Fundamental of Data Structures

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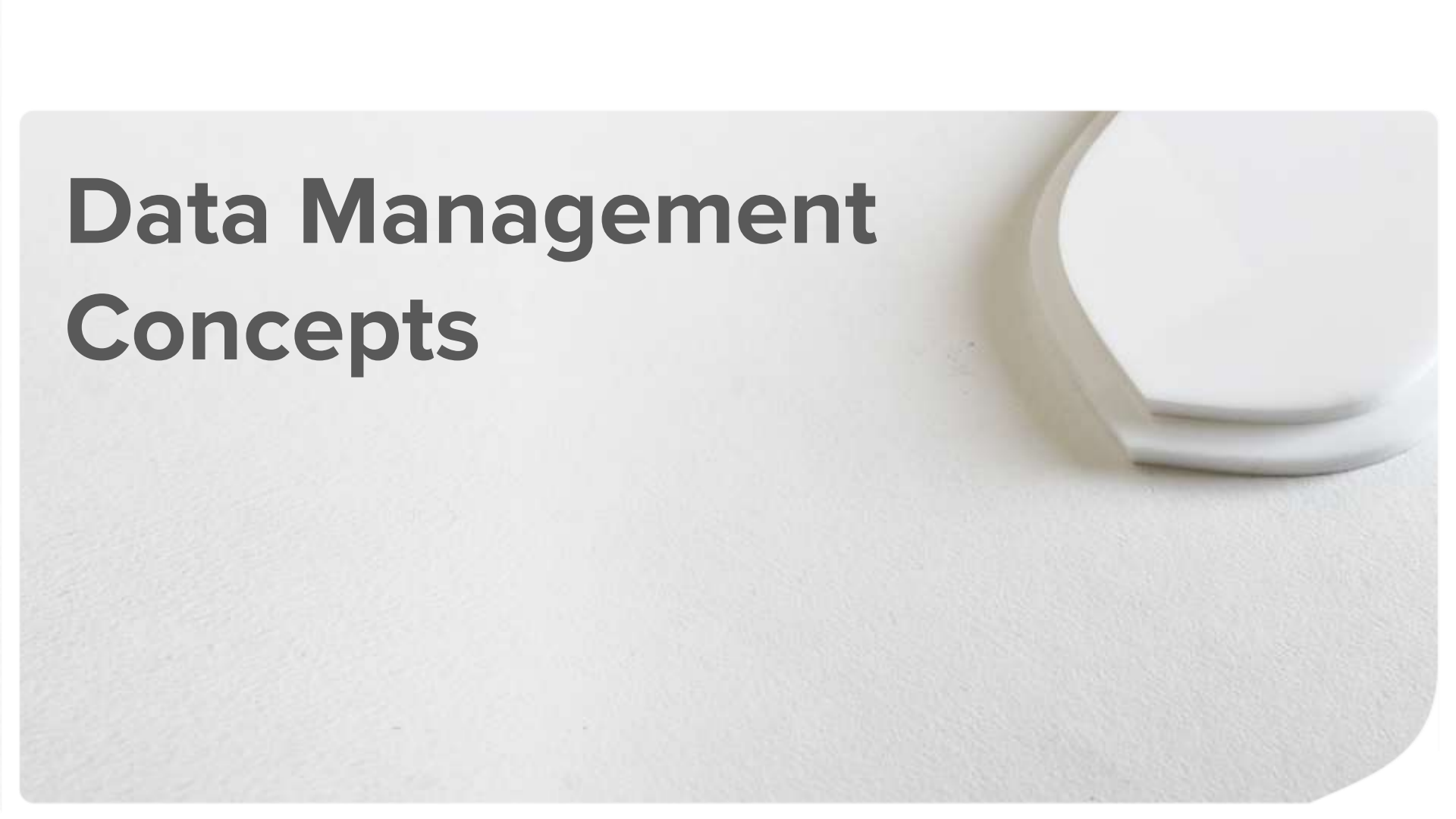
Outline-Unit-1

- Data Management concepts
- Data types – primitive and non-primitive
- Types of Data Structure – linear and non-linear
- Abstract Data Types

Data Management Concepts

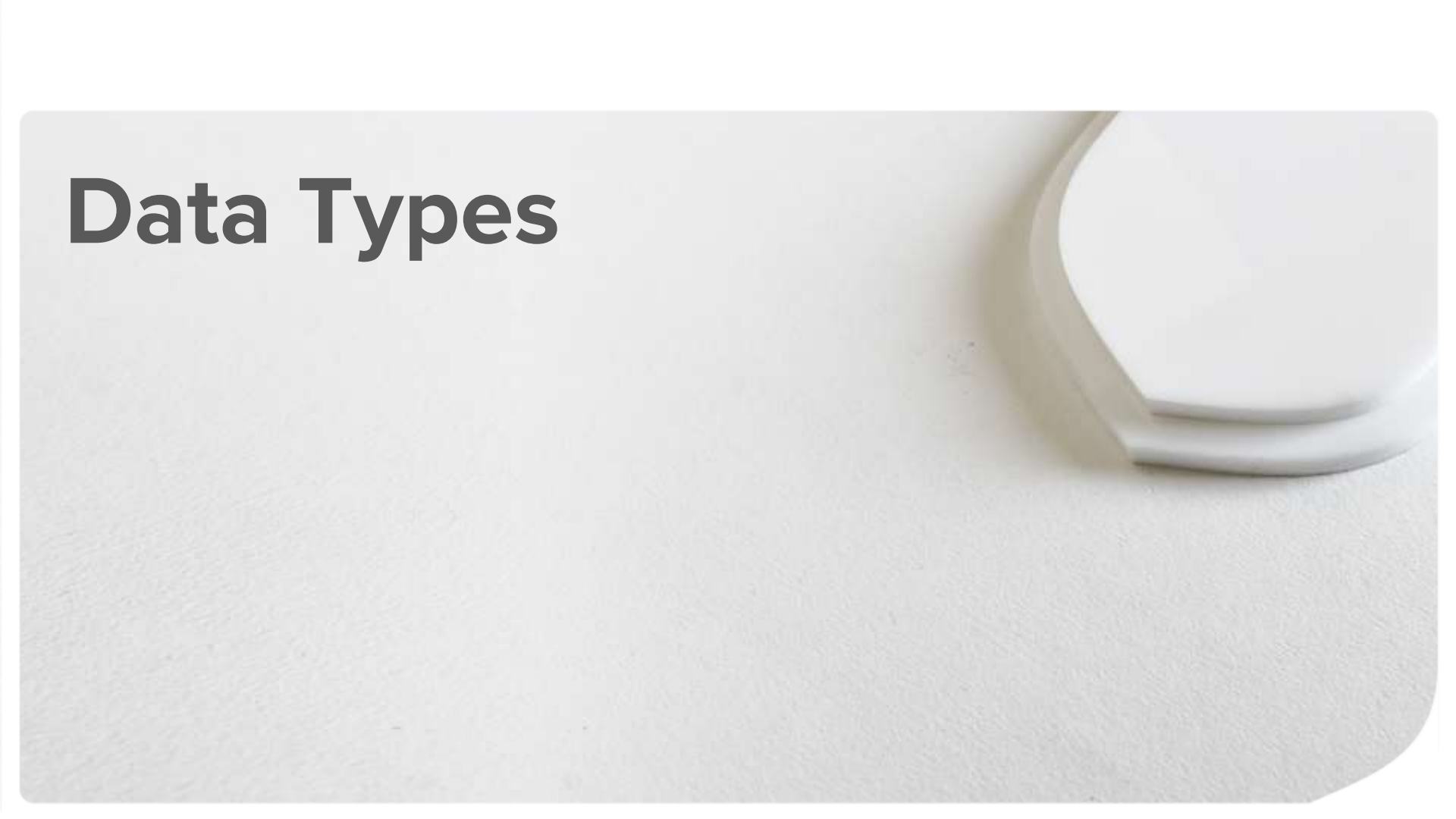


Data Management Concepts

❑ What is Data?

- **Data** is the basic fact or entity that is utilized in calculation or manipulation.
- There are two different **types of data - Numeric** data and **Alphanumeric** data.
- When a programmer collects such type of data for **processing**, he would require **to store them in computer's main memory**.
- The process of storing data items in computer's main memory is called ***representation.***
- **Data** to be processed must be **organized in a particular fashion**, these organization leads to structuring of data, and hence the mission to study the Data Structures.

Data Types



Data Types

❑ What is Data types?

- A **data type** is a classification of data, which can store a specific type of information.

- Data Type = Basic Data Type = Primitive Data Type

Data Types

❑ Primitive Data Types

- A **primitive data** type is predefined by the language and is named by a reserved keyword.

- Primitive data types are predefined, supported by C language.
  - int, char, float, double.

Data Types

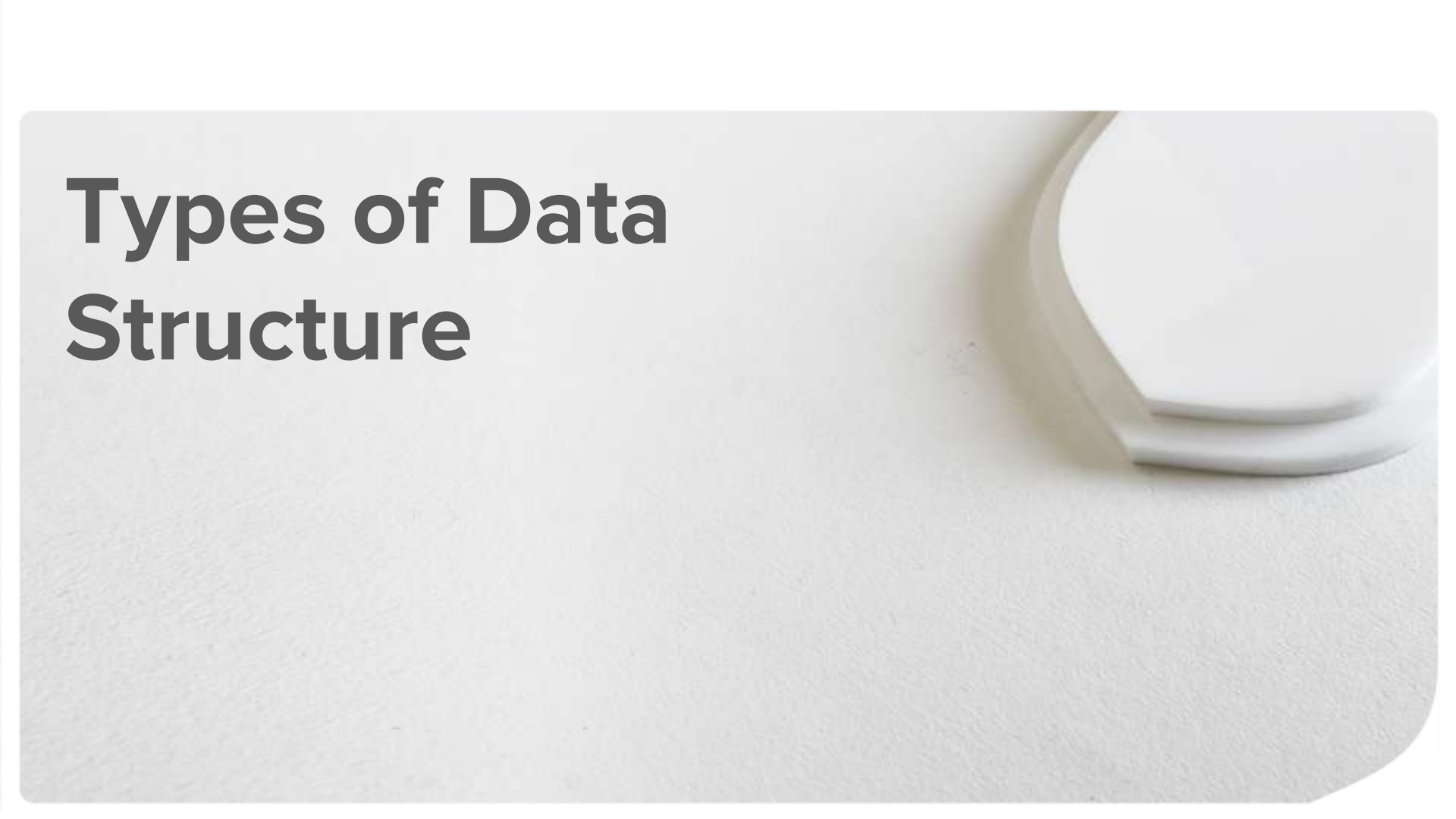
❑ Non-primitive Data Types

- **Non-Primitive** data types are not defined by C language, but are created by the programmer.

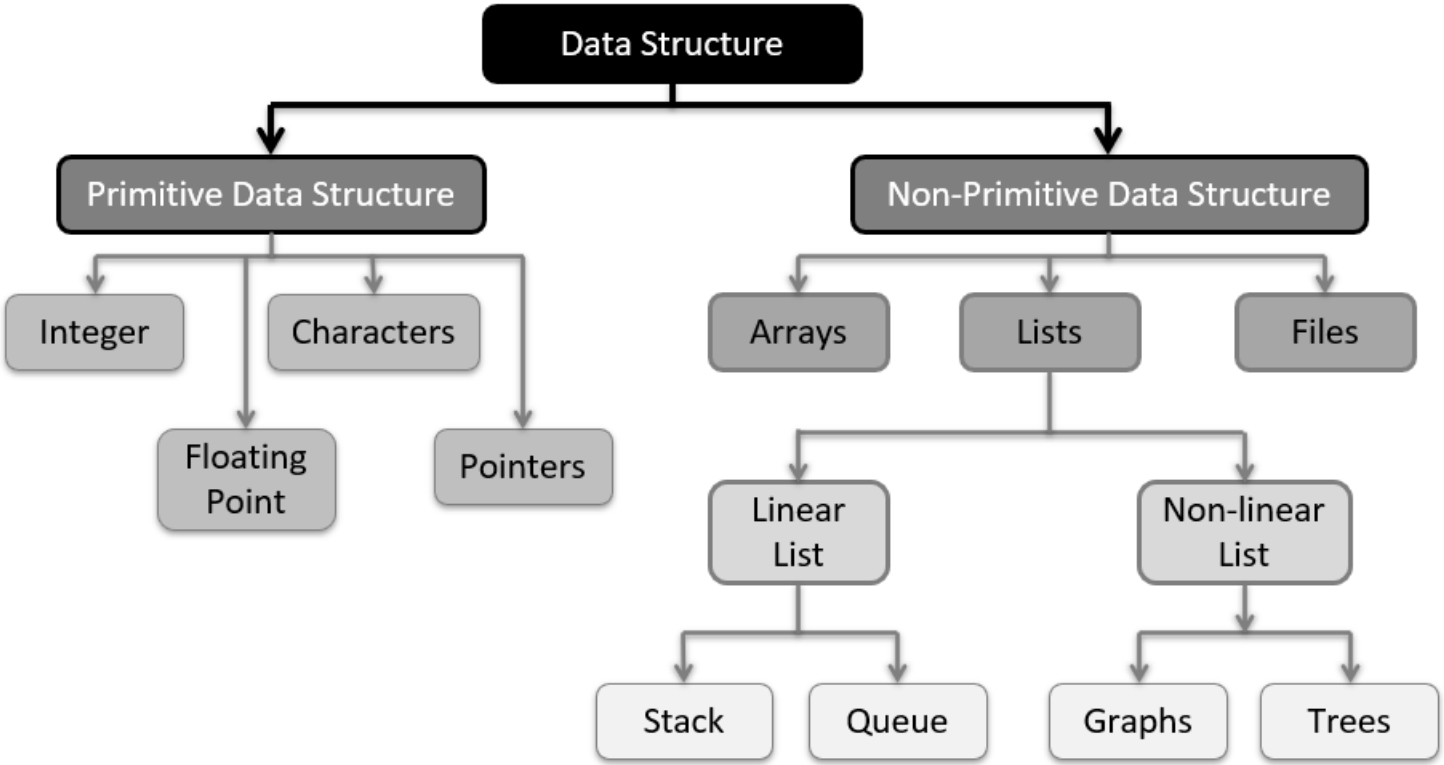
- They are created using the basic data types.

- Example:
  1. Linked List
  2. Stacks
  3. Queue
  4. Graph

Types of Data Structure



Types of Data Structure



Primitive Data Structure

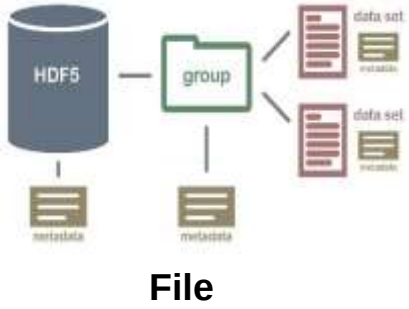
- **Primitive data structures**
  - Primitive data structures are basic structures and are directly operated upon by machine instructions.
  - ***Integers***, ***floats***, ***character*** and ***pointers*** are examples of primitive data structures.

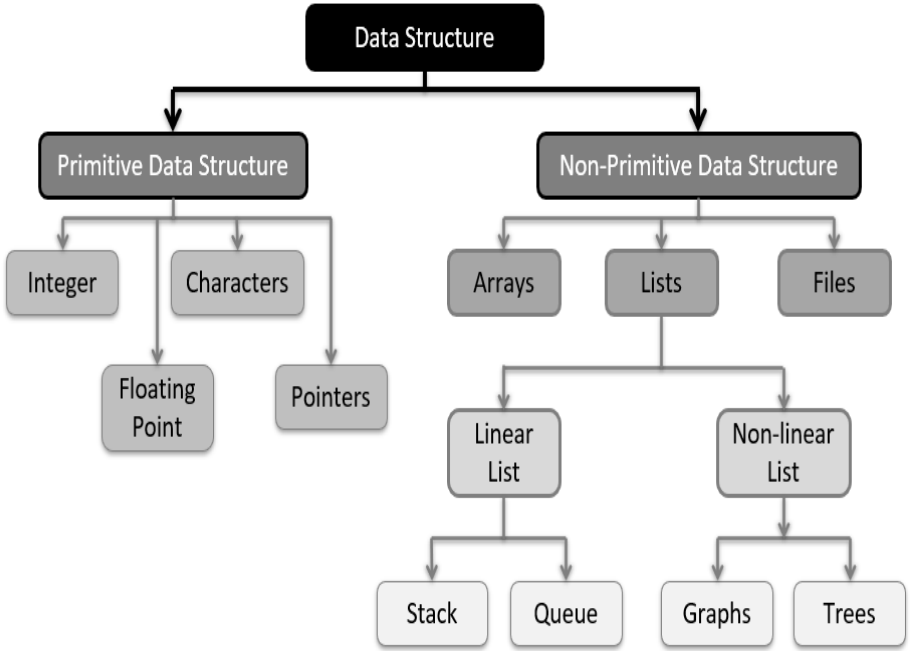
Non-Primitive Data Structure

- **Non primitive data structure**
  - These are derived from primitive data structures.
  - The non-primitive data structures emphasize on structuring of a group of homogeneous or heterogeneous data items.
  - Examples of Non-primitive data type are ***Array***, ***List***, and ***File***.

Non-Primitive Data Structure

- **Array:** An array is a fixed-size sequenced collection of elements of the same data type.
- **List:** An ordered set containing variable number of elements is called as Lists.
- **File:** A file is a collection of logically related information. It can be viewed as a large list of records consisting of various fields.

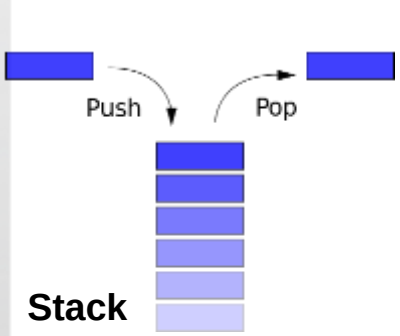


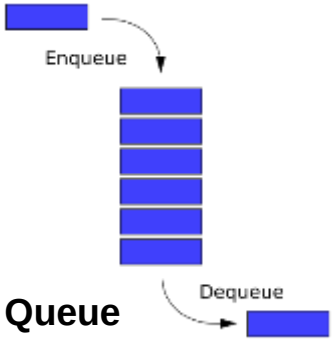


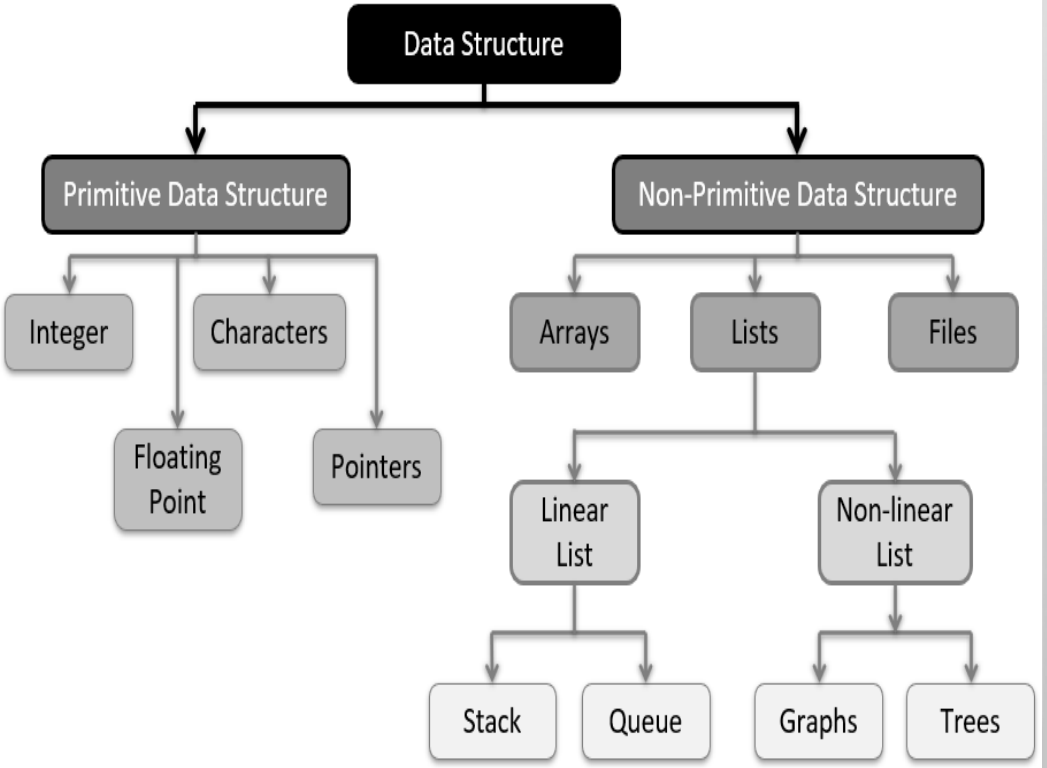
Linear Data Structure

Linear data structures

- A data structure is said to be Linear, if its elements are connected in linear fashion by means of logically or in sequence memory locations.
- Examples of Linear Data Structure are ***Stack*** and ***Queue***.

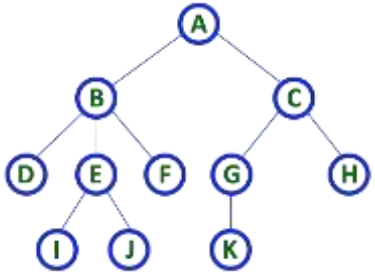




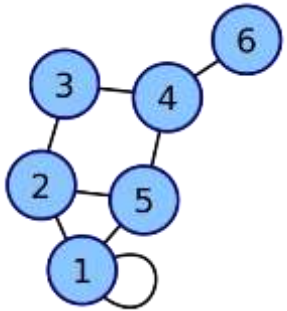


Non-linear Data Structure

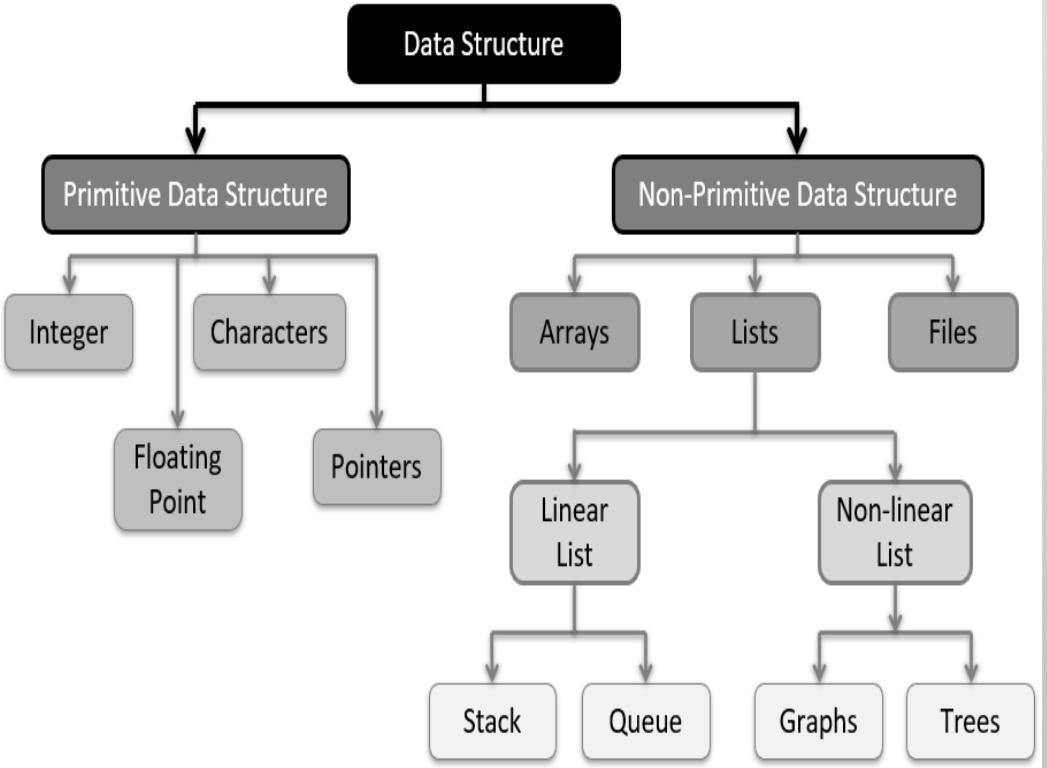
- **Nonlinear data structures**
  - Nonlinear data structures are those data structure in which data items are not arranged in a sequence.
  - Examples of Non-linear Data Structure are ***Tree*** and ***Graph***.



Tree



Graph



Abstract Data Types

Abstract Data Types

- ***Abstract Data type (ADT)*** is a type (or class) for objects whose behavior is defined by a set of values and a set of operations.
- The definition of ADT only mentions what operations are to be performed but not how these operations will be implemented.
- It does not specify how data will be organized in memory and what algorithms will be used for implementing the operations. It is called "**abstract**" because it gives an implementation-independent view.

Abstract Data Types

Example:

- Whenever end user uses Stack, he is concerned about only the type of data and operations that can be performed on it.
- Fundamentals of how the data is stored is invisible to users.
- They will have push() and pop() functions only.

Data Structure

Introduction to Data Structure

What is Data Structure?

- A data structure is a **way of organizing all data items** that **considers** not only the **elements stored** but also their **relationship to each other.**
- We can also define data structure as a **mathematical or logical model** of a particular **organization** of **data items.**

Operation of Data Structure

- **Create**: It results in reserving memory for program elements.
- **Destroy**: It destroys memory space allocated for specified data structure.
- **Selection**: It deals with accessing a particular data within a data structure.
- **Updation**: It updates or modifies the data in the data structure.
- **Searching**: It finds the presence of desired data item in the list of data items.
- **Sorting**: It is a process of arranging all data items in a data structure in a particular order.
- **Merging**: It is a process of combining the data items of two different sorted list into a single sorted list.
- **Splitting**: It is a process of partitioning single list to multiple list.
- **Traversal**: It is a process of visiting each and every node of a list in systematic manner.


Thank
You