Introduction to Data Structures Semester-III

Ms. Sarika Dharangaonkar,
Assistant Professor

Learning Objectives

- Identify different operations to be performed on Data Structures
- Explain the concept of ADT
- Write an example of ADT

Outline

- Review of previous lecture
- Operations on Data Structures
- Abstract Data Type

Quiz

Q1. Which of the following is non-linear data structure?

A) Stacks
B) List
C) Strings
D) Trees

Quiz

Q1. Which of the following is non-linear data structure?

A) Stacks
B) List
C) Strings
D) Trees

Answer: Option D

Quiz

Q2. A ..... is a data structure that organizes data similar to a line in the supermarket, where the first one in line is the first one out.

A) Queue
B) Stack
C) Both of them
D) Neither of them

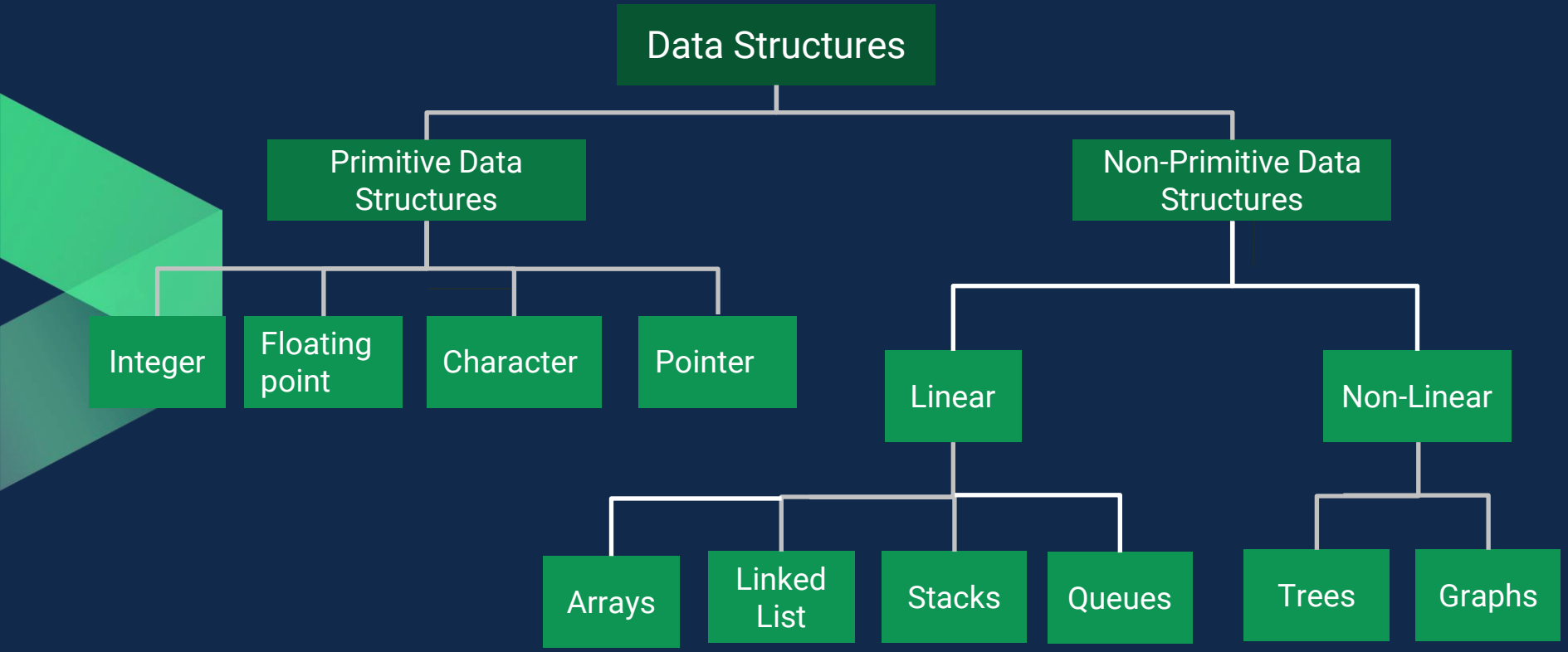
Quiz

Q2. A ..... is a data structure that organizes data similar to a line in the supermarket, where the first one in line is the first one out.

A) Queue
B) Stack
C) Both of them
D) Neither of them

Answer: Option A
Explanation: Queue is a First-in First-out data structure

Types of Data Structures



Operations on Data Structures

- Creation
- Insertion
- Deletion
- Traversal
- Destroy
- Updating
- Merging
- Selection
- Sorting
- Searching

Data Type

A data type consists of two parts:

- A set of values
- A set of operations on values

Type	Values	Operations
integer	-∞, … , -2, -1, 0, 1, 2,…, ∞	*, +, -, %, /, ++, --, …
floating point	-∞, … , 0.0, …, ∞	*, +, -, /, …
character	\0, …, 'A', 'B', … , 'a', 'b', … , ~	<, >, …

#include<math.h>

- **double sqrt(double x)**
- **double ceil(double x)**
- **double floor(double x)**
- `double fabs(double x)`

#include<string.h>

- char *strcat(char *dest, const char *src)
- int strcmp(const char *str1, const char *str2)
- char *strcpy(char *dest, const char *src)

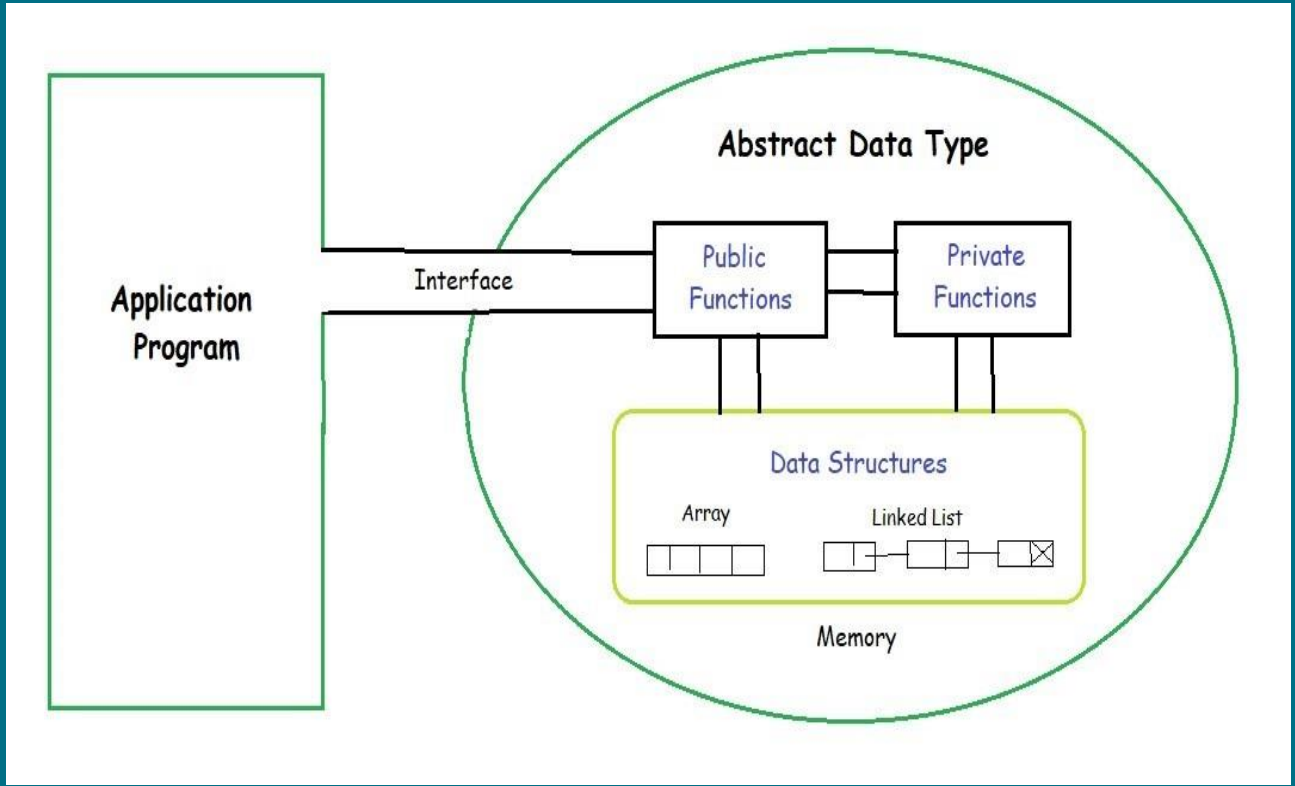
Abstract Data Type

- An abstract data type, abbreviated as ADT, is a logical description of how we view the data and the operations that are allowed without regard to how they will be implemented.
- By providing this level of abstraction, we are creating an encapsulation around the data. The idea is that by encapsulating the details of the implementation, we are hiding them from the user‘s view. This is called information hiding.
- A data structure is the implementation for an ADT.

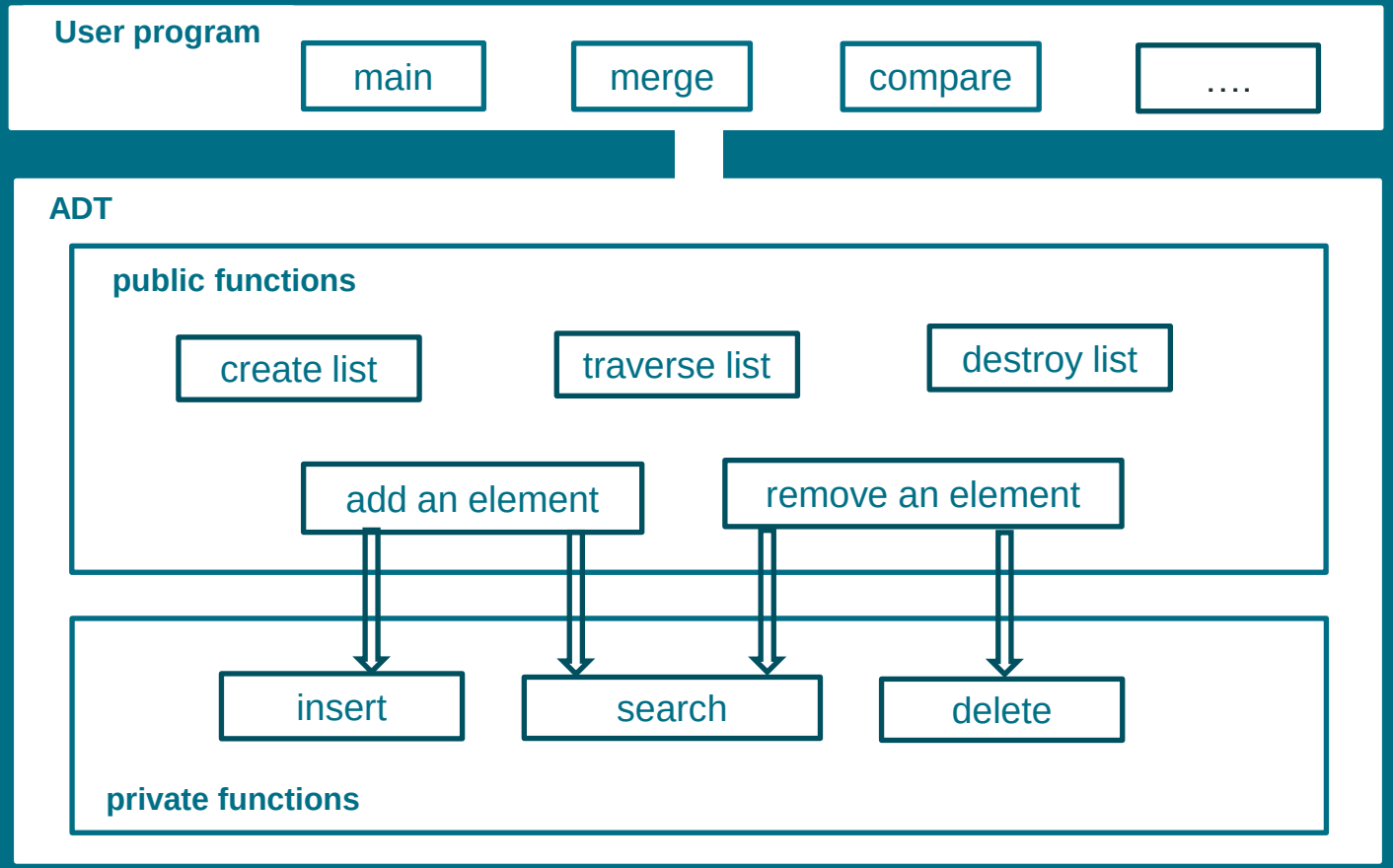
Abstract Data Type

- An ADT is composed of
  - A collection of data
  - A set of operations on that data
- Specifications of an ADT indicate
  - What the ADT operations do, not how to implement them
- Implementation of an ADT
  - Includes choosing a particular data structure

Abstract Data Type Model



ADT Example for List



Quiz

Q3) **A mathematical-model with a collection of operations defined on that model is called**

A. Data Structure
B. Abstract Data Type
C. Primitive Data Type
D. Algorithm

Quiz

Q3) **A mathematical-model with a collection of operations defined on that model is called**

A. Data Structure
B. Abstract Data Type
C. Primitive Data Type
D. Algorithm

Answer: option B

Quiz

Q4) **Choose the correct option about abstract data type(ADT).**

A. An abstract data type is a model of a certain kind of data structure.
B. In abstract data type, we know what a specific data type can do, but how it actually does it is hidden.
C. ADT is user defined type.
D. All of the above.

Quiz

Q4) **Choose the correct option about abstract data type(ADT).**

A. An abstract data type is a model of a certain kind of data structure.
B. In abstract data type, we know what a specific data type can do, but how it actually does it is hidden.
C. ADT is user defined type.
D. All of the above.

Answer: option D

References

[1]. Data Structures using C, Reema Thareja, Oxford

[2]. Data Structures: A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A., Forouzan, Second Edition, CENGAGE Learning