



# Data Structure & Algorithm

## Lecture 1

## Introduction to Data Structure & Algorithm

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# Content

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- Course objectives
- Introduction to DSA
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# DAS's Lecture organization

- Lecture 1.5 h
- Lab 2 h
  - Group of 5 students: 1 leader, 4 members
  - Randomly select to present at the end of the lab
  - Hand in the report at the end of the lab
  - Quiz at the end of the lab for evaluate how you catch the lecture

# DAS's Lecture organization

## Team Leader and members Roles and Responsibilities



### Team Leader

- Organize the group
- Monitor performance
- Be able to perform all skills
- Direct team members



### Team Members

- Understand their role
- Be willing, able, and skilled to perform the role
- Understand the PALS sequences
- Be committed to the success of the team

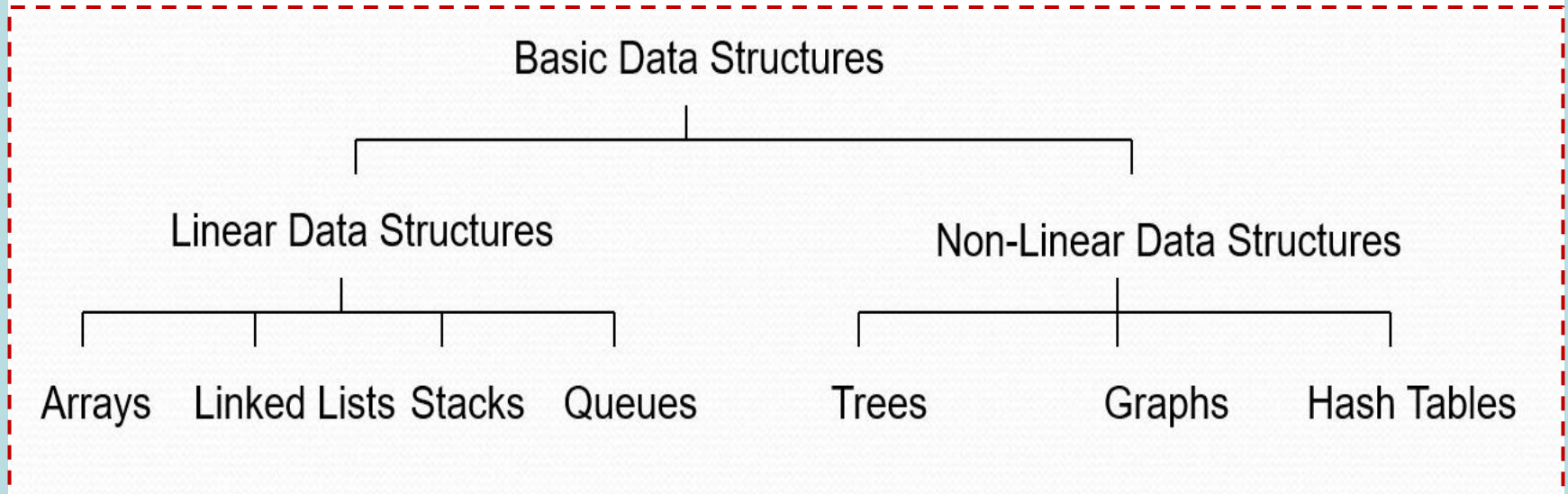
# Course objectives

- Learn basic data structures and algorithms
  - data structures – how data is organized
  - algorithms – unambiguous sequence of steps to compute something
  - algorithm analysis – determining how long an algorithm will take to solve a problem
- Become a better software developer
  - "Data Structures + Algorithms = Programs"
  - Niklaus Wirth, author of Pascal language

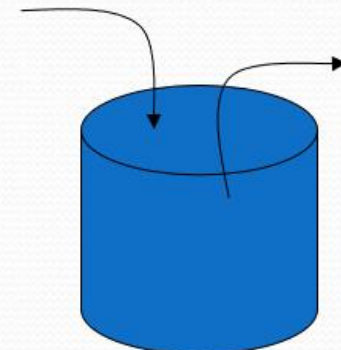
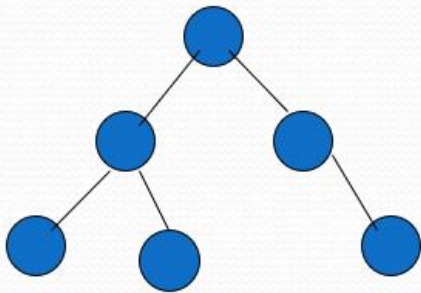
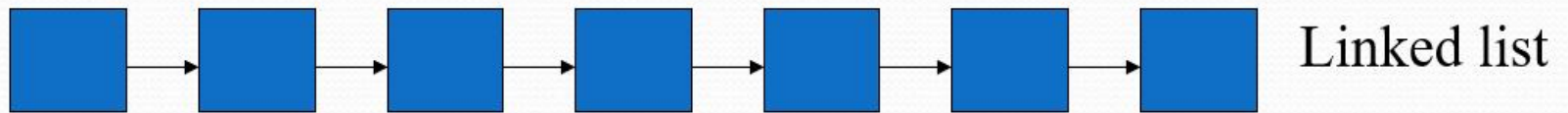
# What is Data Structure?

- Data structure is a representation of data and the operations allowed on that data.
- A data structure is a way to **store** and **organize data** to facilitate access and modifications.
- Data Structure is the method of representing logical relationships between individual data elements related to the solution of a given problem.

# Basic Data Structure



# Basic Data Structure





# Types of Data Structure

- Linear: In Linear data structure, values are arranged in linear fashion.
  - Array: Fixed-size
  - Linked list: Variable-size
  - Stack: Add to the top and remove from top
  - Queue: Add to back and remove from front
  - Priority queue: Add anywhere, remove the highest priority

# Types of Data Structure

- Non-Linear: The data values in this structure are not arranged in order.
  - Hash tables: Unordered lists which use a 'hash function' to insert and search
  - Tree: Data is organized in branches.
  - Graph: A more general branching structure, with less strict connection conditions than for a tree

# Types of Data Structure

- Homogenous: In this type of data structure, values of the same types of data are stored.
  - Array
- Non-Homogenous: In this type of data structure, data values of different types are grouped and stored.
  - Structures
  - Classes

# Abstract Data Type

- ADTs support abstraction, encapsulation, and information hiding.
- Abstraction is the structuring of a problem into well-defined entities by defining their data and operations.
- The principle of hiding the used data structure and to only provide a well-defined interface is known as encapsulation.

# The Core Operations of ADT

- Every Collection ADT should provide a way to:
  - add an item
  - remove an item
  - find, retrieve, or access an item
- Many, many more possibilities
  - is the collection empty
  - make the collection empty
  - give me a subset of the collection

# Selection of Data Structure

- The choice of a particular data model depends on two considerations:
  - It must be rich enough in structure to represent the relationship between data elements
  - The structure should be simple enough that one can effectively process the data when necessary

# Programming Language

What is the **Programming Language**? Name?



# Programming Language

- Top 10 Most Popular Programming Languages:

1) Python

2) JavaScript

3) Java

4) C#

5) C

**6) C++**

7) Go

8) R

9) Swift

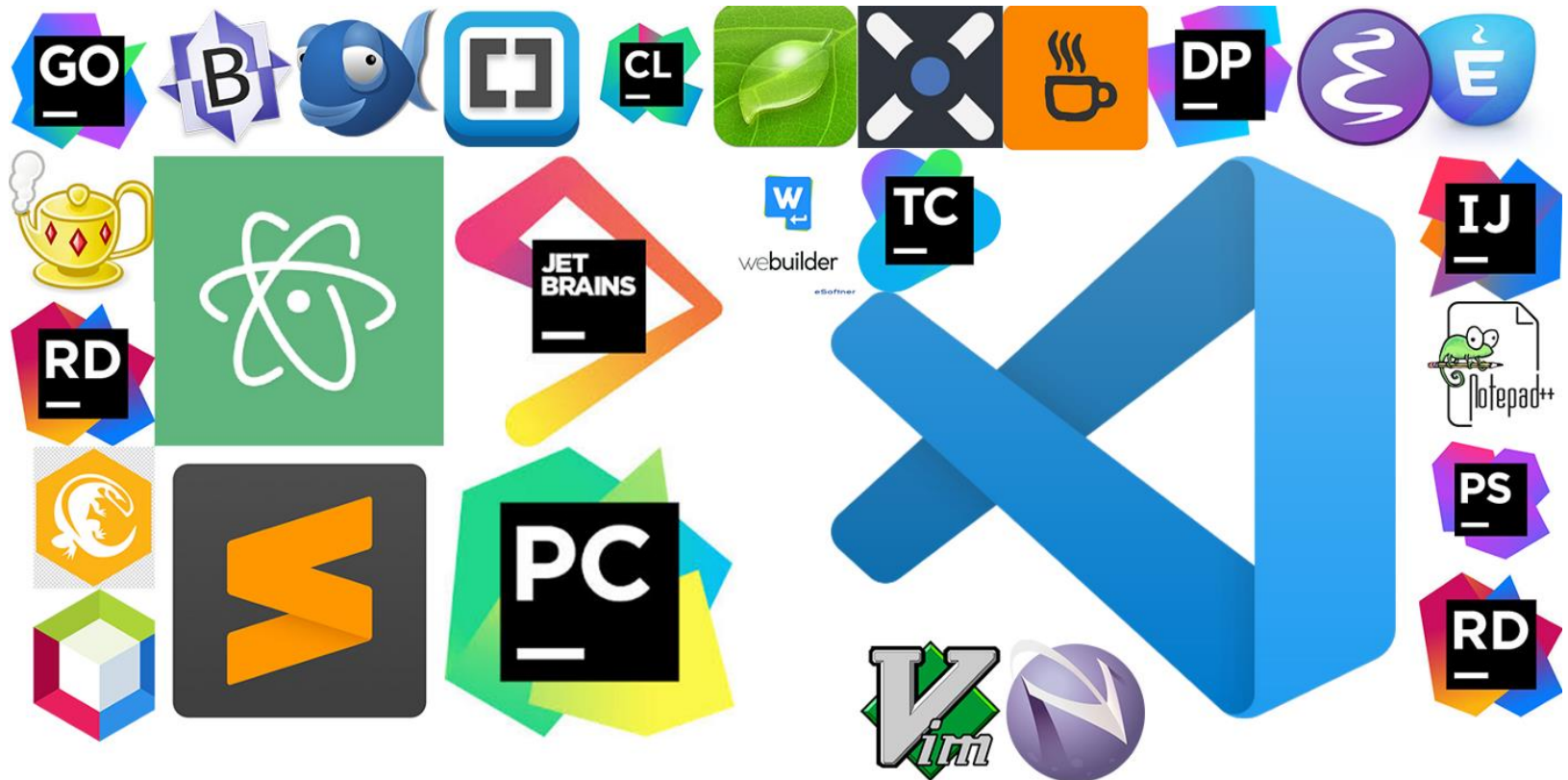
10) PHP

Ref. [The 10 Most Popular Programming Languages to Learn in 2022 \(northeastern.edu\)](#)



# Code Editor

What is a Code editor? Name??



# Code Editor

- Top 10 Best FREE Code Editor & Coding Software:

1) UltraEdit

2) Atom

3) Sublime Text

4) Notepad++

5) Brackets

**6) Visual Studio Code**

7) Vim

8) Bluefish

9) TextMate

10) TextWrangler

**Ref.** [15 Best FREE Code Editor & Coding Software In 2022 \[UPDATED\]](#)

[softwaretestinghelp.com](https://softwaretestinghelp.com)

# W1 – Lab 1

# Getting To Start with C++

- Install **C++ programming** with **Visual Studio Code**

# Getting To Start with C++

- Basic Structure of a C++ program
- Basic Data Type using C++
- Control Statement in C++
- Structure of Function and Class in C++

# Basic Structure of a C++ program

Describe the C++ program below:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      cout << "Hello World!" << endl;
6      return 0;
7  }
```

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- Standard libraries section
- Main function section
- Function body section

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Thanks!