SCHOOL OF ENGINEERING, KMITL

//WK02

Advance Computer Programming

Topic of
Introduction to
Python Programming

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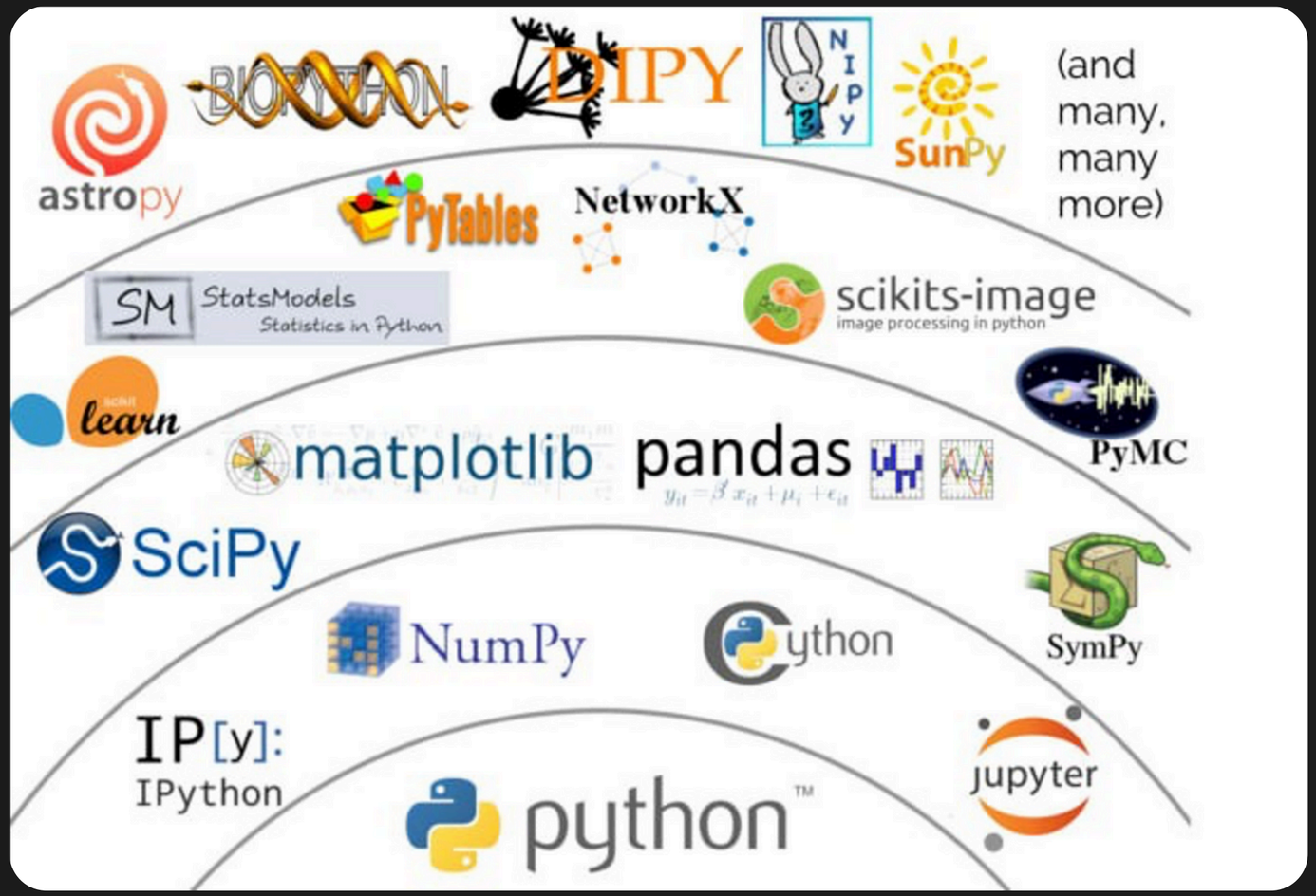
Why Python?

In-term of compatibility



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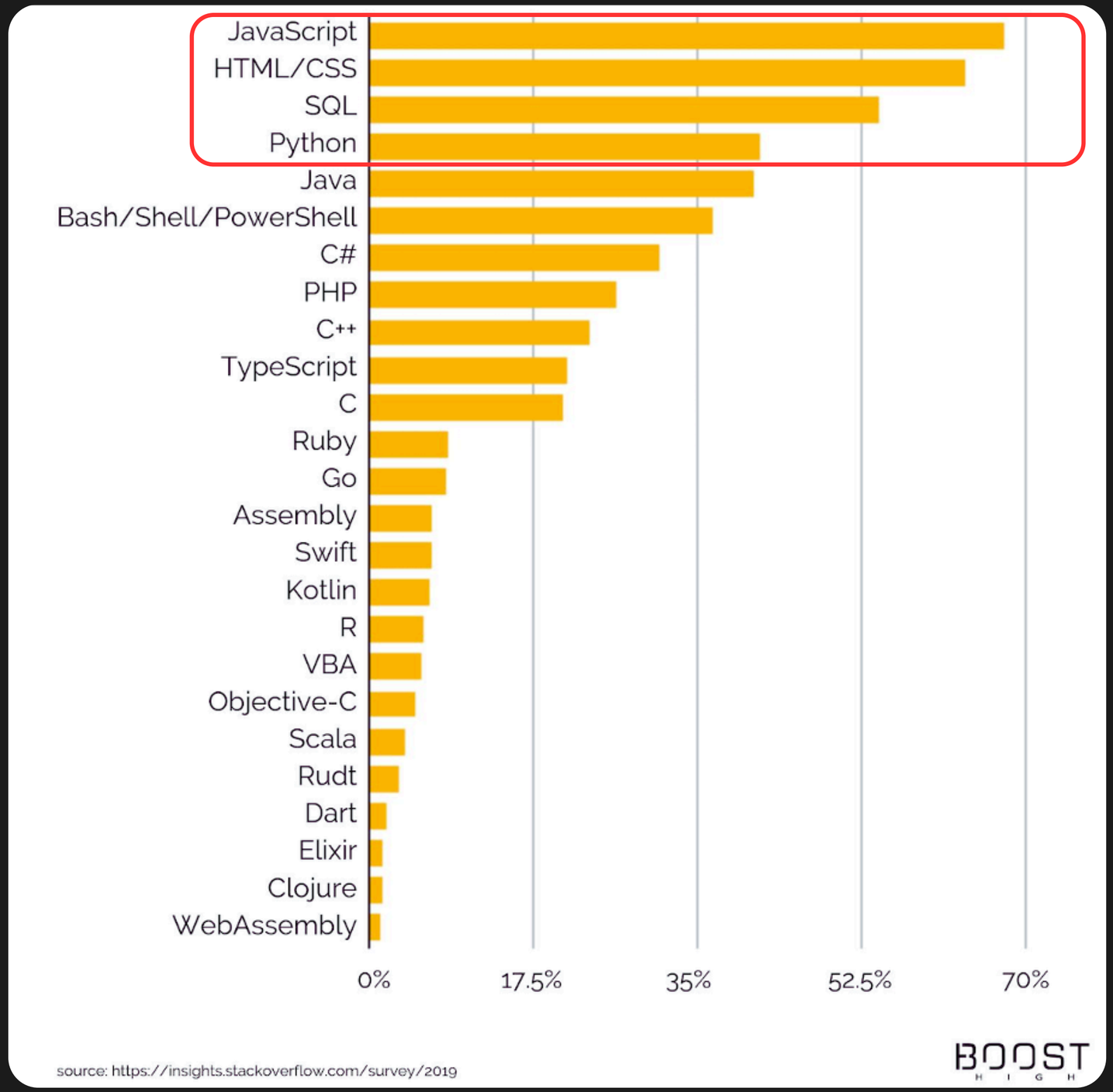
Why Python?

In-term of popularity



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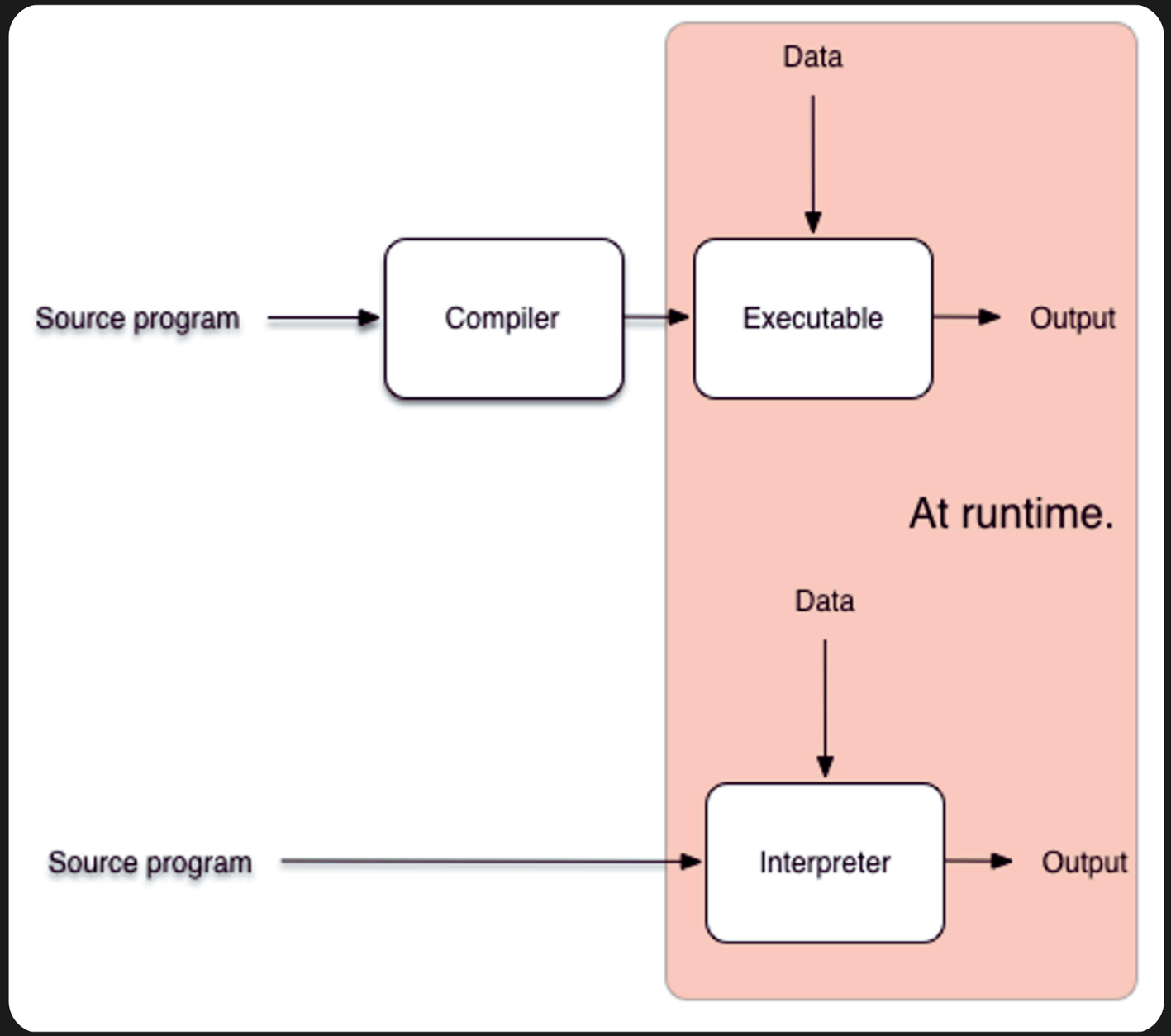
Execution method

Python is an Interpreted Language



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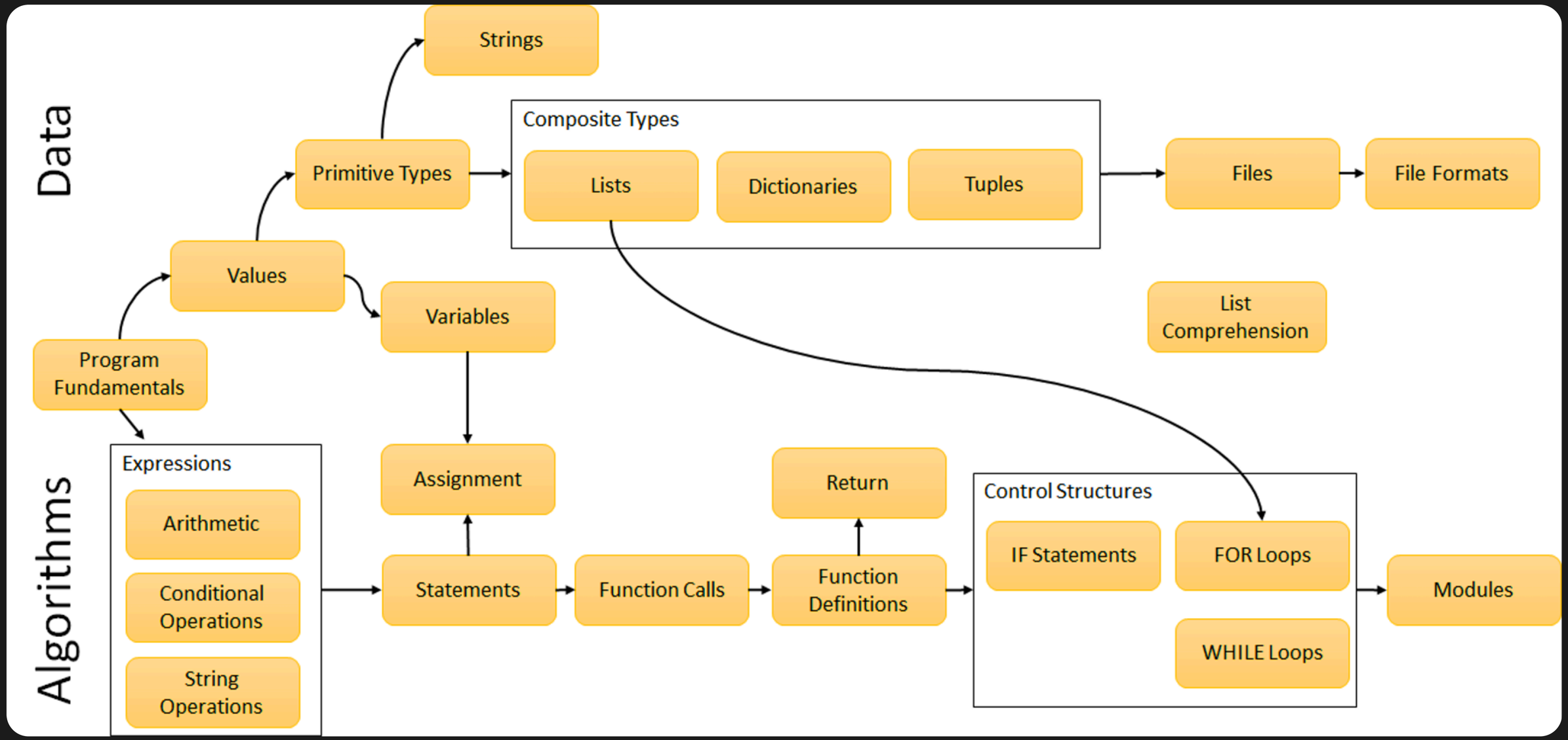
Component of Python



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Data Types

In Python

Numeric Types

- int: Integer numbers

```
num = 10
```

- float: Floating-point numbers

```
dec = 15.2
```

Text Types

- str: String of characters

```
s = "apple"
```

Sequence Types

- list: Ordered, mutable collection

```
fruits = ["apple", "banana"]
```

- tuple: Ordered, immutable collection

```
coordinates = (10.0, 20.0)
```

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Data Types (2)

In Python

Set Types

- set: Unordered collection of unique elements

```
unique_numbers = {1, 2, 3, 4, 5}
```

Dictionary Types

- dict: Key-value pairs

```
student = {"name": "Alice", "age": 21, "grade": "A"}
```

Boolean Types

- bool: Boolean values (True or False)

```
is_active = True
```

None Type

- NoneType: Represents the absence of a value (None)

```
result = None
```

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Using type()

```
# Integer
age = 25
print(type(age)) # Output: <class 'int'>

# Float
price = 19.99
print(type(price)) # Output: <class 'float'>

# List
fruits = ["apple", "banana", "cherry"]
print(type(fruits))  # Output: <class 'list'>
```

In Python, you can use the type() function to determine the type of an object.

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string

Strings are ordered sequences, so these features are Indexing, Slicing, Concatenation and Method manipulation.

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string

Indexing

```
greeting = "Hello, World!"

# Accessing the first character
first_char = greeting[0]
print(first_char)  # Output: H

# Accessing the fifth character
fifth_char = greeting[4]
print(fifth_char)  # Output: o

# Accessing the last char using negative indexing
last_char = greeting[-1]
print(last_char)  # Output: !
```

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Slicing

```
greeting = "Hello, World!"

# Slicing the first five characters
first_five = greeting[0:5]
print(first_five)  # Output: Hello

# Slicing from the seventh character to the end
from_seven_to_end = greeting[7:]
print(from_seven_to_end)  # Output: World!

# Slicing with negative indices
slice_negative = greeting[-6:-1]
print(slice_negative)  # Output: World
```

string

upper() method

```
# Original string
greeting = "Hello, World!"

# Convert to uppercase
uppercase_greeting = greeting.upper()

# Display the result
print(uppercase_greeting)  # Output: HELLO, WORLD!
```

The upper() method in Python converts all characters in a string to uppercase.

string

lower() method

```
# Original string
greeting = "Hello, World!"

# Convert to lowercase
lowercase_greeting = greeting.lower()

# Display the result
print(lowercase_greeting)  # Output: hello, world!
```

The lower() method in Python converts all characters in a string to lowercase.

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string

In Python, you can add numbers into strings using different methods such as string formatting with the % operator, str.format(), and f-strings (formatted string literals).

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string

formating using
the % Operator

```
x = "No. %d" % (100)
print(x)  # Output: No. 100
```

string

formating using
str.format()

```
x = "No. {}".format(100)
print(x)  # Output: No. 100
```

string

Using f-Strings (Formatted String Literals)

```
x = f"No. {100}"
print(x)  # Output: No. 100
```

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list

A list in Python is an ordered, mutable collection of elements. It can hold a variety of data types, including numbers, strings, and even other lists.

list

Key Characteristics:

- **Ordered**: The items have a defined order, and that order will not change unless explicitly modified.
- **Mutable**: You can change, add, and remove items after the list has been created.
- **Heterogeneous**: A list can contain items of different data types.

list

Creating

```
# Creating a list of strings
fruits = ["apple", "banana", "cherry"]

# Creating a list of mixed data types
mixed_list = [1, "hello", 3.14, True]

# Creating an empty list
empty_list = []
```

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list

Common List Operations

Accessing Elements:

```
first_fruit = fruits[0]  # Output: "apple"
```

Modifying Elements:

```
fruits[1] = "blueberry"
# fruits is now ["apple", "blueberry", "cherry"]
```

Adding Elements:

```
fruits.append("orange")  # fruits is now
["apple", "blueberry", "cherry", "orange"]
```

list

Common List Operations (2)

Inserting Elements:

```
fruits.insert(1, "banana")
# fruits is now ["apple", "banana", "blueberry",
"cherry", "orange"]
```

Removing Elements: Removes the first occurrence of a specified value

```
fruits.remove("banana")  # fruits is now
["apple", "blueberry", "cherry", "orange"]
```

Pop Elements: Remove the last element and returns an item

```
last_fruit = fruits.pop()
# Output: "orange", fruits is now ["apple",
"blueberry", "cherry"]
```

list

Common List Operations (3)

Pop Elements: Remove the specific element by index

```
last_fruit = fruits.pop(1)
# Output: "apple", fruits is now ["blueberry",
"cherry"]
```

Slicing: Extract a portion of the list

```
fruits = ["apple", "blueberry", "cherry"]
slice_of_fruits = fruits[1:3]
# Output: ["blueberry", "cherry"]
```

**The stop index in slicing is exclusive, meaning it is not included in the resulting slice.

list

Common List Operations (4)

Length: Get the number of items in the list.

```
length_of_fruits = len(fruits)  # Output: 2
```

Sorting: Sort the list in ascending or descending order.

```
fruits.sort()
# fruits is now ["apple", "blueberry", "cherry"]

fruits.sort(reverse=True)
# fruits is now ["cherry", "blueberry", "apple"]
```

Combining Lists: Concatenate two lists.

```
more_fruits = ["kiwi", "mango"]
all_fruits = fruits + more_fruits
# Output: ["cherry", "blueberry", "apple",
"kiwi", "mango"]
```

list

Common List
Operations (5)

dictionary

An unordered, mutable collection of key-value pairs. Each key is unique, and it maps to a value. Dictionaries are optimized for retrieving values when the key is known

dictionary

Key Characteristics:

- **Unordered**: The items do not have a defined order.
- **Mutable**: You can change, add, or remove items.
- **Unique Keys**: Each key must be unique.
- **Key-Value Pairs**: Each key is associated with a value.

dictionary

Syntax

```
dictionary_name = {
    key1: value1,
    key2: value2,
    key3: value3,
    ...
}
```

dictionary

Example

```
student = {
    "name": "Alice",
    "age": 21,
    "grade": "A",
    "courses": ["Math", "Science", "English"]
}
```

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dictionary

Accessing Values: Using keys to access the values.

```
name = student["name"]
print(name)   # Output: Alice
```

Modifying Values: Changing the value associated with a key.

```
student["age"] = 22
print(student["age"])   # Output: 22
```

Adding: Adding a new key-value pair to the dictionary

```
student["major"] = "RAI"
print(student["major"]) # Output: RAI
```

dictionary

Removing Items: Using del to remove a key-value pair.

```
del student["grade"]
print(student)
# Output: {'name': 'Alice', 'age': 22,
'courses': ['Math', 'Science', 'English'],
'major': 'Computer Science'}
```

Removing Items: Using pop() to remove a key-value pair and return the value.

```
age = student.pop("age")
print(age)  # Output: 22
print(student)  # Output: {'name':
'Alice', 'courses': ['Math', 'Science',
'English'], 'major': 'Computer Science'}
```

dictionary

Method

get(): Returns the value for a key, or a default value if the key is not found (But show error).

```
grade = student.get("grade", "No grade")
print(grade)  # Output: No grade
```

1

```
grade = student.get("grade")
print(grade)  # Output: None
```

2

keys(): Returns a view object containing the keys of the dictionary.

```
keys = student.keys()
print(keys)
# Output: dict_keys(['name', 'courses',
'major'])
```

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dictionary

Method

values(): Returns a view object containing the values of the dictionary.

```
values = student.values()
print(values)
# Output: dict_values(['Alice', ['Math',
'Science', 'English'], 'Computer
Science'])
```

update(): Updates the dictionary with key-value pairs from another dictionary or an iterable of key-value pairs.

```
student.update({"grade": "A", "age": 22})
print(student)
# Output: {'name': 'Alice', 'courses':
['Math', 'Science', 'English'], 'major':
'Computer Science', 'grade': 'A', 'age':
22}
```

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dictionary

Iterating

Looping through keys, values, or key-value pairs.

```
for key in student:
    print(key, student[key])

# Output:
# name Alice
# courses ['Math', 'Science', 'English']
# major Computer Science
# grade A
# age 22
```

dictionary

Iterating (2)

Looping through keys, values, or key-value pairs using items.

```
for key, value in student.items():
    print(f"{key}: {value}")

# Output:
name: Alice
age: 21
grade: A
courses: ['Math', 'Science', 'English']
```

Conditions

if

Syntax of an **if** statement

```
if some_condition:
    # execute some code
```

```
if 3>2:
    print('ITS TRUE!')
```

Conditions

if..else

Syntax of an **if/else** statement

```
if some_condition:
    # execute some code
else:
    # do something else
```

```
hungry = True

if hungry==True:
    print('FEED ME!')
else:
    print("Im not hungry")
```

```
FEED ME!
```

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Conditions

if...elif...else

```
loc = 'Bank'

if loc == 'Auto Shop':
    print("Cars are cool!")
elif loc == 'Bank':
    print("Money is cool!")
elif loc == 'Store':
    print("Welcome to the store!")
else:
    print("I do not know much.")
```

```
Money is cool!
```

Conditions

Loops: for

Syntax of a for loop

```
my_iterable = [1,2,3]
for item_name in my_iterable:
    print(item_name)
```

```
for i in range(0, 5):
    print(i)
```

Conditions

Loops: while

Syntax of a while loop

```
while some_boolean_condition:
    #do something
```

```
i = 0
while i < 5:
    print(f"No. is {i}")
    i = i + 1
```

```
No. is 0
No. is 1
No. is 2
No. is 3
No. is 4
```

Conditions

Loops: while

Syntax of a while loop

```
while some_boolean_condition:
    #do something
```

```
i = 0
while i < 5:
    print(f"No. is {i}")
    i = i + 1
```

```
No. is 0
No. is 1
No. is 2
No. is 3
No. is 4
```

Function vs Method

A function is an independent block of code, while a method is a function associated with an **object** and defined within a **class**.

Function

def

```
def name_of_function():
    '''
    Docstring explains function.
    '''
    print("Hello")
```

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Function

def

```
# Try 1
def my_function1():
    print("hello world")
print(my_function1())

# Try 2
def my_function2():
    return "hello world"
print(my_function2())
```

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Module

A module in Python is a single file containing Python code. It can include functions, classes, and variables, as well as runnable code. Modules help in organizing and reusing code across different programs.

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Module

Creating your own library as module in python

(1) Create a file named **mymodule.py** with a function definition.

```
# mymodule.py
def greet(name):
  return f"Hello, {name}!"
```

(2) Create the main script file named **main.py** that will import and use the function from mymodule.py.

```
# main.py
from mymodule import greet


# Call the function and print the result
greeting = greet("Alice")
print(greeting)  # Output: Hello, Alice!
```