BIG DATA TOOLS FOR MANAGERS

Unit-4 : Introduction to Python Programming

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Overview

- Introduction Python
- Python & Jupyter Notebook
- Getting started with Python
  - Variables
  - Comments
  - Packages

Introduction to Python

- Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language

- Python is designed to be highly readable. It uses English keywords frequently whereas the other languages use punctuations.

How Python is useful?

- Python has built-in features of application development and other system related libraries.
- Python can easily preprocess varieties of structure & unstructured data.
- Python is available for all the operating system (Windows, Linux, macOS), and easy to move Python code from one operating system to another operating system.
- Python has a wide & active community, and 2,00,00+ packages worldwide to improve project features and productivity while working with Python.
- Python has various libraries for Statistical analysis, Text Analysis, Visualization.

Python Software

- Python Interpreter/software, which is available for all the OS

- Official website :

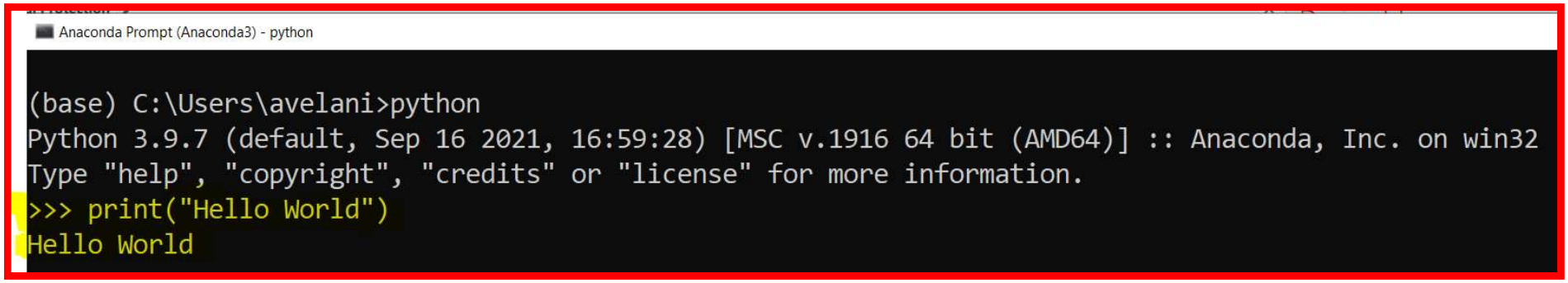
www.python.org

or

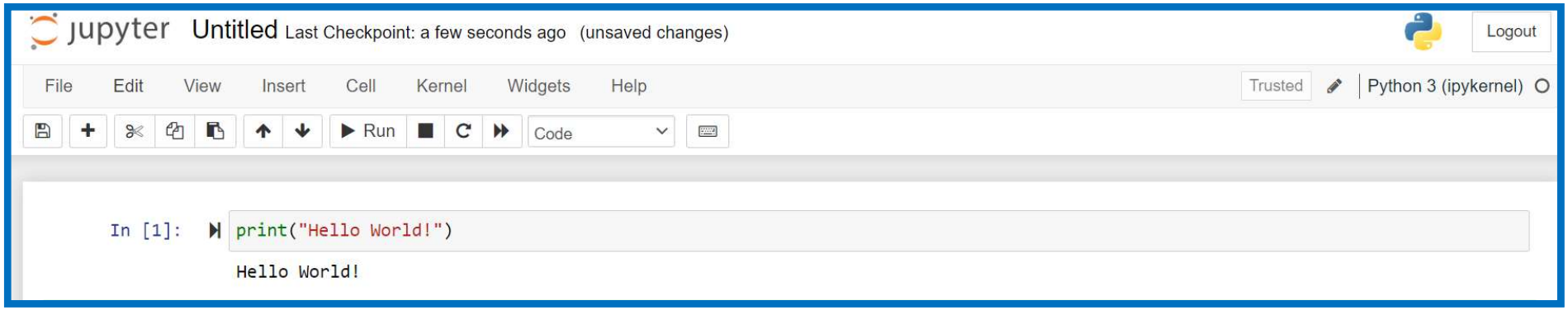
www.anaconda.com

Tools to Run Python Code

- Command Prompt



- Jupyter Notebook



Reserved Words

- The following list shows the Python keywords. These are reserved words and you cannot use them as variables or any other identifier names.

- All the Python keywords contain lowercase letters only.

and	exec	not
as	Finally	or
assert	For	pass
break	from	print
class	global	raise
continue	if	return
def	import	try
del	in	while
elif	is	with
else	lambda	yield
except		

Variables

- Variables are container for storing data value in memory.
- A variable is created the moment you first assign a value to it.

Example:

```
x = 5
y = "John"
print(x)
print(y)
```

Variables

Rules to create variable name:

- A variable name must start with a letter or the underscore character
- A variable name cannot start with a number
- A variable name can only contain alpha-numeric characters and underscores (A-z, 0-9, and _)
- Variable names are case-sensitive (age, Age and AGE are three different variables)
- Python does not allow punctuation characters such as @, $, and % within variable name or identifiers

Variables

- Example:

2myvar = "John"
my-var = "John"
my var = "John"

Invalid variable name

myvar = "John"

my_var = "John"

_my_var = "John"

myVar = "John"

MYVAR = "John"

myvar2 = "John"

Valid variable name

Variables

Multi Words Variable Names:

- Example:

```
myVariableName = "John"

MyVariableName = "John"

my_variable_name = "John"
```

Variables

Example:

```
        age = 55      # An integer assignment
percentage = 98.05   # A floating point
      name = "John" # A string

print(age)
print(percentage)
print(name)
```

( ) → denotes Function Call, print is function and it display the value of variable.

Python Indentation

- Python does not use braces({}) to indicate blocks of code for class and function definitions or flow control.
- Blocks of code are denoted by line indentation, which is rigidly enforced.
- The number of spaces in the indentation is variable, but all statements within the block must be indented the same amount

Python Indentation

```
if True:
    print ("True")
else:
    print ("False")
```

Valid

Invalid

```
if True:
  print ("True")
else:
    print ("False")
```

Quotation in Python

- Python accepts single ('), double (") and triple (''' or """) quotes to denote string literals, as long as the same type of quote starts and ends the string.

```
word = 'word'

sentence = "This is a sentence."

paragraph = """This is a paragraph. It is
made up of multiple lines and sentences."""
```

Comments in Python

- A hash sign (#) that is not inside a string literal is the beginning of a comment.
- All characters after the #, up to the end of the physical line, are part of the comment and the Python interpreter ignores them.

```
# First comment
print ("Hello, Python!") # second comment
```

Python Packages

- PIP is a package manager for Python packages, or modules if you like.
- A package contains all the files you need for a module/libraries.
- Downloading Package from internet
  pip install <package-name>
- On-Jupyter Notebook
  !pip install <package-name>

Python Packages

Example:

```
!pip install pandas
!pip install sklearn
!pip install spacy
!pip install matplotlib
!pip install pandasql
```

Import Packages

- Import statement used to import python packages in Python code.

Example:

```
import pandas

import pandas as pd
```

Alias of package name
Ie. here pd is alias name of pandas

Read csv file in Pandas

- read_csv() function used to read csv file in Pandas.

- i.e

```
import pandas
data = pandas.read_csv("IPL.csv")
```

Read csv file in Pandas

- read_csv() function used to read csv file in Pandas.

- i.e

```
import pandas as pd #pd is alias of pandas
data = pd.read_csv("IPL.csv")
```

Recap

- Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language.
- Python is available for all the operating system.
- Jupyter Notebook is an environment to execute Python Code.
- Reserved Words can not used as variable or function name.
- Variable name can only contain alpha-numeric character and underscores(A-z, 0-9 and _)
- Blocks of code are denoted by indentation, not with the braces ({})
- Python accepts single ('), double (") and triple (‘ ‘ ‘ or “ “ ") quotes to create strings.
- pip command used to download & install python packages from Internet.
- Import statement used to import python package.

Python Programming

- The focus will be on features that are important from data analysis perspective.
  - Declaring Variables
  - Conditional Statements
  - Control Flow
  - Functions
  - Data Structures/Collections (List, Tuple, Sets, Dictionary)

Declaring Variables

- A variable can be declared and then assigned a value without specifying data type.
- Python automatically infers the variable type from values assigned to it.
- A Variable initialized with a value of one type can later be re-assigned as value of a different type.
    - int – Integer type
    - float – Floating point number
    - bool – Boolean value (True/False)
    - str – Textual data

Declaring Variables

Example:

```
var1 = 2
var2 = 5.0
var3 = True
var4 = "Python Programming"
```

Above are the variables creating with various data types (int, float, booleans, string)

Declaring Variables

print() used to print the value of any variables and **type()** function used check the data types of any variables.

```
print(var1)
print(var2)
print(var3)
```

Declaring Variables

print() used to print the value of any variables and **type()** function used check the data types of any variables.

```
print(var1)
print(var2)
print(var3)
```

```
type(var1)  # gives result as int
type(var2)  # gives result as float
type(var3)  # gives result as bool
type(var4)  # gives result as str
```

Conditional Statement

- Python supports if-elif-else for writing conditional statements.
- The condition should be terminated by : (colon) and code block following that must be indented.

Syntax:

```
if condition:
        statements
elif condition:
        statements
else:
        statements
```

Conditional Statement

Example : Simple If

Write conditional statement to check whether variable contains positive value.

```
var1 = 5
if  var1 > 0:
    print("True. Variable contains positive numbers")
```

Conditional Statement

Example : If..Else Statement

Write conditional statement to check then condition and display appropriate message for True & False condition.

```
var2 = -20
if  var2 > 0:
    print("True. Value is positive numbers")
else:
    print("False. Value is not positive numbers")
```

Conditional Statement

Example : if..elif..else

With the help of if..elif..else we can add & check multiple conditions.

```
x = 10
y = 20
if  x>y:
    print("X is greater than Y")
elif y>x:
    print("Y is greater then X")
else:
    print("X & Y are same")
```

Sequence Numbers Generation

range() function used to generate a sequence of numbers. If takes following parameters.

- **start** : starting number of the sequence
- **stop** : Generate numbers up to , but not including this number
- **step** : Difference between each number and default value is 1

Example : Generate sequence number from 1 to 5

```
x = range(1, 5, 1)      #step is 1
Y = range(1, 100, 5)  #step is 5
```

Control Flow Statements

To display value of sequence of numbers by iterating using Control flow statements.

- For Loop
- While Loop

Control Flow Statements

Display sequence of numbers using For loop

```
x = range(1, 5, 1)
for num in x:
    print(num)
```

Output:

1
2
3
4
5

Control Flow Statements

Display sequence of numbers using While loop

```
i = 1    # Initialize variable i with 1
while i < 5:  # Check the condition
    print(i)
    i = i + 1    # increments
```

Output:

1

2

3

4

5

Functions

- Functions are the most important part of a programming language.
- Functions can be created using *def* keyword.
- The function signature should contain the function name followed by the input parameters enclosed in brackets and must be end with colon (:)
- The functions ends with a return statements. If no return statement implies the function returns Nothing (None).

Functions

Syntax:

```
def function_name(parameters1, parameters2…):
        function-statements
        function-statements
        …
        return statement
```

Functions

Example:

Write a functions to add of two integer numbers:

```
def addElement(a,b):
    y = a + b
    return y

addElement(5,10)
# 15
```

Data Structures/ Collections

- Data Structures/Collections are useful containers to store and manipulate list of homogeneous or heterogeneous elements.

- Following data structures in this sections:
  - List
  - Tuple
  - Set
  - Dictionary

List - Data Structures

- List allows to contain heterogeneous items, that is, a single list can contain items of type int, float, string or object.
- List can be created with square bracket [ ]
- List values can repeat, it allows to store repeated values.
- Lists are mutable and generally initialized with a list of values specified inside square brackets or an empty list.

List - Data Structures

- Creation syntax:

variable_name = [element-1, element-2, element-3..etc]

Example:

- Create list of integer number

num_list = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

print(num_list)

List - Data Structures

- Creation syntax:

variable_name = [element-1, element-2, element-3..etc]

Example:

- Create list of integer number

num_list = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
print(num_list)

- Create list of city name

city_name = ["Tumkur", "Bangalore", "Mysuru",
"Mandya", "Davangere", "Shivamogga"]
print(city_name)

List - Data Structures

Accessing Elements from a List

- List elements can be access using indexing range separated by colon (:)
- Index range allows from 0 to n-1 element.

Syntax

list-variable-name[index]

or

list-variable-name[start:end] # with range of index

List - Data Structures

```
num_list = [ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 ]
print(num_list)

# Accessing first element
num_list[0]

# Accessing list using index range
num_list[3:7] #Index 7 will not be included (4,5,6,7)

# Accessing last element
num_list[-1]   #Negative index display element from last

# Accessing last 3 element from a list
num_list[-3: ]
```

List - Data Structures

Calculate list size (how many elements are present in list)

```
len(num_list)
```

List allow to combine another list easily with + (plus) operator

```
num = [1, 2, 3, 4, 5]
alpha = ['a','b','c','d','e']

combined_list = num + alpha
print(combined_list)
```

Output:

[1, 2, 3, 4, 5, 'a’, 'b’ ,'c’ ,'d', 'e']

List - Data Structures

List allows to change/update the list elements

num_list = [1,2,3,4,5,6,7,8,9,10]

num_list[4] = 404 #updating 4th index element with new value

num_list[-2] = 99990 #updating 2nd last element of list

print(num_list)

Output:
[1, 2, 3, 4, 404, 6, 7, 8, 99990, 10]

Tuple - Data Structures

- Tuple is also a list, but it is immutable. Once a tuple has been created it cannot be modified.
- Tuple can be created with parenthesis ()
- Tuple can have repeat value, and it allows to store repeated values also.
- Tuple are immutable and generally initialized with a list of values specified inside parenthesis ().

Tuple - Data Structures

- Creation syntax:

variable_name = (element-1, element-2, element-3..etc)

Example:

- Create Tuple of integer number

num_list = (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

print(num_list)

Tuple - Data Structures

- Creation syntax:

variable_name = (element-1, element-2, element-3..etc)

Example:

- Create Tuple of integer number

```
num_list = (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
print(num_list)
```

- Create Tuple of city name

```
city_name = ("Tumkur", "Bangalore", "Mysuru",
             "Mandya", "Davangere", "Shivamogga")
print(city_name)
```

Tuple - Data Structures

Accessing Elements from a Tuple

- Tuple elements can be access using indexing range separated by colon (:)
- Index range allows from 0 to n-1 element.

Syntax

tuple-variable-name[index]

or

tuple-variable-name[start:end] # with range of index

Tuple - Data Structures

```
num_tuple = ( 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 )
print(num_tuple)

# Accessing first element
num_tuple[0]

# Accessing tuple using index range
num_tuple[3:7] #Index 7 will not be included (4,5,6,7)

# Accessing last element
num_tuple[-1]   #Negative index display element from last

# Accessing last 3 element from a tuple
num_tuple[-3: ]
```

Tuple - Data Structures

Calculate list size (how many elements are present in list)

len(num_tuple)

Tuple allow to combine another Tuple easily with + (plus) operator

num_tuple = (1, 2, 3, 4, 5)

alpha_tuple = ('a','b','c','d','e’)

combined_tuple = num_tuple + alpha_tuple

print(combined_tuple)

Output:

[1, 2, 3, 4, 5, 'a’, 'b’ ,'c’ ,'d', 'e']

Tuple - Data Structures

#Tuple is immutable, means once it created, we can not change any elements.

num_tuple = (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
print(num_tuple)

num_tuple[4] = 404 #This statement will throw error message, bcz tuple is immutable

```
num_tuple[4] = 404
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
~\AppData\Local\Temp/ipykernel_15804/3831651665.py in <module>
----> 1 num_tuple[4] = 404

TypeError: 'tuple' object does not support item assignment
```

Set - Data Structures

- A set is a collection of unique elements, that is the value con not repeat.

- Set can be created with curly brackets {}

- The set automatically removes duplicates and contains only unique list of numbers.

- Syntax:

variable_name = {element-1, element-2, element-3..etc }

Set - Data Structures

Example:

```
s = {1, 2, 3, 4, 1, 2, 3, 4, 5, 6, 7, 8, 9, 9,10}
print(s)
```

Iterate using For loop.

```
for ele in s:
    print(ele)
```

Set - Data Structures

#Set Operation:

s1= {1,2,3,4,5,10,20,30,40}

s2= {4,5,6,7,8,9,10}

Union

s3 = s1.union(s2)

print(s3)

Set - Data Structures

#Set Operation:

s1= {1,2,3,4,5,10,20,30,40}

s2= {4,5,6,7,8,9,10}

Union

s3 = s1.union(s2)

print(s3)

Intersection

s4=s1.intersection(s2)

print(s4)

#difference Set (A-B)

s5 =s1.difference(s2)

print(s5)

Dictionary - Data Structures

- Dictionary is a list of key and value pairs. All keys in a dictionary are unique.

- Dictionary can be created with curly brackets & key : value
  {"Key": "Value"}

- The value of dictionary can be accessed by using key.

- Syntax:

```
dict_var_name = {
    "key1": "value",
    "key2": "value",
    ...
    }
```

Dictionary - Data Structures

Example:

```
student = {
            "USN":  "1SI22MBA01",
          "NAME":  "John",
           "CITY":  "Tumkur",
          "DEPT":  "MBA",
   "COLLEGE": "SIT, Tumkur"
   }

print(student)
```

Dictionary - Data Structures

Display all the Keys available in Dictionary:

student.keys()

Display all the value available in Dictionary:

student.values()

Access element using Key

student['USN’]

student['NAME’]

Update value in Dictionary

student['USN']="1SI22MBA02" # Print dictionary after an update

Dictionary - Data Structures

```
# Combine two dictionary

sub = {
        'Sub-1': 45,
         'Sub-2': 55,
         'Sub-3': 65
}

student.update(sub)
print(student)
```

Comparison with Python Data structure

Lists	Tuple	Set	Dictionary
Lists are mutable	Tuples are immutable.	Sets are mutable	Dictionary are mutable
Lists are enclosed within square braces. [ ]	Tuples are enclosed within parenthesis. ( )	Sets are enclosed in curly brackets. { }	Dictionaries are enclosed in curly brackets with key-value pairs. { key : value }
List element can be accessed using index/ range of index	Tuple element can be accessed using index/range of index	Have use iteration like for, while loop to access element	Dictionary element can be accessible using its key
len() function used to get length/size of list	len() function used to get length/size of Tuple	len() function used to get length/size of set	len() function used to get length/size of dictionary
Easy to combine two or more lists with + (plus) operator	Easy to combine two or more Tuple with + (plus) operator	union to be used for combining two set	update function used to combine two dictionary

Exercise

Create a List with given element [10,20,30,40,50,60,70,80,90,100]

Write a python code for :

1. Create a List
2. Print element using print()
3. Print element using iteration (For loop)
4. Multiply list elements with number 2
5. Display first element of list
6. Display last element of list
7. Display first 3 elements of list
8. Display last 3 elements of list

Exercise

Create a dictionary for Employee data

employee_Name : John

employee_City : Bangalore

employee_Mobile: 9876512345

employee_Email : john@gmail.com

Write a python code for :

1. Create a employee dictionary
2. Display all the key present in dictionary
3. Display all the value present in dictionary
4. Print Dictionary element
5. Access dictionary element using employee_Name
6. Access dictionary element using employee_Email