ITA6017
Python Programming

Dr. Arun Pandian J

Course Objectives

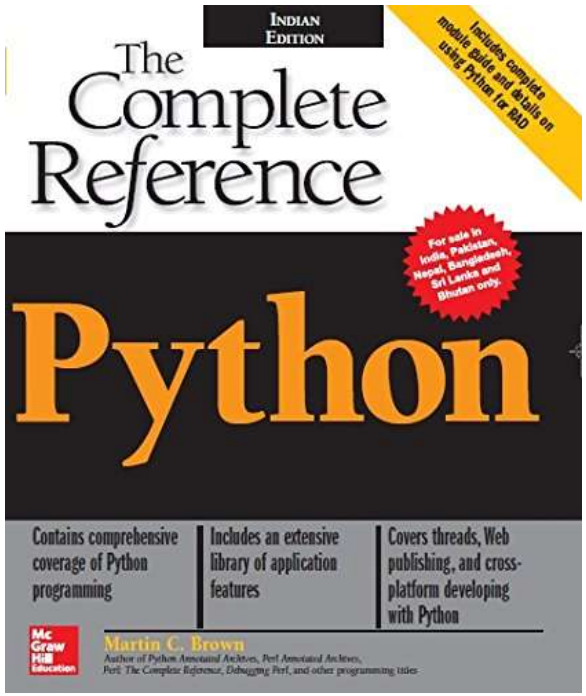
- To design and apply programming constructs in python
- To learn how to write loops and decision statements in python
- To learn how to use lists, tuples, and dictionaries in python programs
- To apply embedded programming features in python

Expected Course Outcomes

1. Apply a solution clearly and accurately in a program using Python
2. Implement a given algorithm as a computer program using Python constructs
3. Demonstrate the implications of specialized data structures in Python
4. Develop simple embedded oriented applications in Python
5. Develop data visualization trends in Python

Text Book

- Martin C. Brown, Python: The Complete Reference, 20 Mar 2018, 4th Edition, McGraw Hill Education, USA.

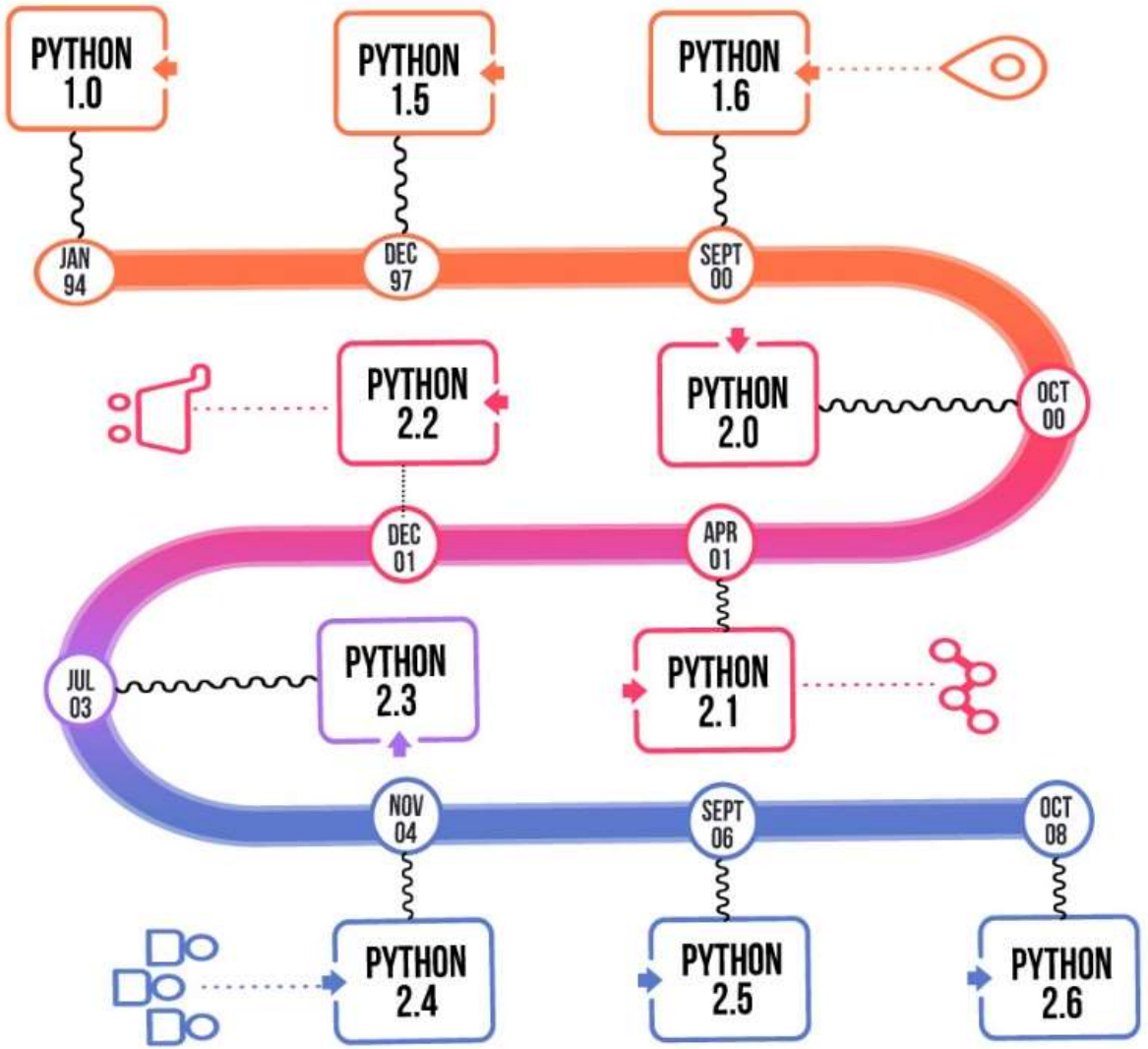


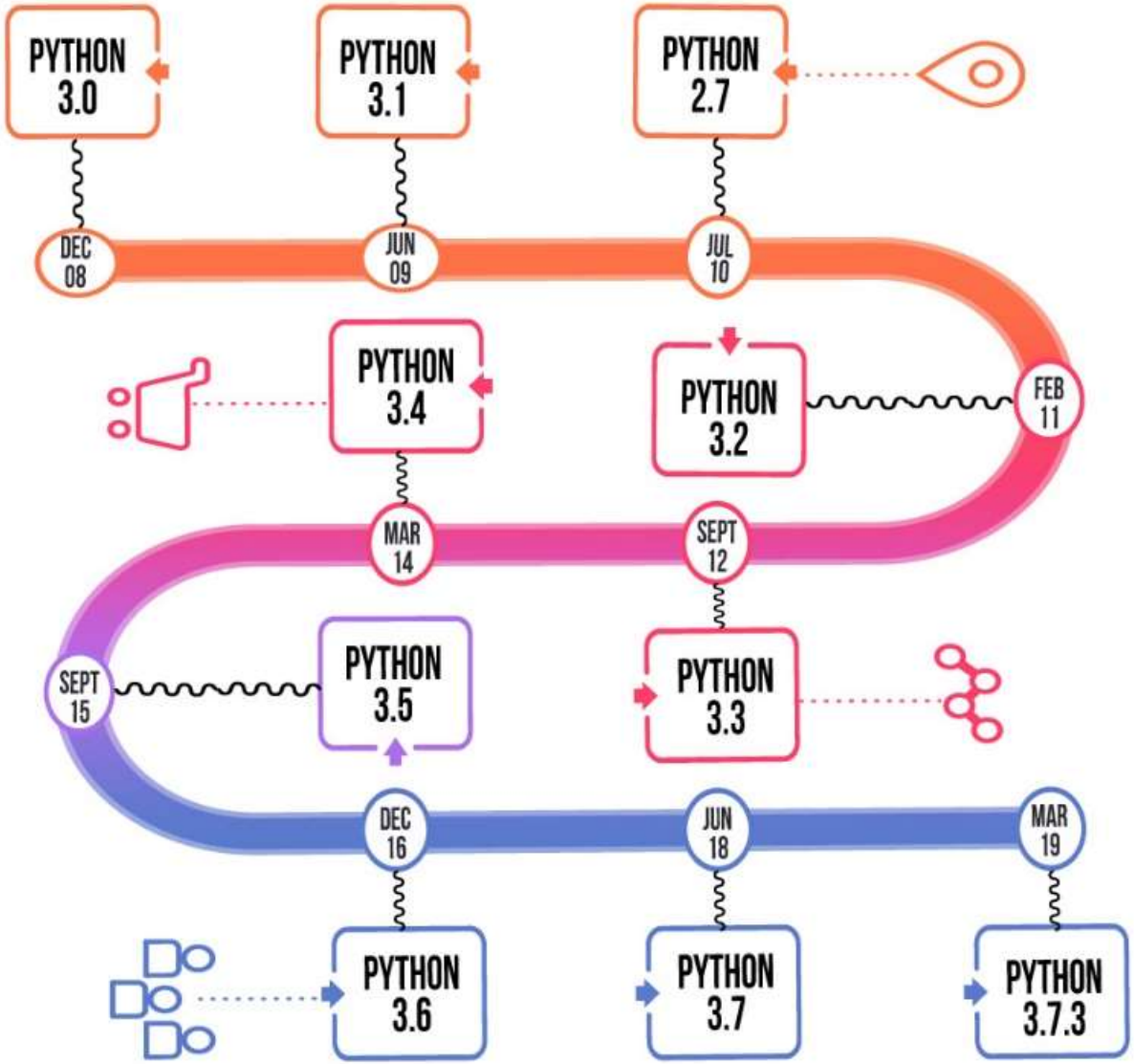
Module:1 Introduction to Python

History of Python, Unique features of Python, Demo on IDE, Ipython, Spyder etc., “Hello world” program in Python, Keywords, Identifiers, Reading input from user-Demo, Python Data Types, Declaring and using Numeric data types: int, float, complex and string

(4 Hours)

History


PYTHON 1.0
PYTHON 1.5
PYTHON 1.6
JAN 94
DEC 97
SEPT 00
PYTHON 2.2
PYTHON 2.0
OCT 00
DEC 01
APR 01
JUL 03
PYTHON 2.3
PYTHON 2.1
NOV 04
SEPT 06
OCT 08
PYTHON 2.4
PYTHON 2.5
PYTHON 2.6


PYTHON 3.0
PYTHON 3.1
PYTHON 2.7
DEC 08
JUN 09
JUL 10
PYTHON 3.4
PYTHON 3.2
FEB 11
MAR 14
SEPT 12
SEPT 15
PYTHON 3.5
PYTHON 3.3
DEC 16
JUN 18
MAR 19
PYTHON 3.6
PYTHON 3.7
PYTHON 3.7.3

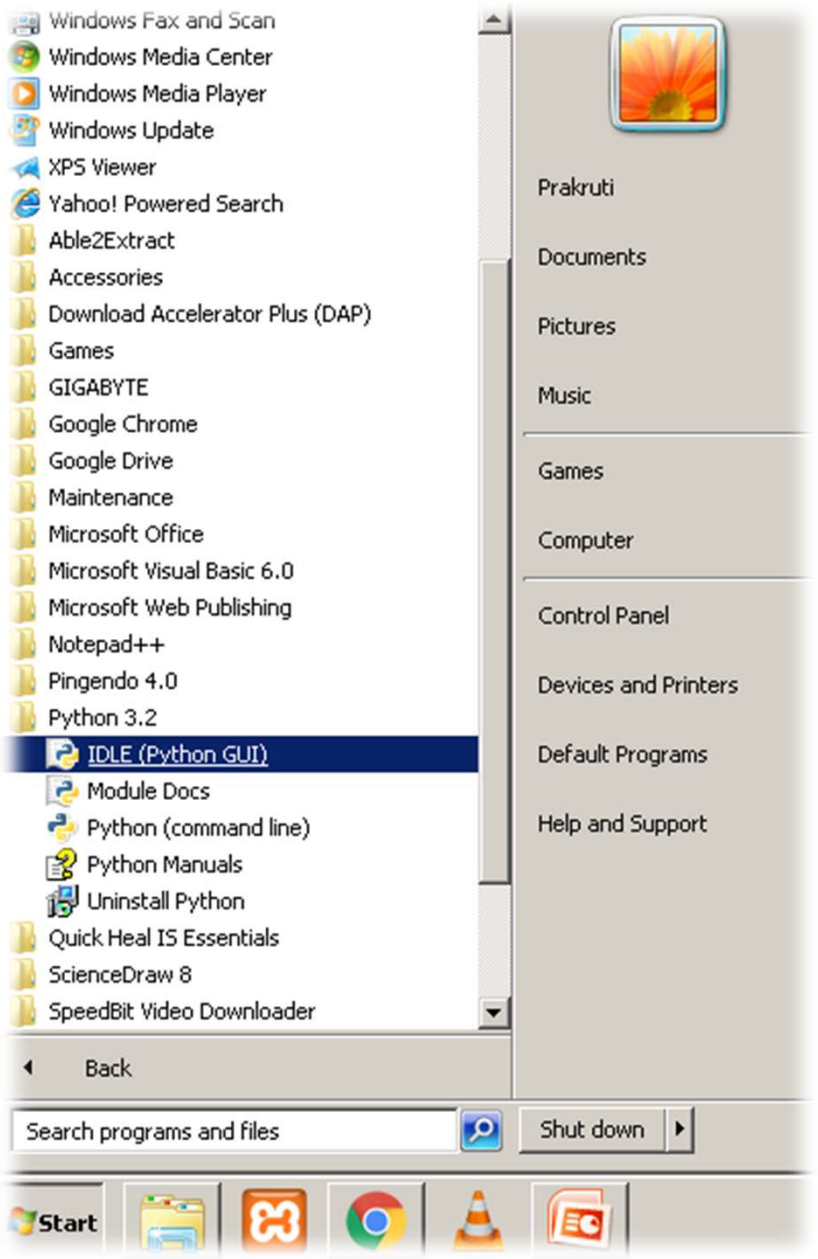
Current version of python is

3.11.2

Unique features of Python

- Easy to Code
- Easy to Read
- Free and Open-Source
- Robust Standard Library
- Interpreted
- Portable
- Object-Oriented and Procedure-Oriented
- Extensible
- Expressive
- Support for GUI
- Dynamically Typed

Demo on Python Editors



PYTHON INTRACTIVE MODE PYTHON IDLE

PYTHON SHELL

What is Shell?

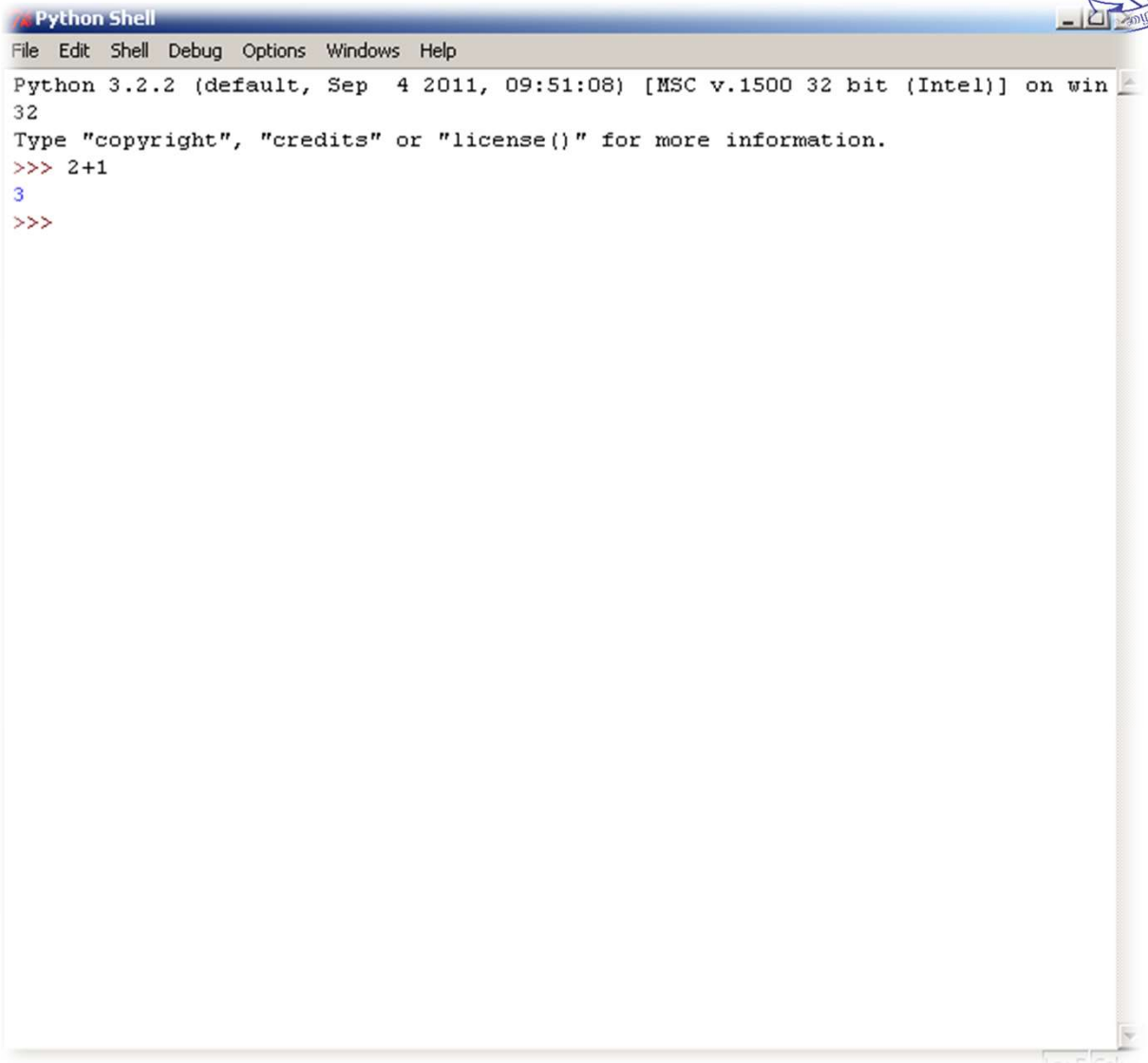
A shell is usually an "interactive shell", usually termed a REPL which stands for "Read - Execute - Print - Loop" Most interpreted languages offer a REPL interface - whether its LISP, python, BASIC or Javascript or even DOS batch language or Unix Shells. The interpreter is what actually executes the lines of code.

PYTHON SHELL

What is Python Shell or Python Interactive Shell?

The Python interpreter can be used from an interactive shell. The interactive shell is also interactive in the way that it stands between the commands or actions and their execution. ... Python offers a comfortable command line interface with the Python shell, which is also known as the "Python interactive shell".

PYTHON SHELL IDLE



PYTHON BASIC MODES

What are the basic modes of python?

Python has two basic modes:

1) Script and

2) Interactive.

PYTHON BASIC MODES

1) Script Mode:

The normal mode is the mode where the scripted and finished .py files are run in the Python interpreter.

PYTHON BASIC MODES

2) Interactive Mode:

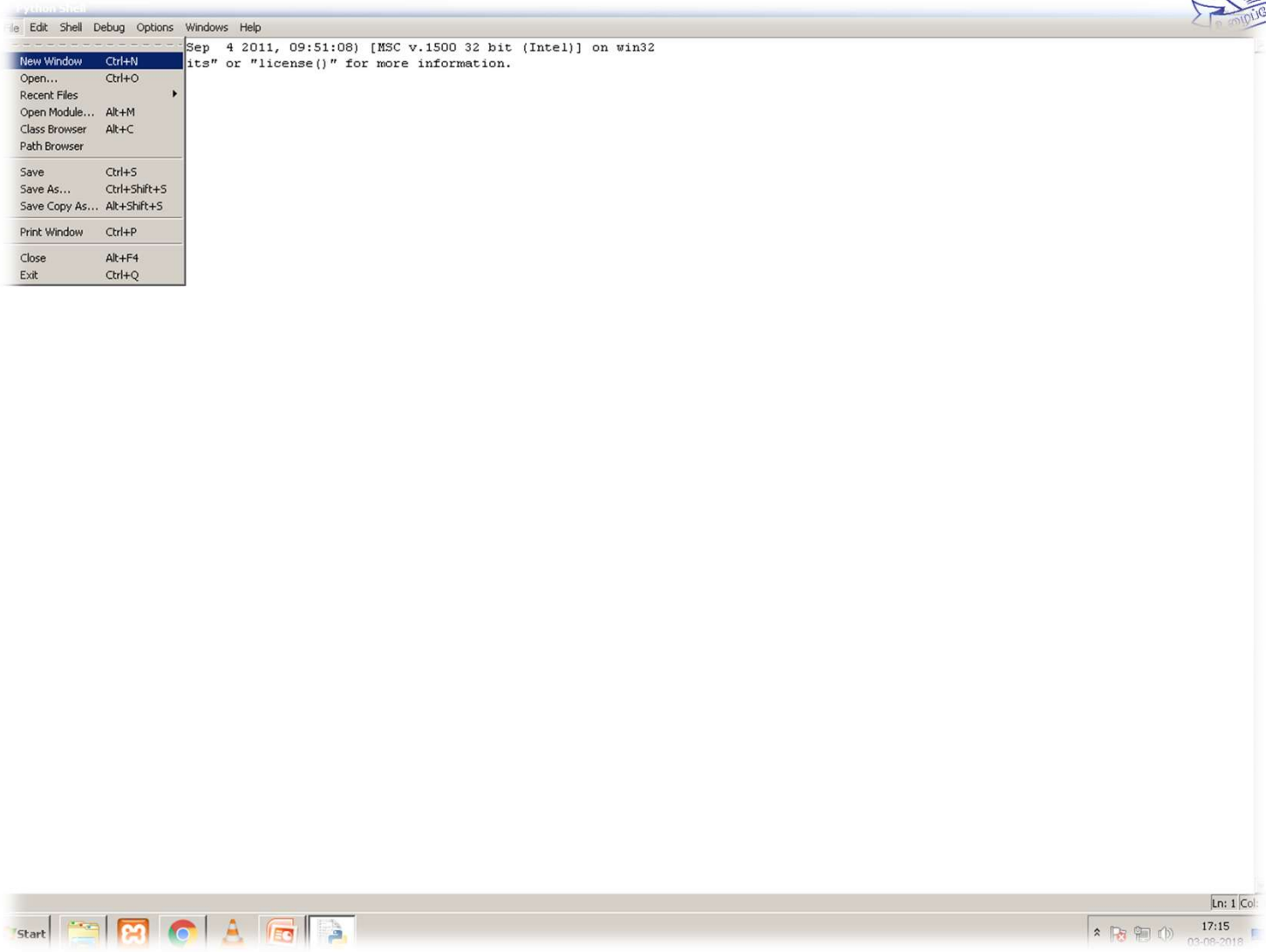
Interactive mode is a command line shell which gives immediate feedback for each statement, while running previously fed statements in active memory.

SCRIPT

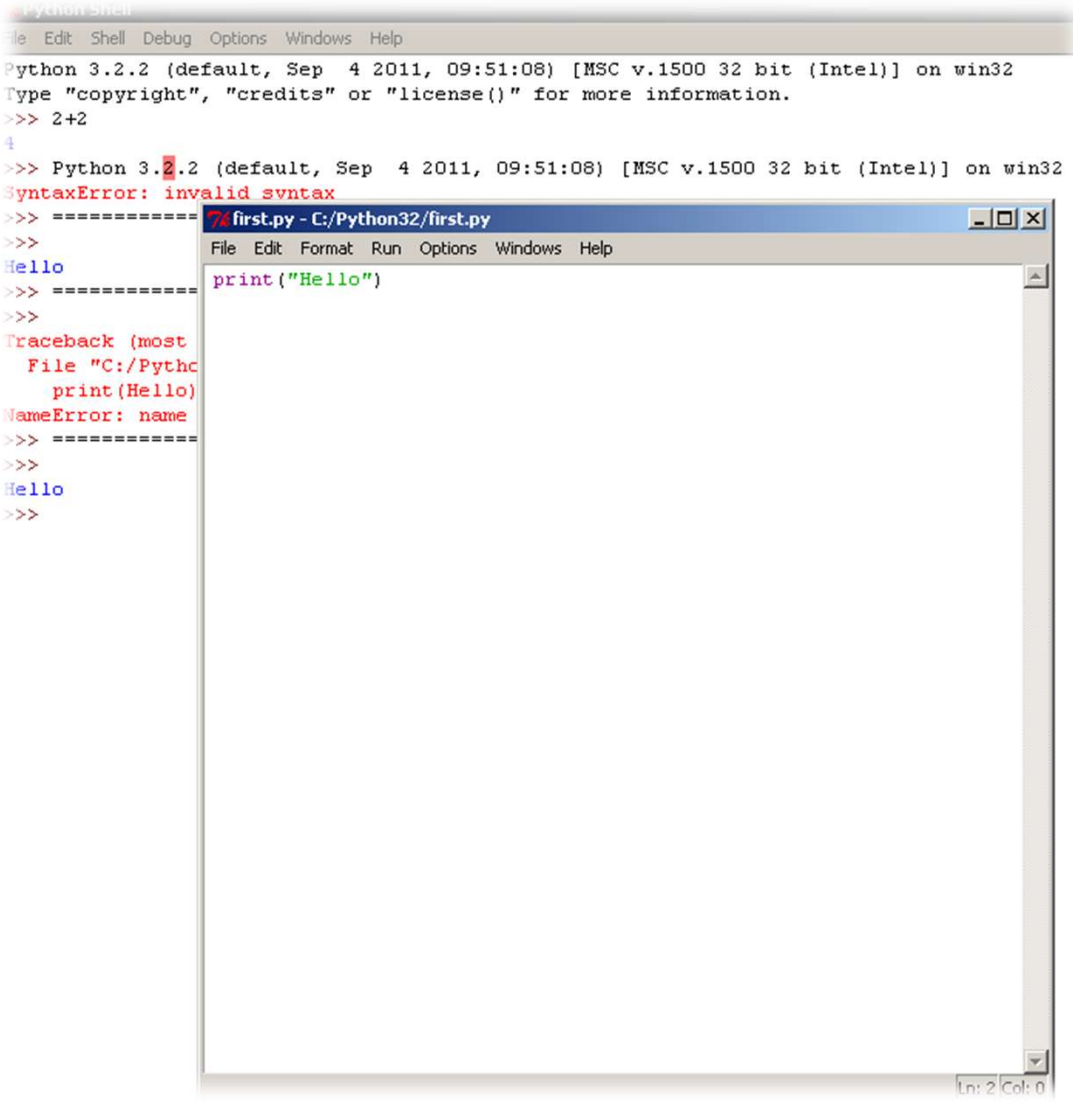
What is Script?

Scripts are reusable. Basically, a script is a text file containing the statements that comprise a Python program. Once you have created the script, you can execute it over and over without having to retype it each time. Scripts are editable.

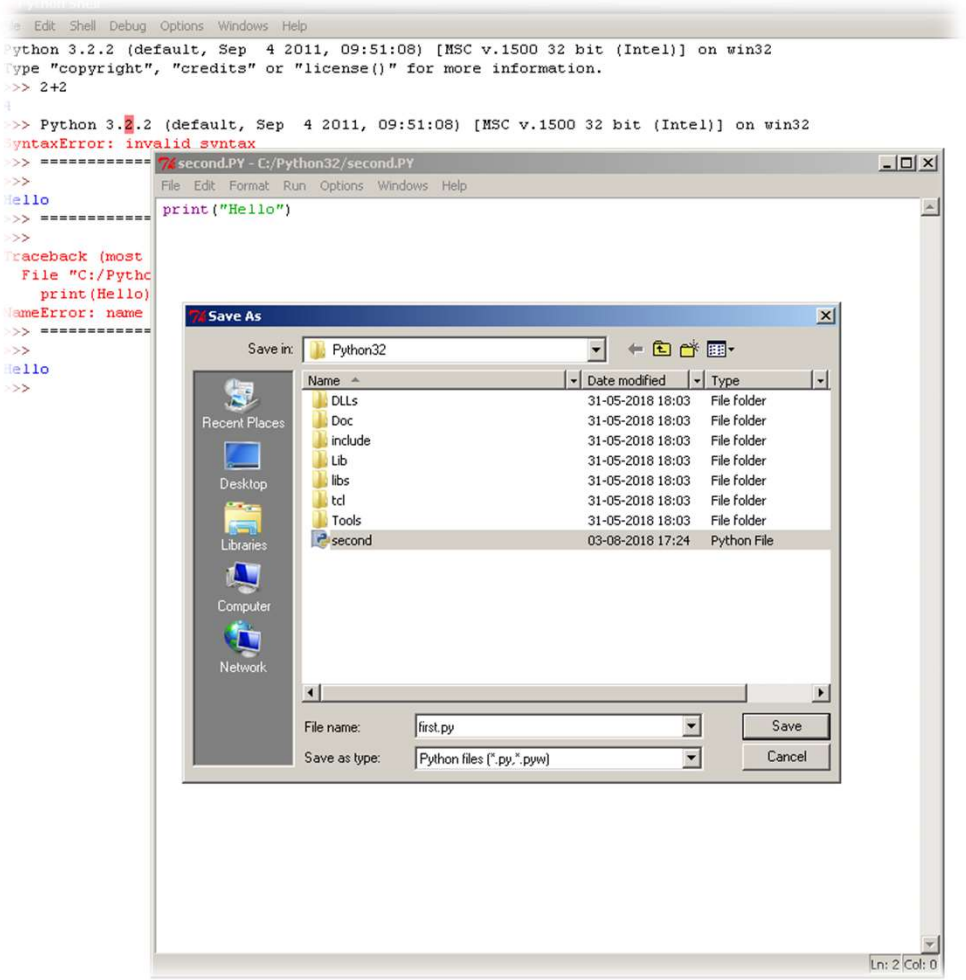
INVOKING SCRIPT MODE



INVOKING SCRIPT MODE



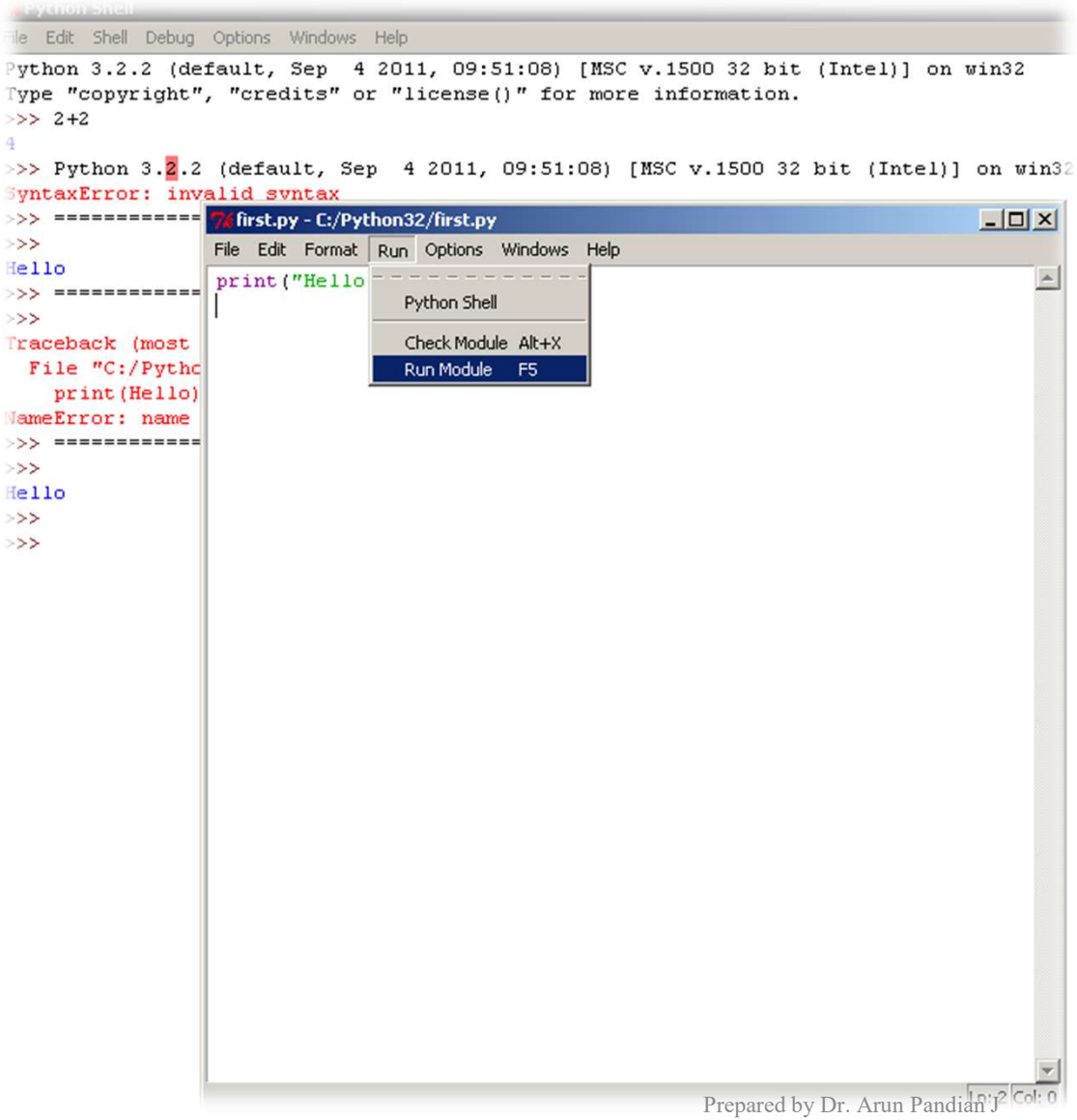
Saving Script / Program File



Click On File
Select Save
Give filename with
py extension

For Example:
first.py
Or
first.PY

Running or Executing Program / Script



Click On Run

Select

Run Module

Or

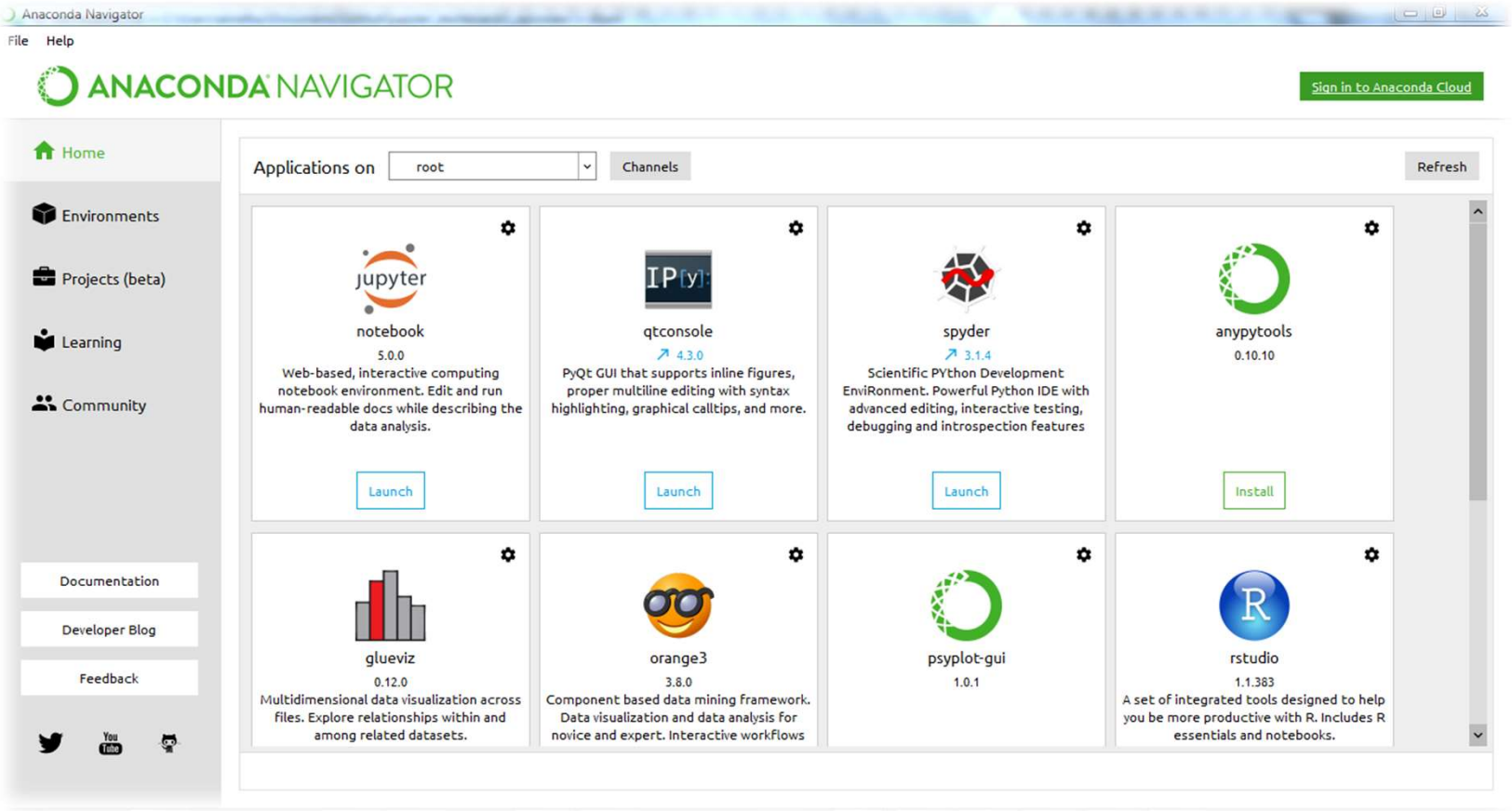
F5

ANACONDA

Powered by Continuum Analytics®

WORKING IN ANACONDA

ANACONDA NAVIGATOR



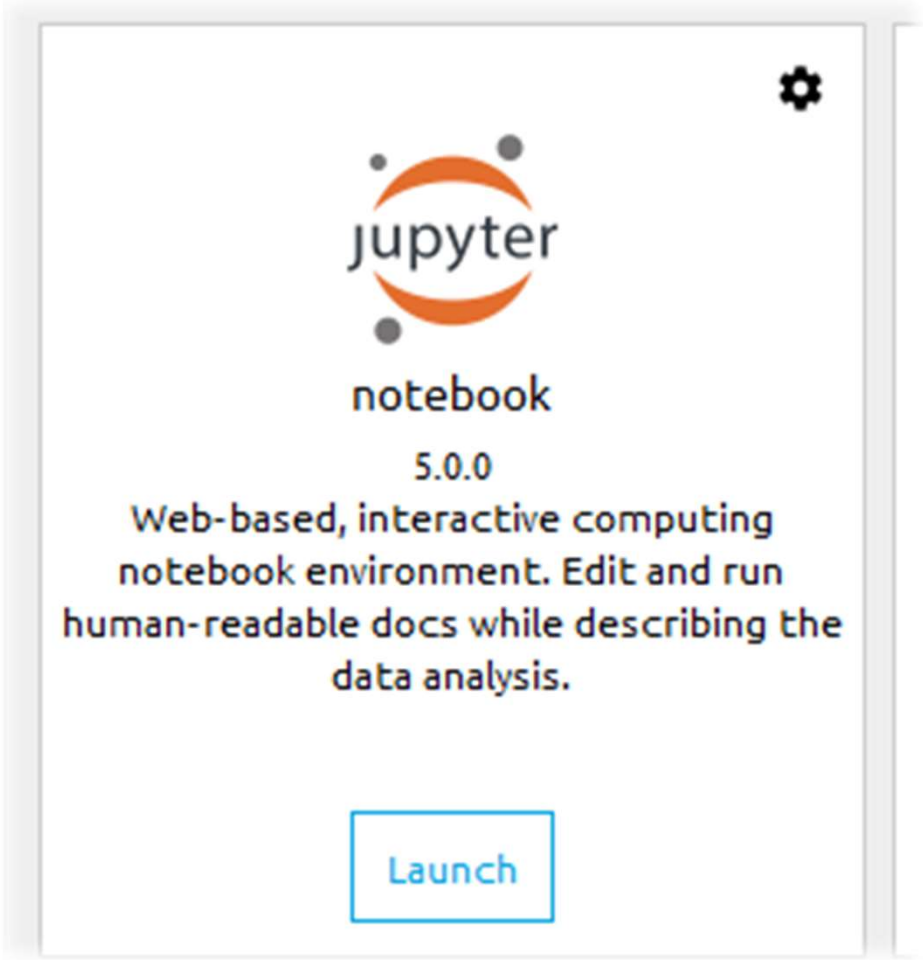
JUPYTER NOTEBOOK IDE

What is Jupyter Notebook?

The Jupyter Notebook is an ANACONDA TOOL and is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.

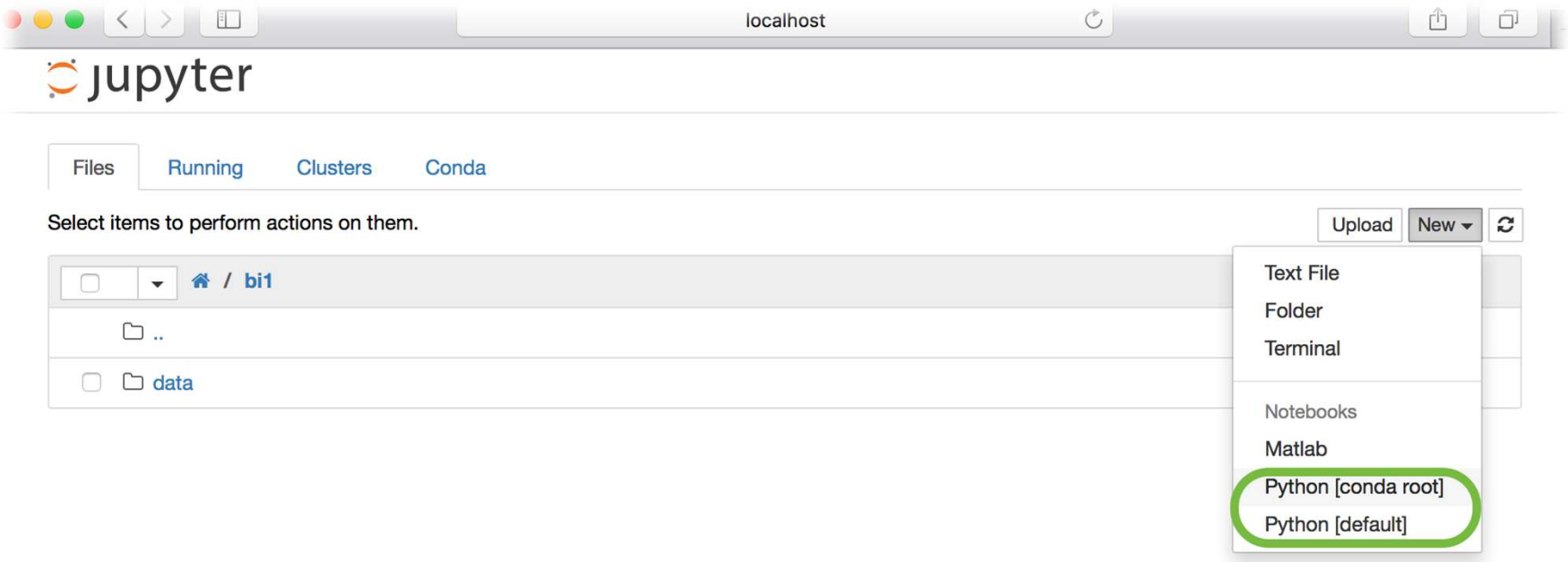
Note: Jupyter Notebook runs on your browser.

JUPYTER NOTEBOOK IDE

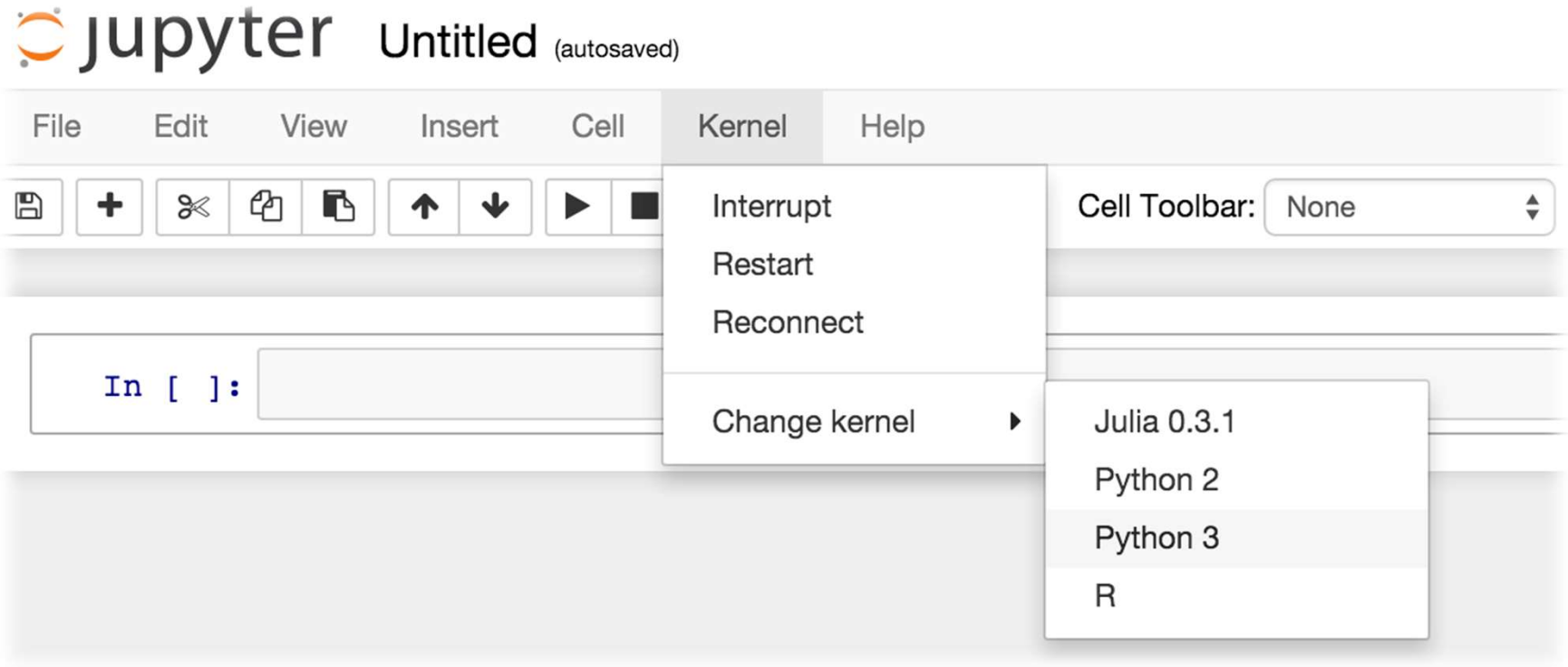


JUPYTER NOTEBOOK IDE

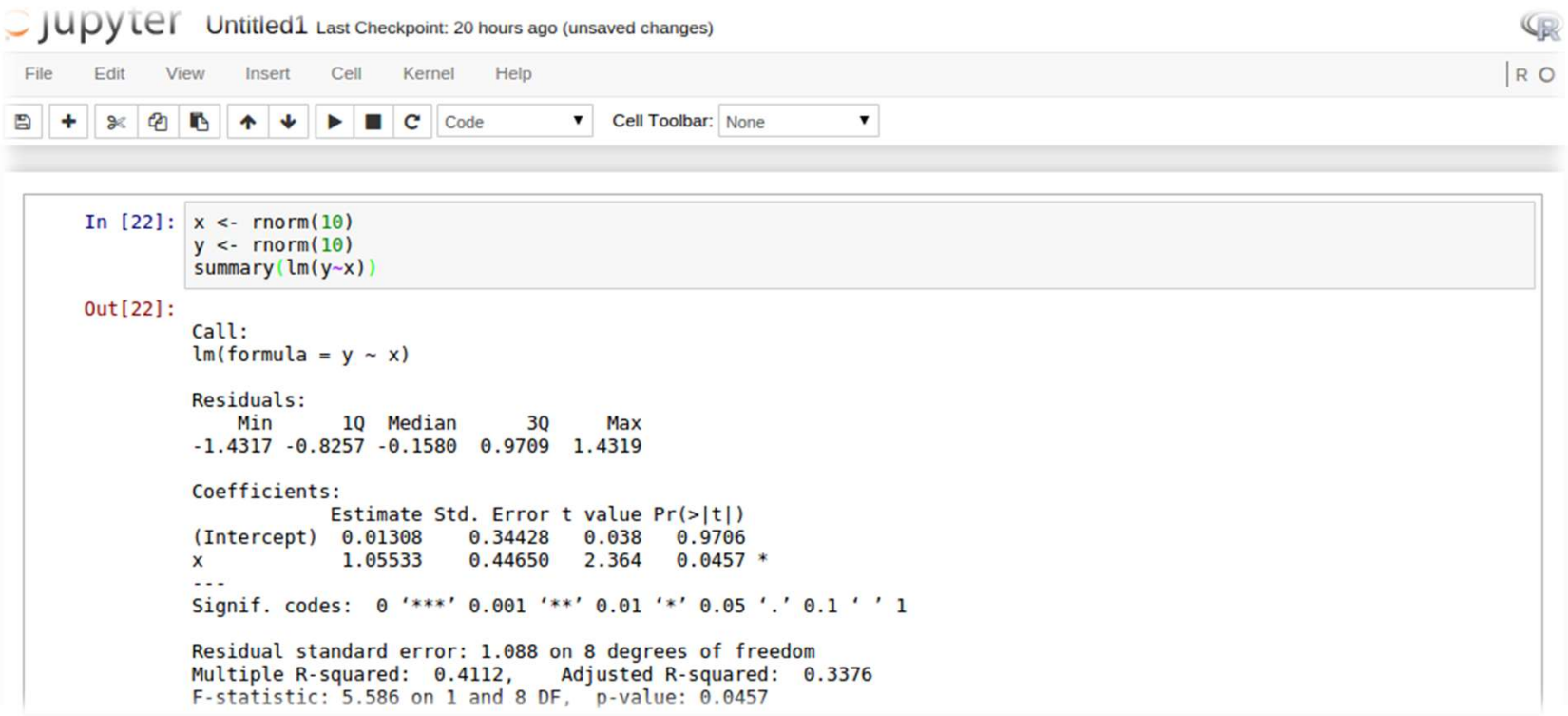
JUPYTER DASHBOARD



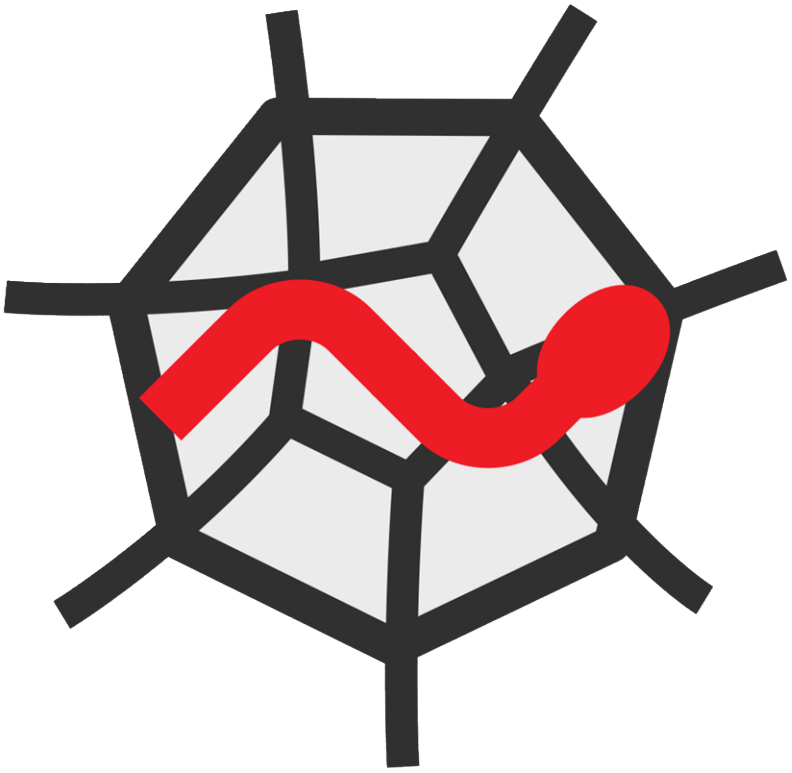
JUPYTER INTERACTIVE MODE



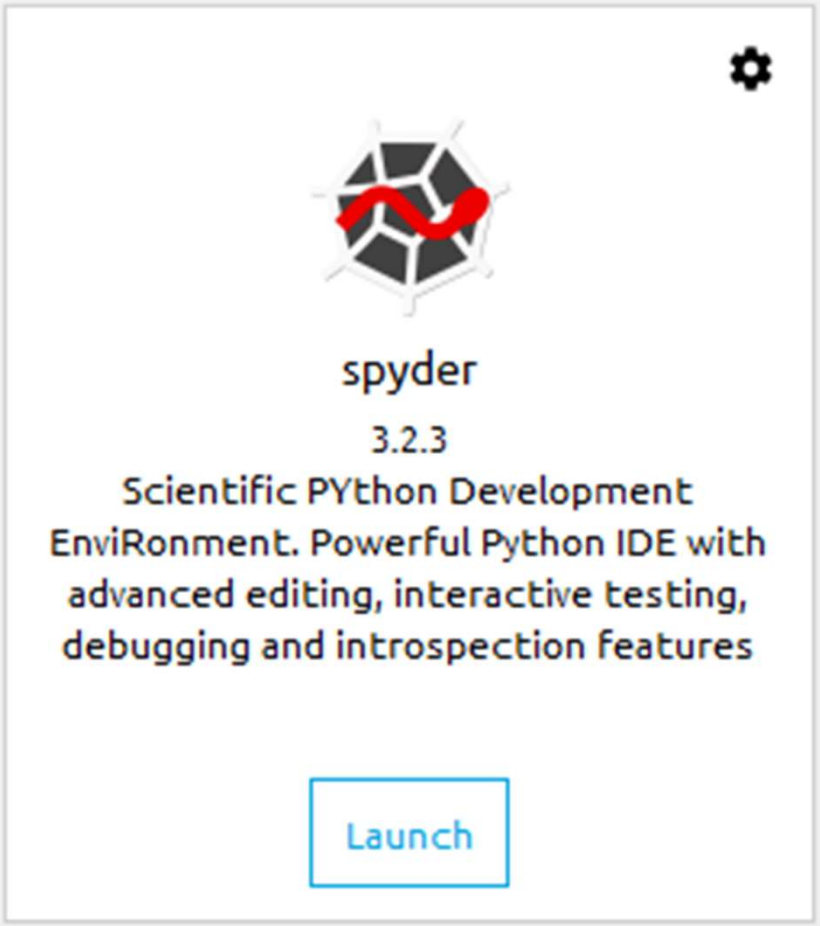
JUPYTER SCRIPT MODE



SPYDER IDE



SPYDER IDE

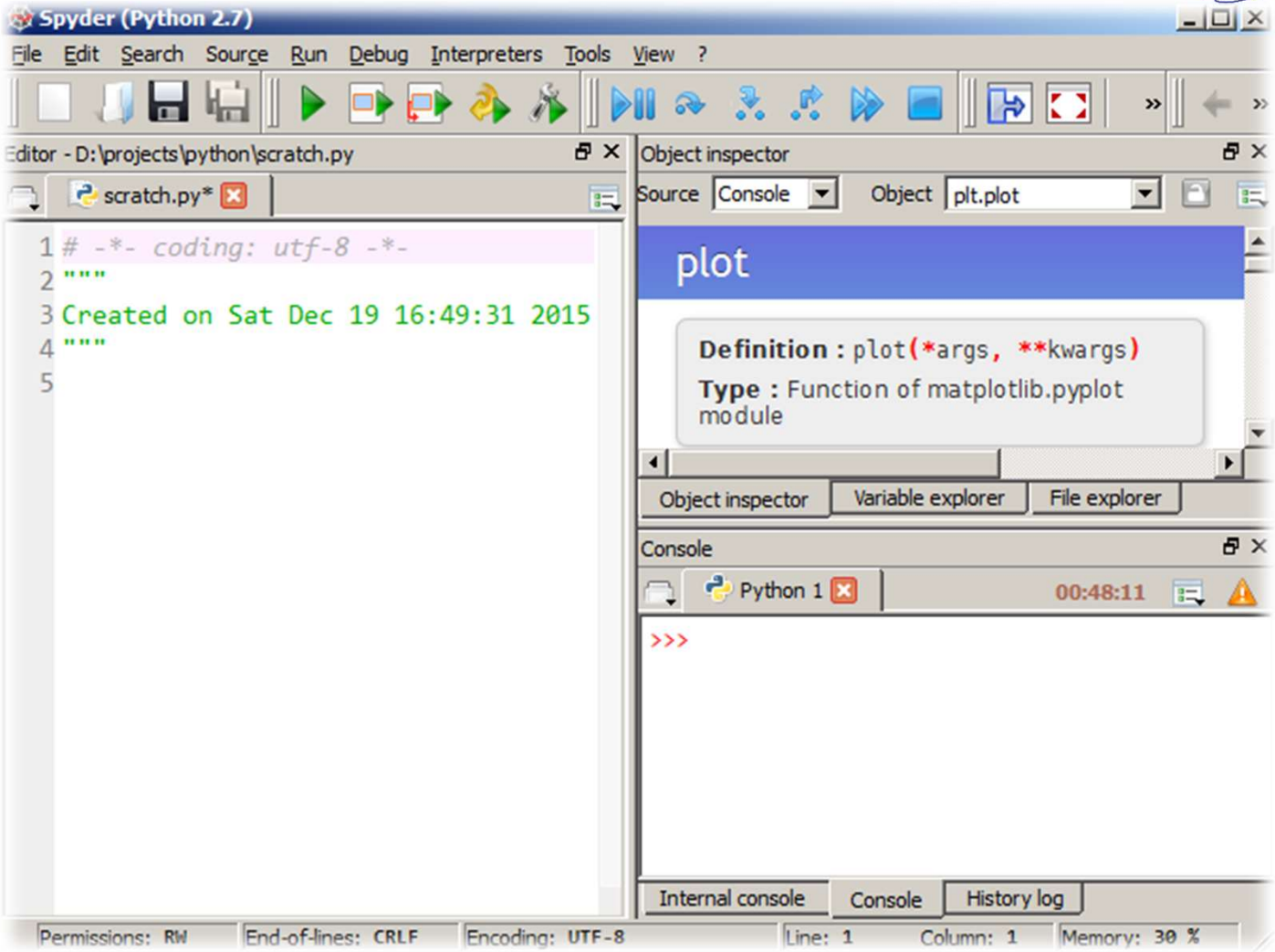

spyder
3.2.3
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
Launch

SPYDER IDE

What is Spyder?

Spyder is an open source cross-platform integrated development environment (IDE) for scientific programming in the Python language

SPYDER IDE


Spyder (Python 2.7)
File Edit Search Source Run Debug Interpreters Tools View ?
Editor - D:\projects\python\scratch.py
scratch.py*
1 # -*- coding: utf-8 -*-
2 """
3 Created on Sat Dec 19 16:49:31 2015
4 """
5
Object inspector
Source Console Object plt.plot
plot
Definition : plot(*args, **kwargs)
Type : Function of matplotlib.pyplot module
Object inspector Variable explorer File explorer
Console
Python 1 00:48:11
>>>
Internal console Console History log
Permissions: RW End-of-lines: CRLF Encoding: UTF-8 Line: 1 Column: 1 Memory: 30 %

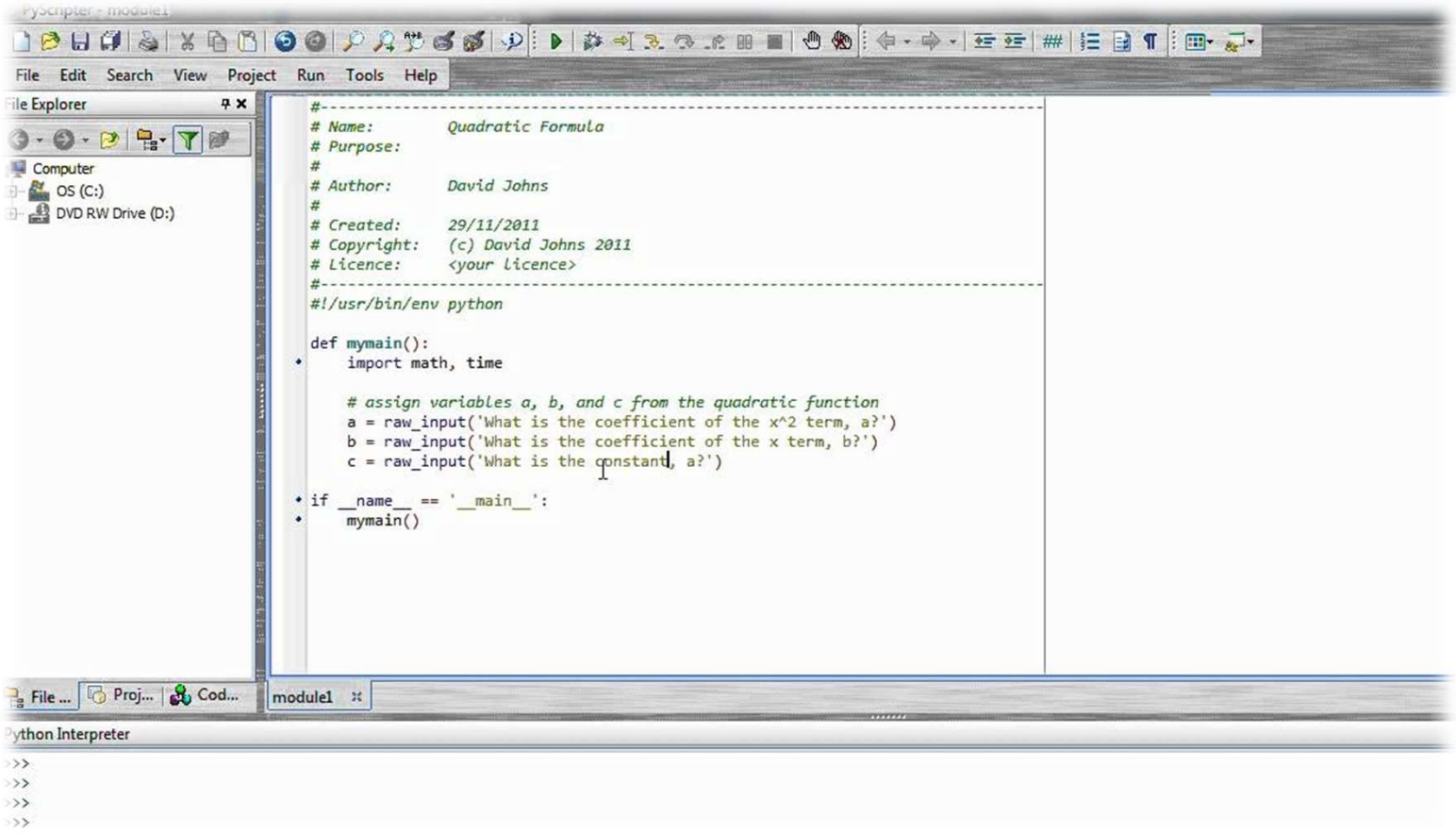
PyScripter IDE

PyScripter IDE

What is PyScripter?

PyScripter is a free and open-source Python Integrated Development Environment (IDE) created with the ambition to become competitive in functionality with commercial Windows-based IDEs available for other languages

PyScripter IDE



Hello World Program

```
print("Hello World")
```

Demo on IDE


IDLE Shell 3.11.2
File Edit Shell Debug Options Window Help
Python 3.11.2 (tags/v3.11.2:878ead1,
AMD64)] on win32
Type "help", "copyright", "credits" o
>>> print("hello World")
hello World
>>>

What is Keyword or reserved word?

Keyword/Reserved Word

What is Keyword?

Keywords are also called as reserved words these are having special meaning in python language. The words are defined in the python interpreter hence these cant be used as programming identifiers.

Some Keywords of Python Language

and	assert
break	class
continue	def
del	elif
else	except
exec	finally
for	from

Some Keywords of Python Language

global	if
import	in
is	lambda
not	or
pass	print
raise	return
try	while
with	yield

What is an identifier?

IDENTIFIERS

What is an identifier?

A Python Identifier is a name given to a function, class, variable, module, or other objects that you'll be using in your Python program.

In short, its a name appeared in the program.

For example: a, b, c

a b and c are the identifiers and

a b & c and , are the tokens

PYTHON NAMING CONVENTIONS

PYTHON NAMING CONVENTIONS

What are the python naming conventions?

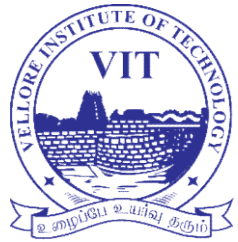
- An identifier can be a combination of uppercase letters, lowercase letters, underscores, and digits (0-9).
- Hence, the following are valid identifiers: myClass, my_variable, var_1, and print_hello_world.

PYTHON NAMING CONVENTIONS

What are the python naming conventions?

- The first character must be letter.
- Special characters such as %, @, and $ are not allowed within identifiers.
- An identifier should not begin with a number. Hence, 2variable is not valid, but variable2 is acceptable.

PYTHON NAMING CONVENTIONS



What are the python naming conventions?

- Python is a case-sensitive language and this behaviour extends to identifiers. Thus, Labour and labour are two distinct identifiers in Python.
- You cannot use Python keywords as identifiers.

PYTHON NAMING CONVENTIONS

What are the python naming conventions?

- You cannot use Python keywords as identifiers.
- You can use underscores to separate multiple words in your identifier.

PYTHON NAMING CONVENTIONS

SOME VALID IDENTIFIERS:

Myfile1	DATE9_7_8
y3m9d3	_xs
MYFILE	_FXd

SOME INVALID IDENTIFIERS:

MY-REC	28dre	break
elif	false	del

Things to Remember

- Python is a case-sensitive language. This means, Variable and variable are not the same.
- Always give the identifiers a name that makes sense. While c = 10 is a valid name, writing count = 10 would make more sense, and it would be easier to figure out what it represents when you look at your code after a long gap.
- Multiple words can be separated using an underscore, like this_is_a_long_variable.

Swap two numbers without using third variable

x = 5.4

y = 10.3

After swapping X and Y, we get :

x = 10.3

y = 5.4

Swap: Using simple built-in method

```
x = 5.4
y = 10.3

# Swap Code
x, y = y, x
```

Swap: Using Addition and Subtraction Operators


```
x = 5.4
y = 10.3


# Swap Code
x = x + y
y = x - y
x = x - y
```

Swap: Using Division and Multiplication Operators


```
x = 5.4
y = 10.3


# Swap code
x = x * y
y = x / y
x = x / y
```

Reading Input from user

input ():

- This function first takes the input from the user and converts it into a string.
- The type of the returned object always will be <type 'str'>. It does not evaluate the expression it just returns the complete statement as String.
  - For example, Python provides a built-in function called input which takes the input from the user. When the input function is called it stops the program and waits for the user's input. When the user presses enter, the program resumes and returns what the user typed.

Syntax:

```
inp = input('STATEMENT')
```

Example

```
num = input ("Enter number :")
print(num)
name1 = input("Enter name : ")
print(name1)

# Printing type of input value
print ("type of number", type(num))
print ("type of name", type(name1))
```

Python Datatypes

- Everything is an object in Python programming, data types are actually classes and variables are instance (object) of these classes.

- Standard Built-in types
  - **Numeric**
  - **Sequence Type**
  - **Boolean**
  - **Set**
  - **Dictionary**

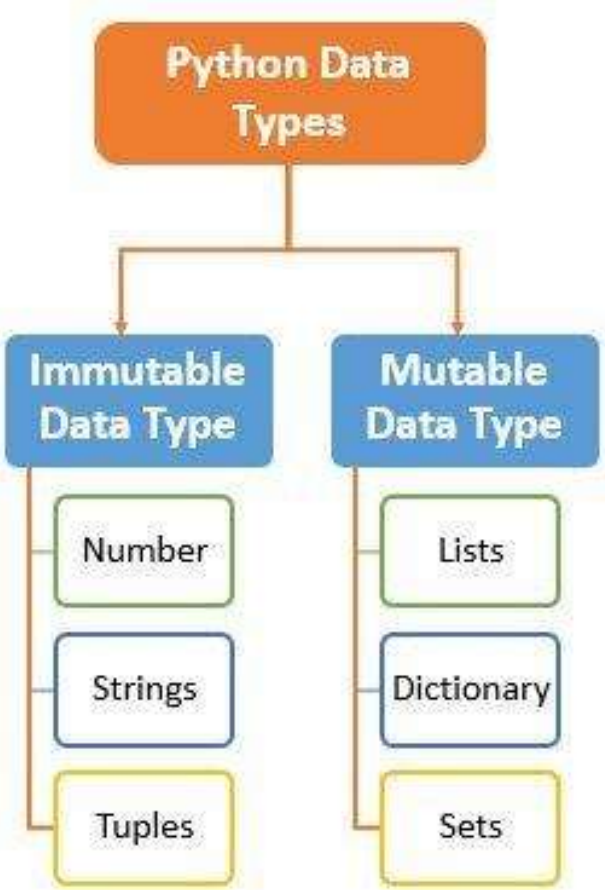
Python Datatypes

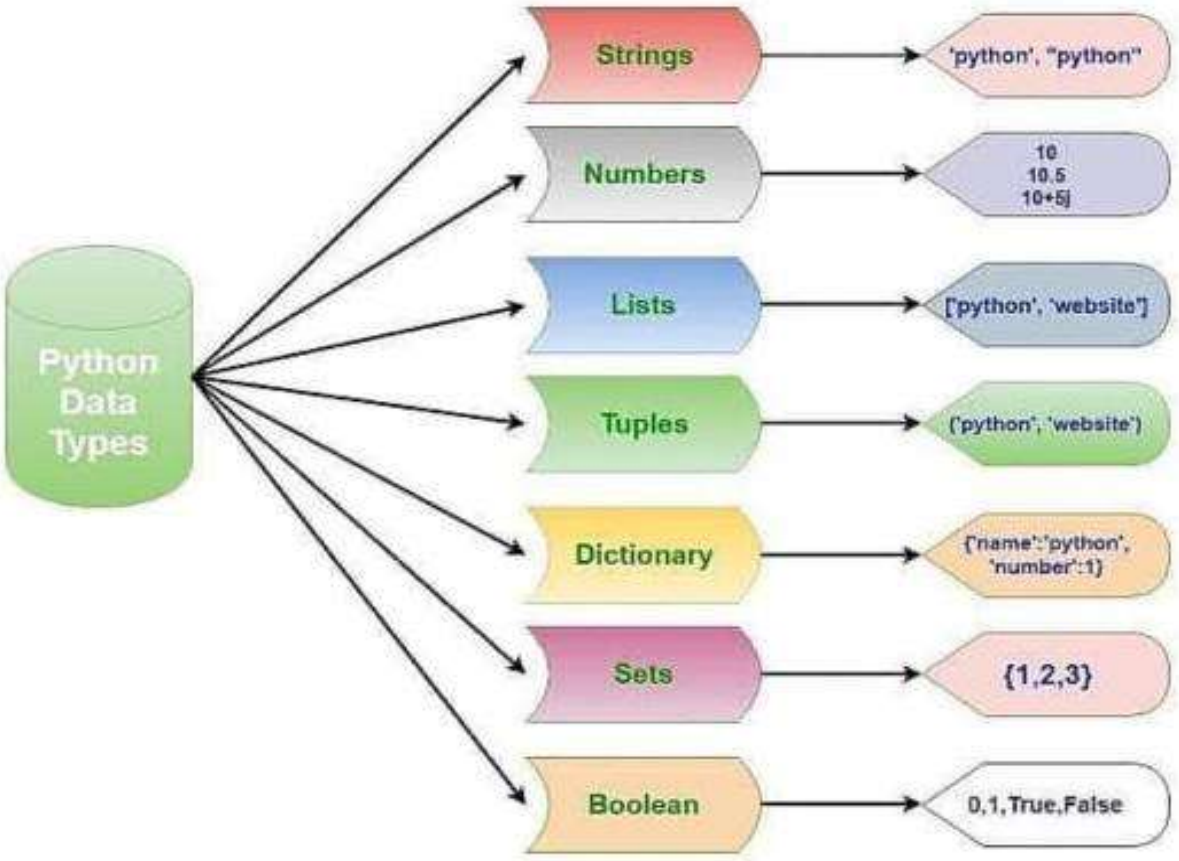
Text Type:	`str`
Numeric Types:	`int`, `float`, `complex`
Sequence Types:	`list`, `tuple`, `range`
Mapping Type:	`dict`
Set Types:	`set`, `frozenset`
Boolean Type:	`bool`
Binary Types:	`bytes`, `bytearray`, `memoryview`
None Type:	`NoneType`

Python Datatypes

Name	Type	Description
Integers	int	Whole numbers, such as: **3 300 200**
Floating point	float	Numbers with a decimal point: **2.3 4.6 100.0**
Strings	str	Ordered sequence of characters: **"hello" 'Sammy' "2000" "楽しい"**
Lists	list	Ordered sequence of objects: **[10,"hello",200.3]**
Dictionaries	dict	Unordered Key:Value pairs: **{"mykey" : "value" , "name" : "Frankie"}**
Tuples	tup	Ordered immutable sequence of objects: **(10,"hello",200.3)**
Sets	set	Unordered collection of unique objects: **{"a","b"}**
Booleans	bool	Logical value indicating **True** or **False**

Python Datatypes





Python Datatypes

- A **mutable** object can be changed after it is created, and an **immutable** object can't.
- mutable objects by changing the element the id() value will not change , whereas for immutable objects *id()* value will change.

Class	Description	Immutable?
bool	Boolean value	✓
int	integer (arbitrary magnitude)	✓
float	floating-point number	✓
list	mutable sequence of objects	
tuple	immutable sequence of objects	✓
str	character string	✓
set	unordered set of distinct objects	
frozenset	immutable form of set class	✓
dict	associative mapping (aka dictionary)	

Mutable objects:

list, dict, set, byte array

```
>>> list1 = [1,2,3,4]
>>> id(list1)
23321928
>>> list1[1] = 10
>>> id(list1)
23321928
```

Immutable objects:

int, float, complex, string, tuple, frozen set [note: immutable version of set], bytes

```
>>> # Example 1
>>> var1 = 10
>>> id(var1)
1852024896
>>> var1 = 20
>>> id(var1)
1852025056
```

```
>>> string1 = "abc"
>>> id(string1)
22712096
>>> string1 = string1 + "def"
>>> id(string1)
23392064
```

Declaring and using Numeric data types

- Integer
- Float
- Complex
- String

Integer

- Integers are one of the Python data types. An integer is a whole number, negative, positive or zero.
- In Python, integer variables are defined by assigning a whole number to a variable. Python's type() function can be used to determine the data type of a variable.

```
>>> a = 5
>>> type(a)
<class 'int'>
```

Float

- Floating point numbers or floats are another Python data type.
- Floats are decimals, positive, negative and zero.
- Floats can also be represented by numbers in scientific notation which contain exponents.
- Both a lower case e or an upper case E can be used to define floats in scientific notation.
- In Python, a float can be defined using a decimal point . when a variable is assigned.

```
>>> c = 6.2
>>> type(c)
<class 'float'>
>>> d = -0.03
>>> type(d)
<class 'float'>
>>> Na = 6.02e23
>>> Na
6.02e+23
>>> type(Na)
<class 'float'>
```

Complex

- Another useful numeric data type for problem solvers is the complex number data type.
- A complex number is defined in Python using a real component + an imaginary component j.
- The letter j must be used to denote the imaginary component.
- Using the letter i to define a complex number returns an error in Python.

```
>>> comp = 4 + 2j
>>> type(comp)
<class 'complex'>
```

String

- Numbers and decimals can be defined as strings too. If a decimal number is defined using quotes ' ', the number is saved as a string rather than as a float.
- Integers defined using quotes become strings as well.

```
>>> num = '5.2'
>>> type(num)
<class 'str'>

>>> num = '2'
>>> type(num)
<class 'str'>
```

Thank You