CPSC 231 - Lab
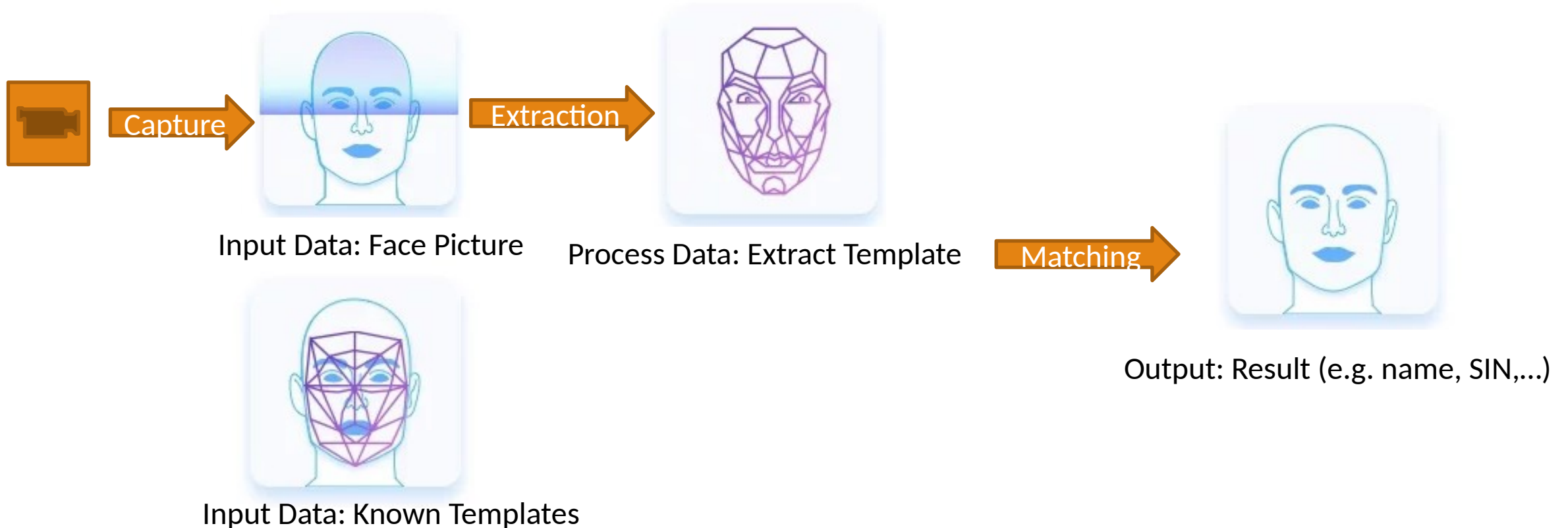
VARIABLES

How do Computers Work?

✓ Computers get input data, process that and provide output data.

✓ Computers have at least one process unit which is responsible for processing the given data.

✓ Computers have at least one memory to store data.

✓ When a program runs, it allocates the storage that need to store data (input, processing and output).

✓ e.g. Adding two number:
Input data: first number, second number
Output data: the result
In this case we need 3 storage unit in memory to store the data

How do Computers Work? (cont.)

Another example: Face Recognition Program

Capture

Input Data: Face Picture

Extraction

Process Data: Extract Template

Matching

Input Data: Known Templates

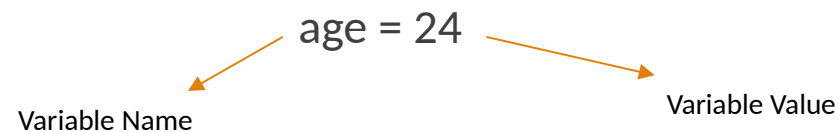Output: Result (e.g. name, SIN,...)

What is programming variable?

In all programming codes, the required data storages are defined.

We use variables to allocated storages, define types and default value of them.

Each programming language has a unique syntax for defining variables.
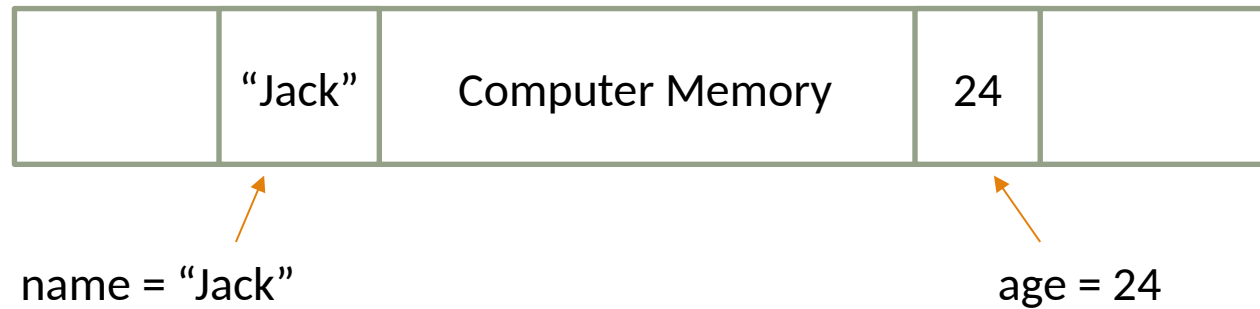
Python Syntax:

age = 24

Variable Name

Variable Value

name: "Jack"

isStudent:true

height: 178.5

What is programming variable? (cont.)

	"Jack"	Computer Memory	24	

name = "Jack"

age = 24

Variable Types

Python has different type of variables:

1. Numbers

2. String

3. Boolean

4. List

5. Tuple

6. Dictionary

Numerical variables

1.   int: Signed Integers (e.g. 1,2,10,-123,101231)
   ○ max: 9223372036854775807
   ○ min: - 9223372036854775808

2. long: Long Integers (e.g. 9223372036854775808)

3. float: Floating point real values (e.g. 3.14, 0.4, 1.0)

4. complex

String variables

1. char: single character (e.g. 'a', 'b', '}', 'ب')

2. string: set of characters (e.g. 'Hello', '12345', 'Welcome to CPSC231!')

You can define strings with "" or '' symbols

Boolean Variables

Just two states: True and False

isStudent = True

We will find out more about this type of variable when we know about conditions.

Value assignment

1. Direct assignment:
   - age = 25
   - name = "Sepehr Sabour"

2. Use expressions:
   - age = birthYear – currentYear
   - numberOfSeconds = numberOfMinutes * 60

3. Functions:
   - userAge = input("please enter your age:")
   - floor = math.floor(3.14) //answer is 3.0

Constant variables

A **variable** whose value cannot be changed once it has been assigned a value.

Python syntax: variable name with upper case
- PI = 3.14
- NUMBER_OF_SECOND_PER_MINUTE = 60

Snake case
- MINIMUM_SLARY
- memory_capacity

Camel case
- avarageOfStudentsAge
- errorMessage

Always use one of the naming styles in your code!

Operations

+ : Adds values on either side of the operator. (number, string and boolean)

- : Subtracts right hand operand from left hand operand (number and boolean)

 * : Multiplies values on either side of the operator (number, string and boolean)

/ : Divides left hand operand by right hand operand (number and boolean)

% : Divides left hand operand by right hand operand and returns remainder (number and boolean)

// : The division of operands where the result is the quotient in which the digits after the decimal point are removed. (number and boolean)

** : Performs exponential (power) calculation on operators (number and boolean)

Operations (cont.)

Python does not support some operations for some types of variables.

E.g.

```
8
>>> "hi" ** 2
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: unsupported operand type(s) for ** or pow(): 'str' and 'int'
>>> "hi" - "h"
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: unsupported operand type(s) for -: 'str' and 'str'
>>>
```

Functions

A function is block of code that gets input(s) and provides an output

Built-in functions are functions that you do not implement them.

you can use these functions by calling them.

For example print function. print("hello world")

There are dozens of built-in functions that you use in you codes.

You will learn how to implement function in the next sessions.

Functions (input)

input("print a string and ask user to type an input")

- ° Print a string
- ° Read user input

```
>>>
>>>
>>> a = input("please enter your age!")
please enter your age!25
>>> a
25
>>>
```

Functions (input)

input("print a string and ask user to type an input")
- Print a string
- Read user input

```
>>>
>>>
>>> a = input("please enter your age!")
please enter your age!25
>>> a
25
>>>
```

Function (len)

len("input string")

- ◦ Gets a string and return its length

```
>>> len("Python is cool!")
15
```

Function (type conversions)

Some functions are used to convert different types

int() : This function converts **any data type to integer**

float() : This function is used to convert **any data type to a floating point number**

ord() : This function is used to convert a **character to integer.**

 str() : Used to **convert integer into a string.**

chr(): Used to **convert integer into a character.**

bool() : This function converts **any data type to boolean**