Algorithms & Data Structure

→ 40%. Algorithms + 60%. Data structures

→ Data Structures

→ what is data structure?

→ why do you need to study this??

→ Types of Data Structures

→ Algorithms

→ what is an algorithm?

→ How do you correlate the two?!

Some Data Statistics

→ Facebook: 4 PB
= 4000 TB/day

→ YouTube: 5 billion videos/day

→ Phone memory requirements

→ Jobs for Data Scientist/Data Analytics

→ Scope for Data Science

→ Think of data in daily life

Need of Data Structures

What is Data Structures??

Class : Think of attributes

→ way to organize data

→ easy management

→ storage

→ efficient operations

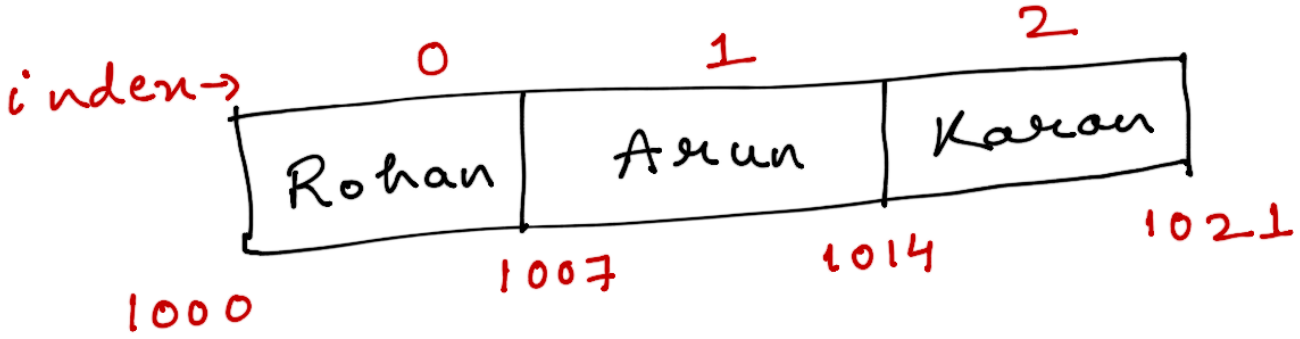
Types of Data Structures

→ Primitive
- → integers
- → character
- → float
- → pointers

→ Non-Primitive
- → Arrays
- → Lists
  - Linear
    - → Stacks (LIFO)
    - → Queues (FIFO)
    - → Linked lists
  - Non-Linear
    - → Trees
    - → Graphs

Data types:	String	int	float
	Name	Age	Marks
	Rohan	22	34.5
	Arun	21	36.8
	Karan	23	39.0

String arr[3] = {'Rohan', 'Arun', 'Kara
}



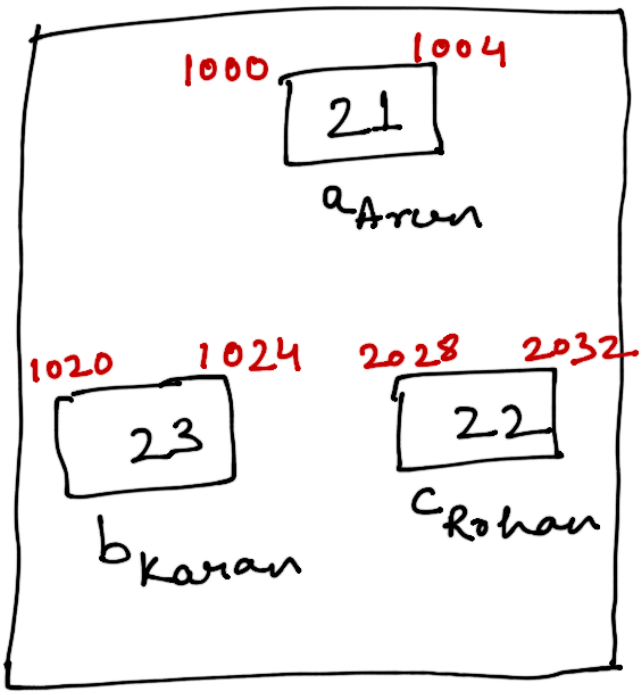
Age: {22, 21, 23}

↑ integers

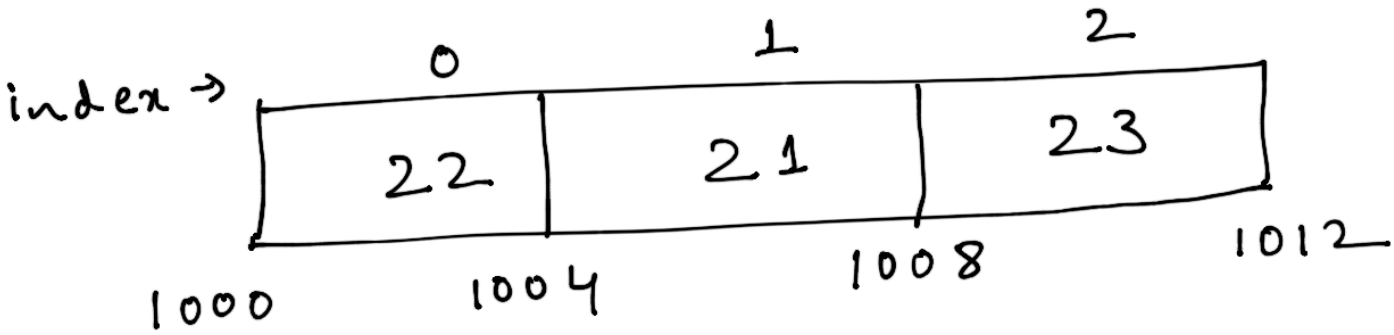
$a_{Arun} = 21;$

$b_{Karan} = 23;$

$c_{Rohan} = 22;$



int arr[3] = {22, 21, 23}



Problems, Algorithms, Program

Problem: Specific tasks

inputs $\xrightarrow{\text{mapping}}$ outputs

How??? X

Algorithms: A step by step process

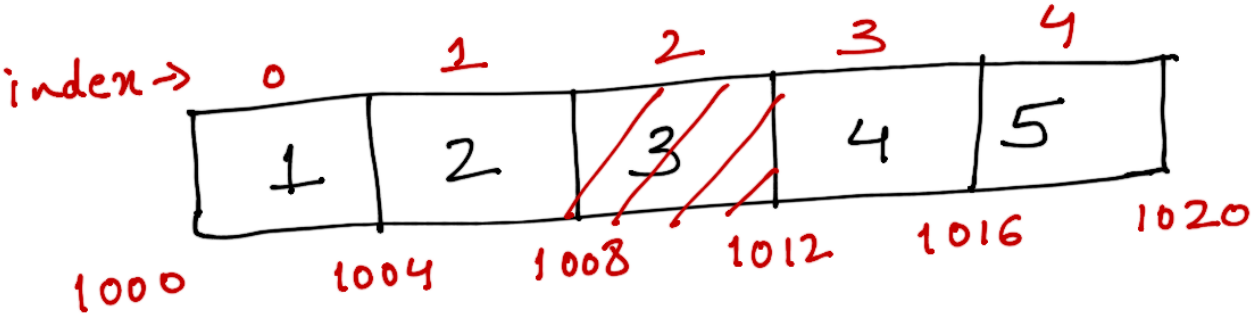
* concrete steps
* No ambiguity
* Correct
* terminate

Program: An instance of an algorithm

→ May use different programming language

Eg: Search an element in an array

int arr[5] = {1, 2, 3, 4, 5}

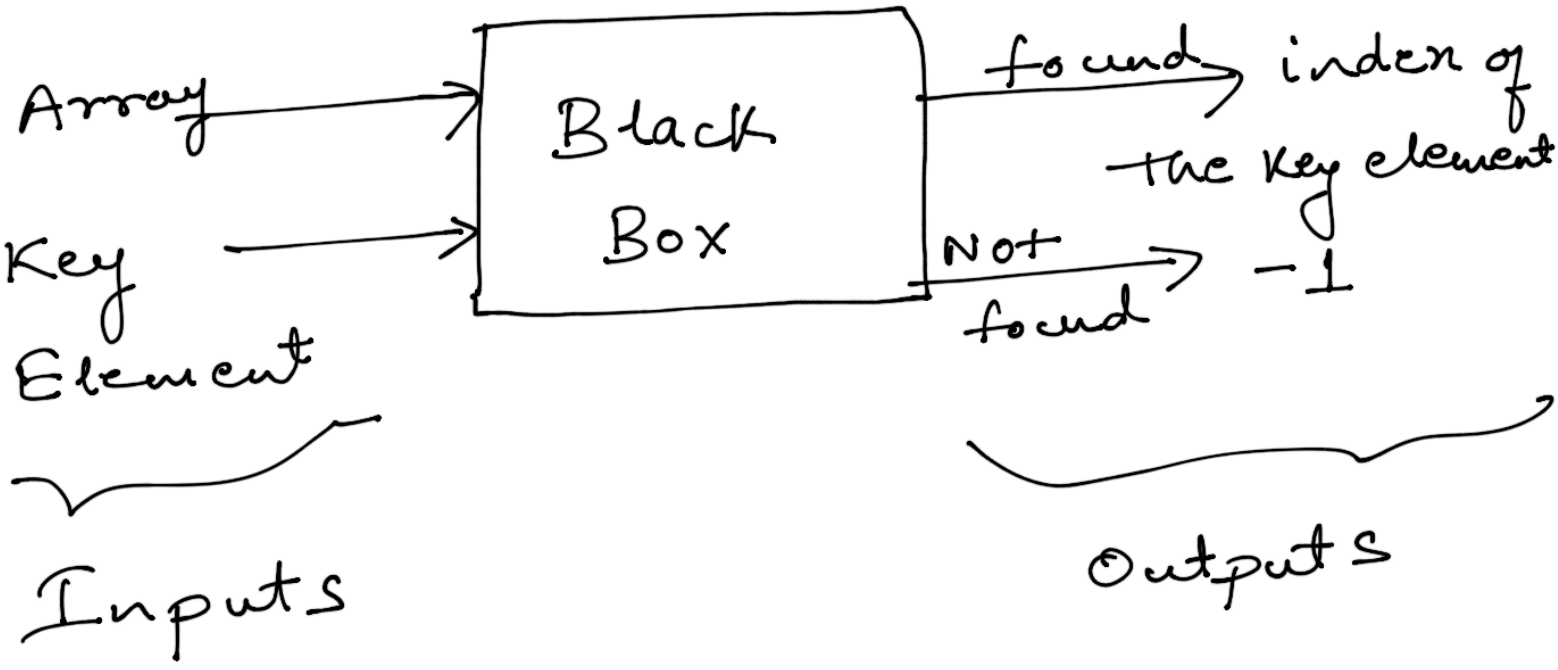


Problem:

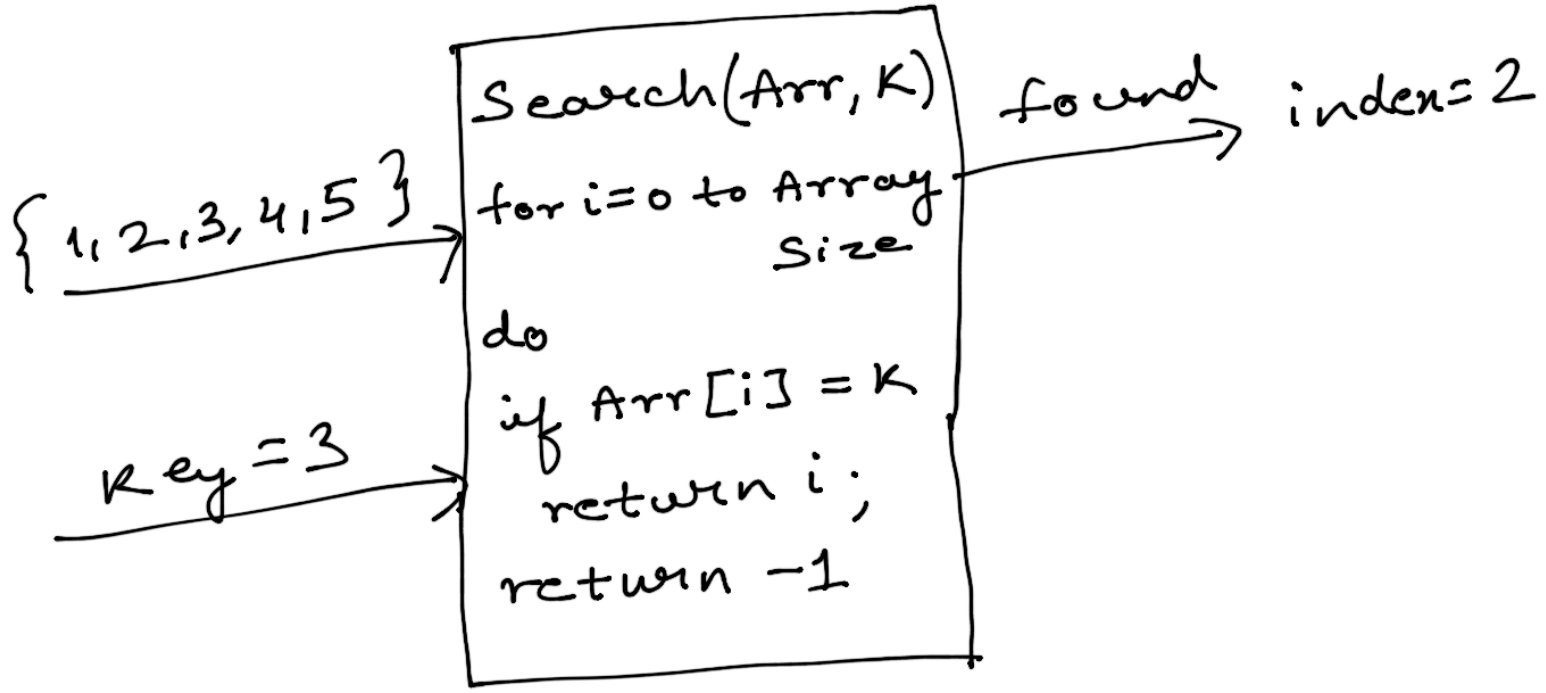
Inputs: Array, Key element

Output: index { if found
-1 { if NOT

Problem:



Algorithm



Abstract Data Types

Abstract : model, logical view

↓

Implementation ✗

→ Data Definitions

→ Operations : What ??

NOT How ??

Eg : Smart Phones

Abstract

Implementation

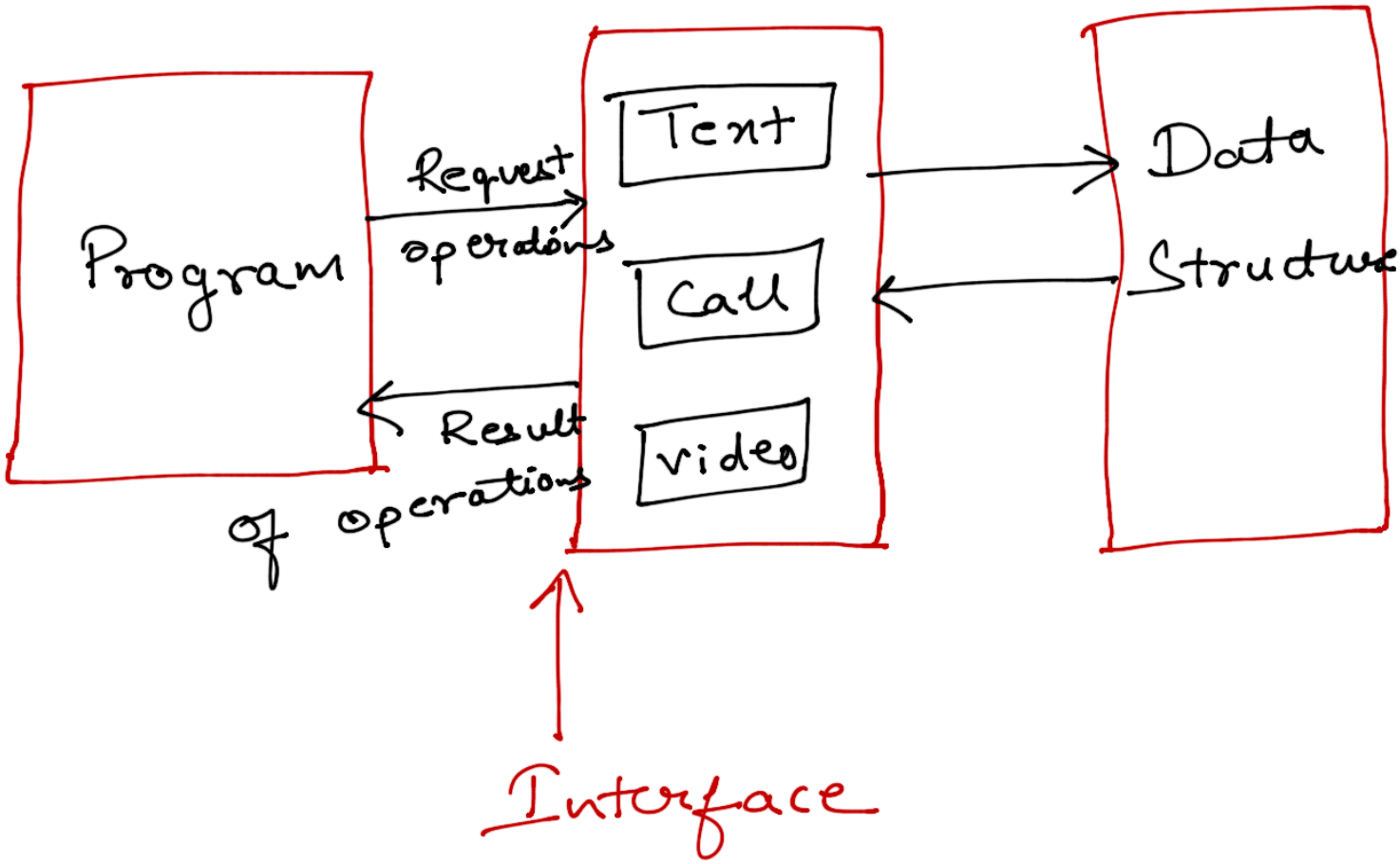
Abstract view

- 4 GB RAM
- 2.2 GHz Processor
- 5.5 inch Screen
- Dual Camera
- Android 8.0
- Operations
  - call()
  - Text()
  - video()

Implementation

```
class SmartPhone
{
private:
        int ramSize;
        float processor;
        float screen;
        int cameraCount;
        String android;

Public:
        void call();
        void text();
        void video();
};
```



Wall of ADT operations

Eg: A Set of elements of integer data type

- → Read the elements
- → Modify the elements
- → Count the elements
- → perform Sorts.

Solutions : ??