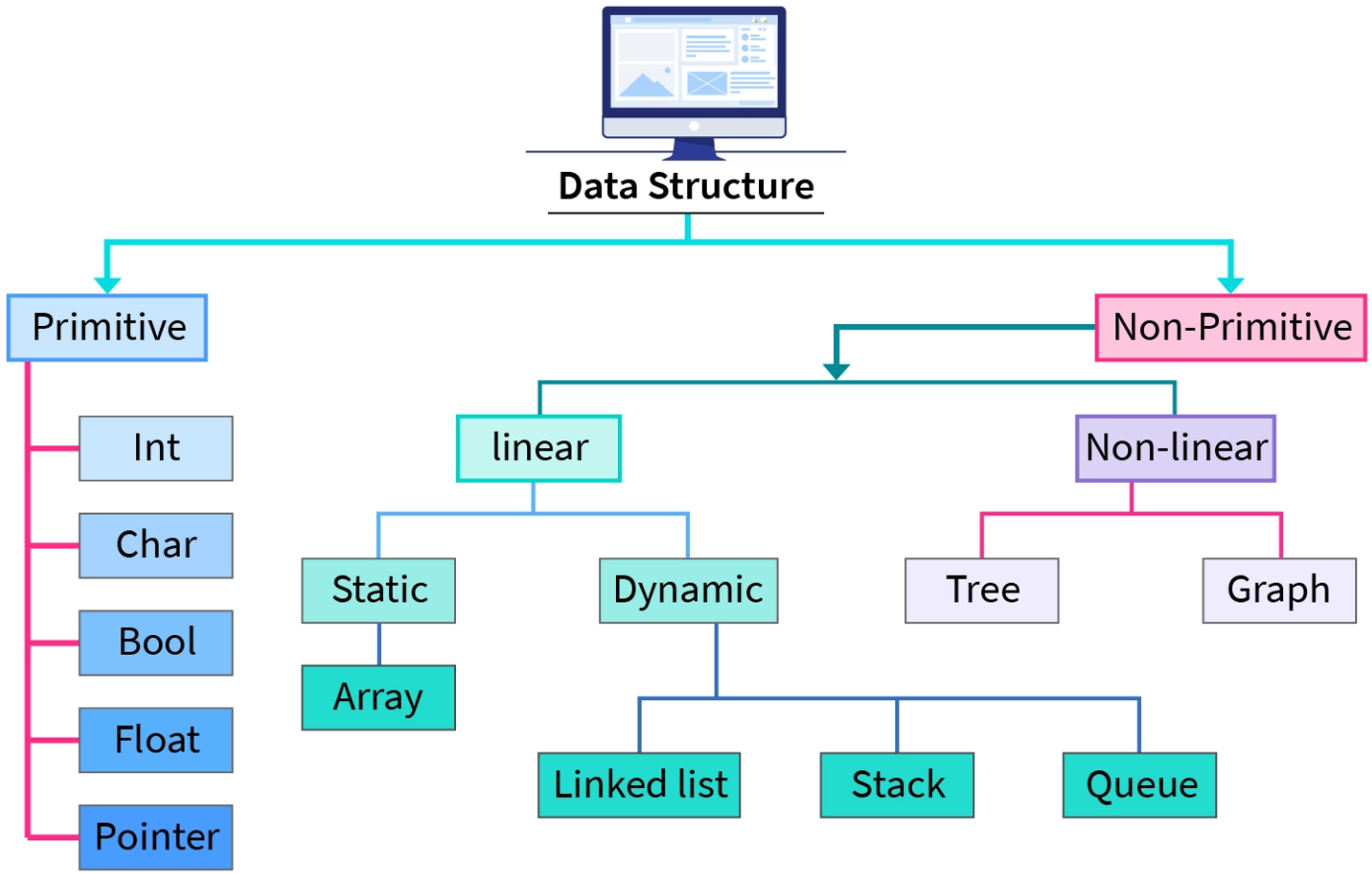
- Primitive data structure
- Non-primitive data structure

Primitive Data structures are directly supported by the language ie; any operation is directly performed in these data items. The int, char, float, double, and pointer are the primitive data structures that can hold a single value.

# Classification of Data Structures

Non-primitive data structures are derived from primitive data structures. A Non-primitive data type is further divided into Linear and Non-Linear data structure.

- **Linear-** The arrangement of data in a sequential manner is known as a linear data structure. For ex- Arrays, Linked list, Stacks, and Queues.
- **Non-Linear-** Here data elements are not connected in a sequence manner. Examples: Trees and Graphs.

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# Classification of Data Structures

Data structures can also be classified as:

- **Static data structure:** It is a type of data structure where the size is allocated at the compile time. Therefore, the maximum size is fixed.

- **Dynamic data structure:** It is a type of data structure where the size is allocated at the run time. Therefore, the maximum size is flexible.

# Data Structure Operations

Following operations can be performed on the data structures:

- 1. Traversing
- 2. Searching
- 3. Inserting
- 4. Deleting
- 5. Sorting
- 6. Merging

# Data Structure Operations

- Traversing- It is used to access each data item exactly once so that it can be processed.
- Searching- It is used to find out the location of the data item if it exists in the given collection of data items.
- Inserting- It is used to add a new data item in the given collection of data items.
- Deleting- It is used to delete an existing data item from the given collection of data items.
- Sorting- It is used to arrange the data items in some order i.e. in ascending or descending order in case of numerical data and in dictionary order in case of alphanumeric data.
- Merging- It is used to combine the data items of two sorted files into single file in the sorted form.