"Python For Research"

tri-chandra
research group

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WHAT WE DO TODAY?

Our basic target is that, we able to solve any Mathematical questions where formulas are used.

And able to use any python modules for our problem solving.

- Package Manager
- Import methods
- Intro. Of Math, NumPy, Pandas and Matplotlib
- Create nD Arrays in NumPy - see on Repo.

- Intro. of Modules
- Create/Import
- It's uses

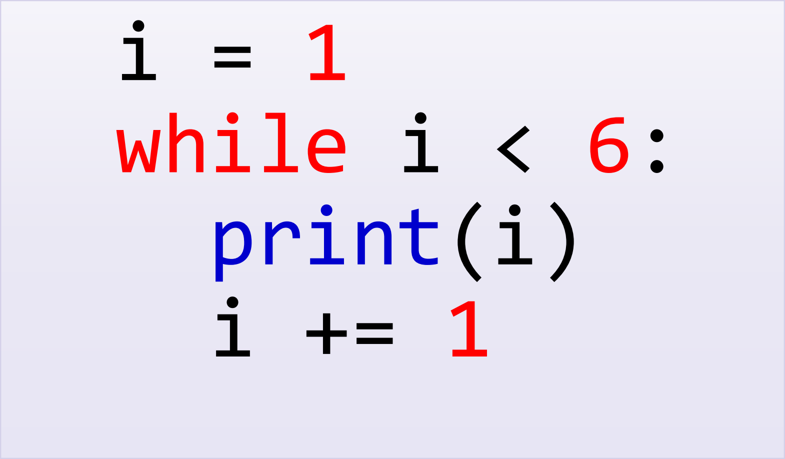
- Loops
- If statements
- Functions
- Math Questions

LOOPS IN PYTHON

A loop is an instruction that repeats multiple times as long as some condition is met.

- ➢ While Loop

It execute the set of statements as long as condition is true. Eg.



```python
i = 1
while i < 6:
  print(i)
  i += 1
```

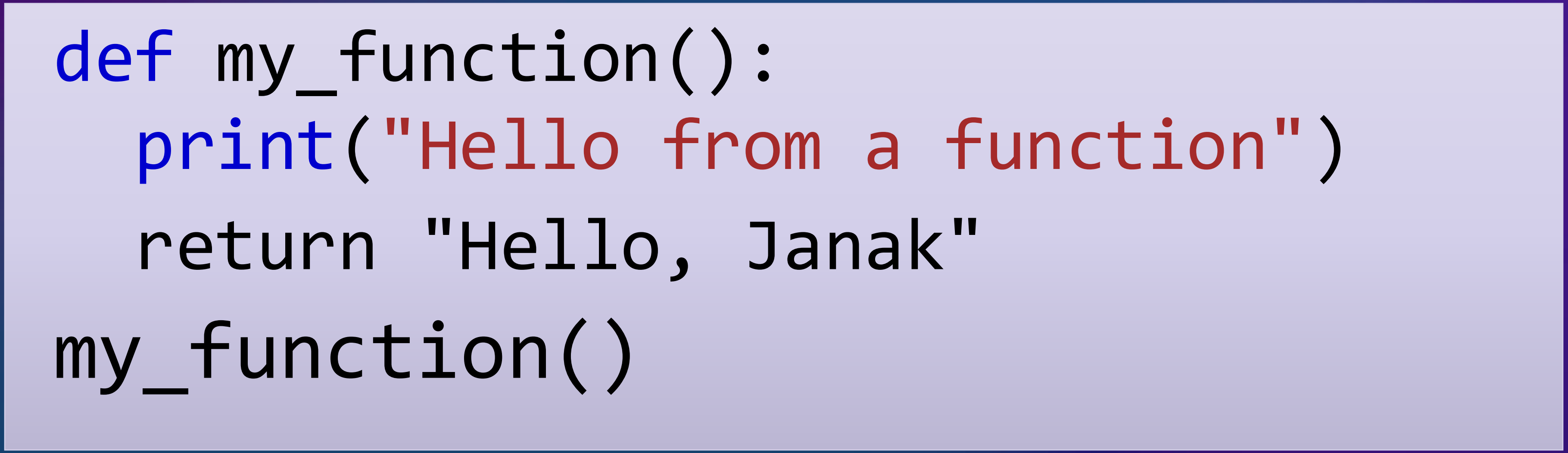
FOR LOOP IN PYTHON

The for loop in Python is used to iterate over a sequence (like a list, tuple, or string) or other iterable objects. Iterating over a sequence means going through each element one by one. Eg.

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
  print(x)
  if x == "banana":
    break
```

FUNCTIONS IN PYTHON

- A function is a block of code which only runs when it is called.
- You can pass data, known as parameters, into a function.
- A function can return data as a result.



```python
def my_function():
  print("Hello from a function")
  return "Hello, Janak"
my_function()
```

IN-BUILD FUNCTIONS/METHODS

- input() : allowing user input
- len() : return length of an object
- max(): return largest item in iterable/list/objects
- min(): return minimum item
- print(): print standard output
- range(): return the sequence of numbers, start from zero.

IN-BUILD FUNCTIONS/METHODS

- round() : round the number
- sum() : return sum of numbers
- type(): return of objects
- complex(): return complex number
- pow(): return the value x to the power of y
- lower(): convert the string to lowercase.

IN-BUILD FUNCTIONS/METHODS

- upper() : convert the string to upper case
- count() : Returns the number of times a specified value occurs in a string.
- ...., Etc.

ADVANCED IN-BUILD DATA TYPES IN PYTHON

- ➢Arrays/List
- ➢Dictionary
- ➢Tuple
- ➢Sets

1 Lists are used to store multiple items in a single variable. A list is a data structure in Python that is a mutable, or changeable, ordered sequence of elements.

2 Dictionaries are mutable data structures that allow you to store key-value pairs. Dictionary can be created using the dict(). Once you have created a dictionary, you can add, remove, or update elements using the methods dict. update(), dict. pop(), etc.

3 Tuples are a type of data structure that is very similar to lists. The main difference between the two is that tuples are immutable, meaning they cannot be changed once they are created.

4 Set is a data type in python used to store several items in a single variable. It is a collection that is written with curly brackets and is both unindexed and unordered.Mathematical set operations like union, intersection, and difference can be performed on them.

LIST/ARRAYS IN PYTHON

```
myList = ["apple", "banana", "cherry", "mango"]
print(myList)

---------------------------------------------

thislist = ["apple", "banana", "cherry"]
print(len(thislist))

---------------------------------------

list2 = [1, 5, 7, 9, 3]
list3 = [True, False, False]

----------------------------------------------Using Constructor

thislist = list(("apple", "banana", "cherry")) # note the double round-brackets
print(thislist)

print(thislist[1]) # Access value
```

Methods see on W3Schools.com

DICTIONARY IN PYTHON

```
thisdict = {
  "brand": "Ford",
  "model": "Mustang",
  "year": 1964,

   "colors": ["red", "white", "blue"]

}
print(thisdict["brand"])

#Access value

print(thisdict["colors"][1])

# results in None value

print('Country:', you.get('country'))
```

Methods see on W3Schools.com

TUPLE IN PYTHON

✓ Tuples are used to store multiple items in a single variable.

✓ A tuple is a collection which is ordered and unchangeable.

```
thistuple = ("apple", "banana", "cherry")
print(thistuple)
print(thislist[1]) # Access value
tuple1 = ("abc", 34, True, 40, "male")
```

Methods see on W3Schools.com

SETS IN PYTHON

A set is a collection which is unordered, unchangeable*, and unindexed.

* **Note:** Set *items* are unchangeable, but you can remove items and add new items.

```
    set1 = {"apple", "banana", "cherry"}
    set2 = {1, 5, 7, 9, 3}
    set3 = {True, False, False}
```

```
thisset = set(("apple", "banana", "cherry")) # note the double round-brackets
print(thisset)

for x in thisset:
  print(x) # Access value
```

Methods see on W3Schools.com

Solve Mathematical Problems By Python

See on code.....

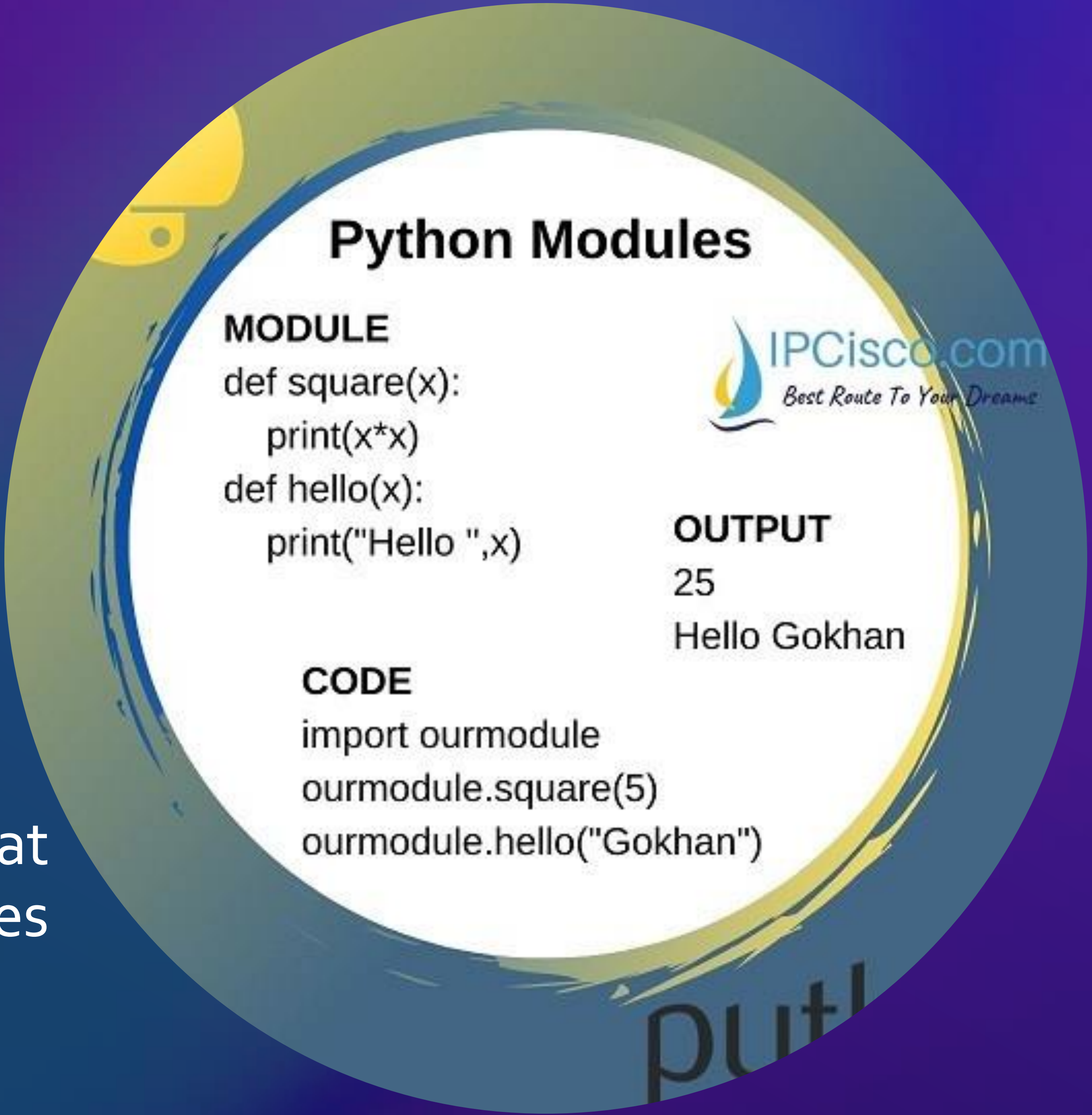
SOME PROGRAMS

- Basic Calculator
- Chatbot using If
- Eligibility test for voting
- Math App
- Etc….

Python Modules

To create a module just save the code you want in a file with the file extension .py

Python Modules are the libraries that includes a set of functions, variables etc. that are defined earlier.



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Python Modules

MODULE

```
def square(x):
    print(x*x)
def hello(x):
    print("Hello ",x)
```

OUTPUT

```
25
Hello Gokhan
```

CODE

```
import ourmodule
ourmodule.square(5)
ourmodule.hello("Gokhan")
```

PYTHON MODULES FOR RESEARCH

Module is a file that contains code to perform a specific task.

A module may contain variables, functions, classes etc. Some popular modules for Research are showing here.

Jupyter Notebook

NumPy

Pandas

Matplotlib

Scipy

Python ML/DL Modules

CREATE & USE MODULE IN PYTHON

- Save this code in a file named mymodule.py

```
# Python Module addition
def add(a, b):
    result = a + b
    return result
```

- **Now we can use the module we just created, by using the import statement:**

```
import mymodule
mymodule.add(4,5) # returns 9
```

SOME ABOUT MODULE

- Variables in Module

```
person1 = {
  "name": "John",
  "age": 36,
  "country": "Norway"
}
```

- Use of variable

```
import mymodule
a = mymodule.person1["age"]
print(a)
```

Re-naming a Module

```
import mymodule as mx
a = mx.person1["age"]
print(a)
```

Import Method Direct

```
from mymodule import person1

print (person1["age"])
```

PACKAGE MANAGER IN PYTHON [PIP]

Python package managers are essential tools that help developers install, manage, and update external libraries or packages used in Python projects. These packages can contain reusable code, modules, and functions developed by other programmers, making it easier for developers to build applications.

- Verify Pip Installation: pip --version

- Installation Module Syntax: pip install moduleName eg. pip install numpy

INTRODUCTION OF POPULAR MODULES

Overall, Python is a great choice for data analysis because of its simplicity, community support, rich ecosystem of libraries and tools, interoperability with other languages, and high-level programming capabilities.

NumPy

NumPy is a Python library. It is used for working with arrays. its short for "Numerical Python".

Pandas

Pandas is a Python library used for working with data sets. It has functions for analyzing, cleaning, exploring, and manipulating data.

Matplotlib

Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python.

Math

Python has a built-in module that you can use for mathematical tasks. The math module has a set of methods and constants.

PYTHON FOR RESEARCH

Contd… See you next class

TC-RESEARCH GROUP

"PYTHON FOR RESEARCH"

Python has become one of the most popular programming languages in the research community due to its simplicity, versatility, and powerful libraries.

OOP–OBJECT ORIENTED PROGRAMMING

Object-Oriented Programming is a methodology to design a program using classes and objects. It simplifies the software development and maintenance by providing some concepts defined below

OOP TERMS

- Function/Methods
- Class
- Objects
- Parameters
- Inheritance
- Polymorphism
- Scope

1 A function is a block of code which only runs when it is called.

2 Class is a user-defined data type which defines its properties and its functions. Class is the only logical representation of the data.

3 Object is a run-time entity. It is an instance of the class. An object can represent a person, place or any other item. An object can operate on both data members and member functions.

HOW TO CREATE CLASS

To create a class, use the keyword

```
class:
```

```
class MyClass:
  x = 5

  p1 = MyClass()
  print(p1.x)
```

The __init__() Function

All classes have a function called __init__(), which is always executed when the class is being initiated.

```
class Person:
  def __init__(self, name,
age):
    self.name = name
    self.age = age

p1 = Person("John", 36)

print(p1.name)
print(p1.age)
```