



Python for Artificial Intelligence: Functions and Modules

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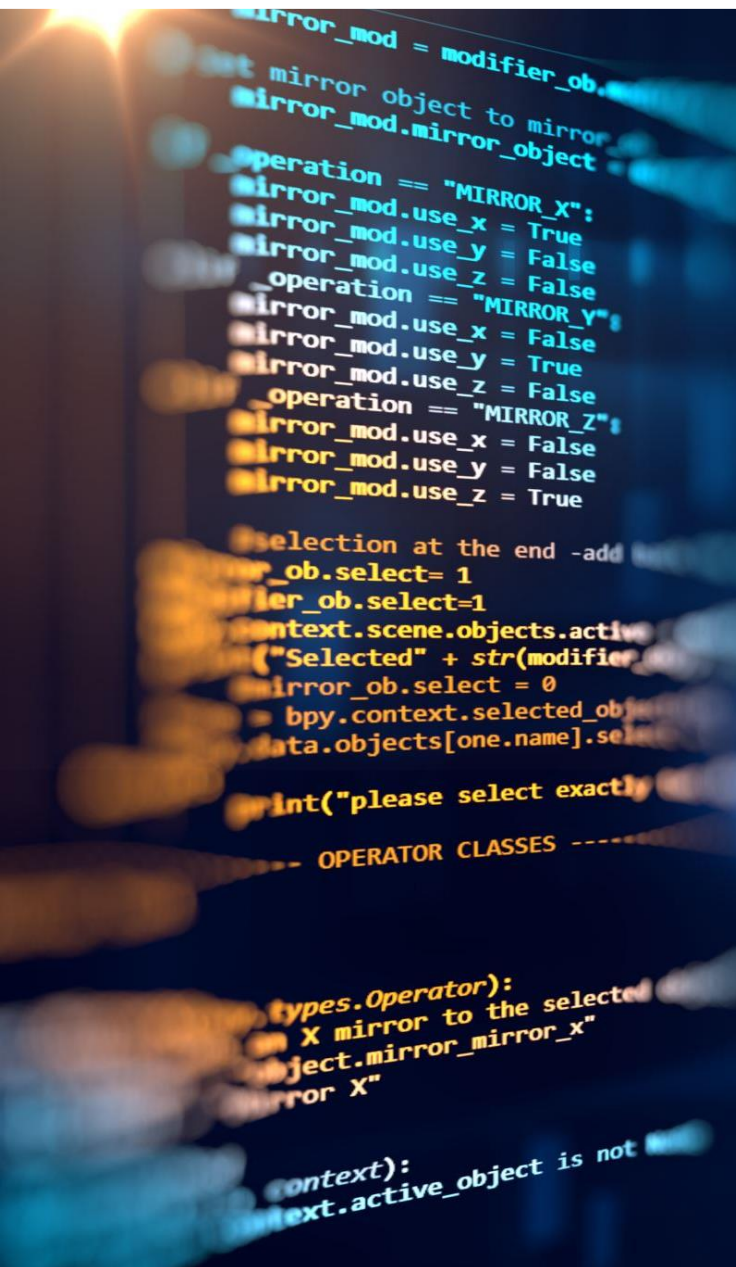
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1.0 Python Introduction

An interpreted, compiled, and interactive, object-oriented, dynamic, imperative, and open-source programming language.

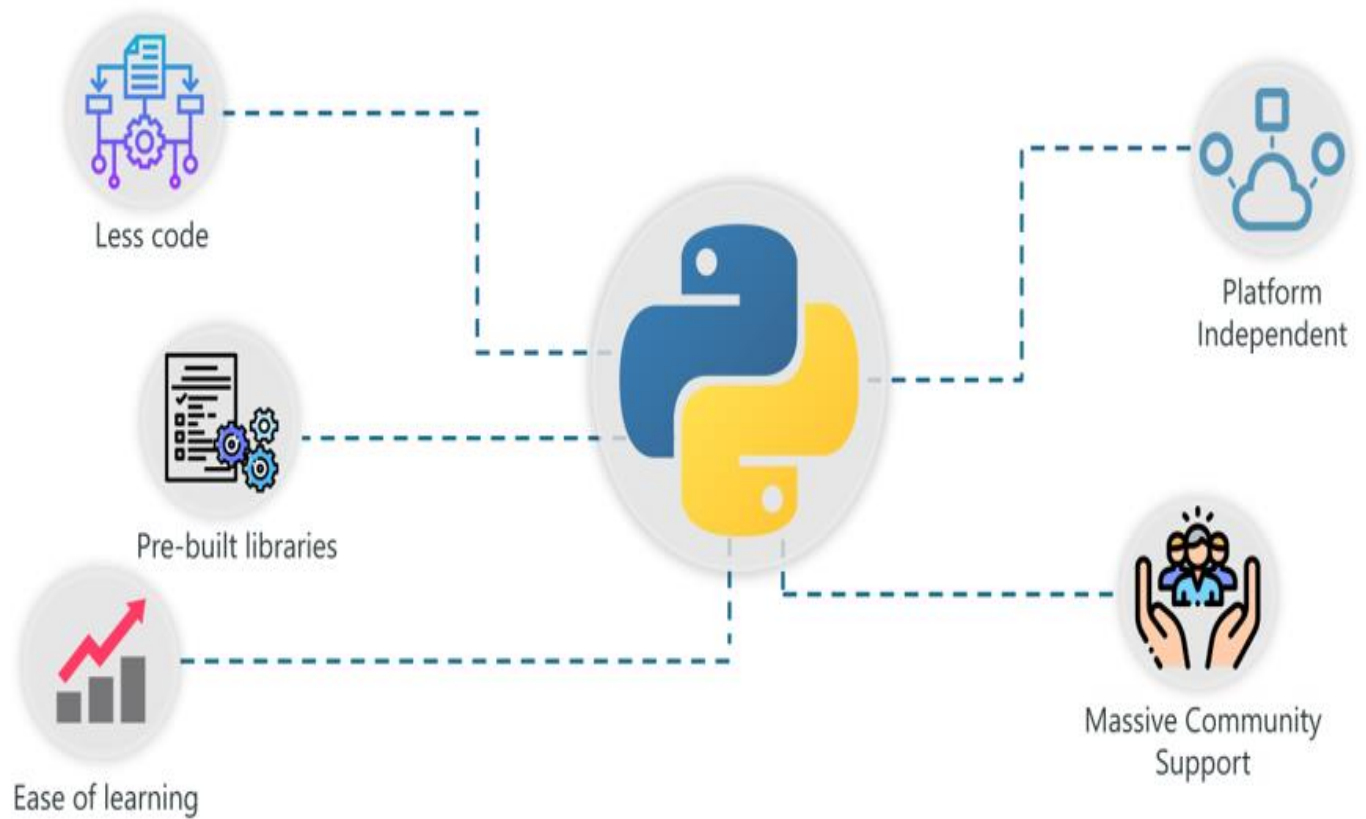
Created in early 90's by Guido van Rossum at Stichting Mathematisch Centrum in the Netherlands.

The name comes from the Monty Python and not from the snake.

There is a big community of Python programmers, with conferences and magazines: <http://pycon.org/>

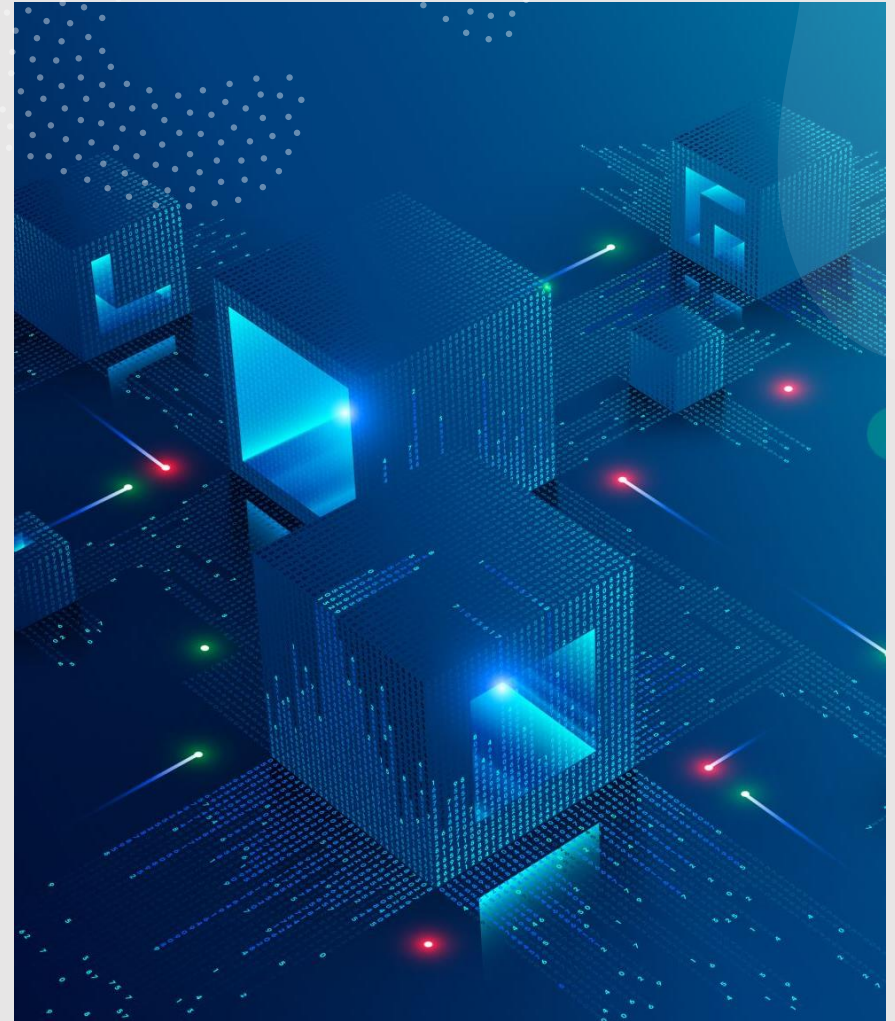
Web site: www.python.org.

1.2 Why Python



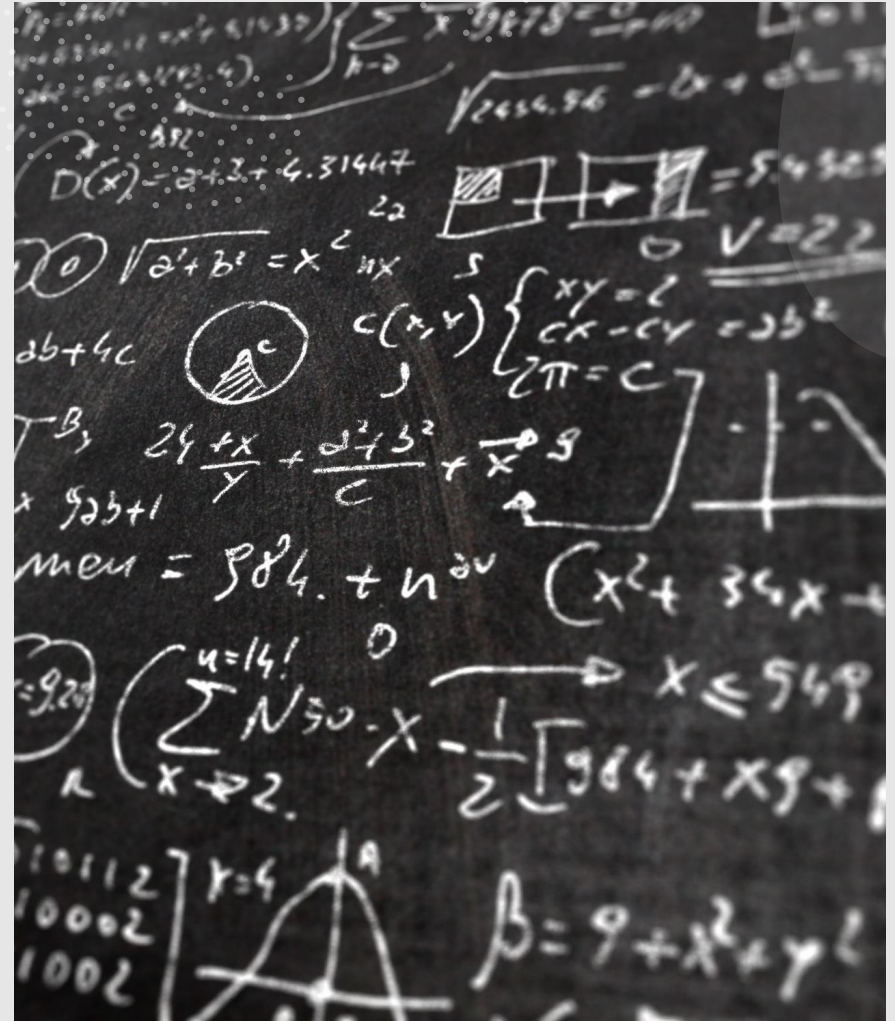
1.3 Application

- Artificial intelligence
- Machine Learning
- Data Science
- Data Analytics
- Data Engineering
- Web Dev, SW Dev
- etc.



1.4 Syntax Rules

- The syntax is designed to be simplified as compared to other languages like C/C++.
- Every compound instruction ends with ":"
- There are no blocks of code; blocks are implicitly created by indentation.
- Expressions: usual arithmetic operators, named logic operators: and, or, not.
- Assignments use the = sign but they don't have to end with ";"
- Comments start with # as in shell scripting.
- Variables are declared by assigning them a value and they are local to the block where they appear first.



2.0 Functions



- A function is a block of code that performs a specific task.
- Function types:
 - Standard library functions - These are built-in functions in Python that are available to use.
 - User-defined functions - We can create our own functions based on our requirements.
- It supports default values for parameters.
- All parameters are value parameters.
- Any variable storing a complex data structure contains a reference to it. Any changes to the content of such a data structure in the function will affect the variable passed in the function call.

2.1 Examples

Python function declaration:

```
def function_name(arguments):  
    # function body  
  
    return
```

```
def greet():  
    print('Hello World!')
```

```
# call the function  
greet()
```

Here,

- `def` - keyword used to declare a function
- `function_name` - any name given to the function
- `arguments` - any value passed to function
- `return` (optional) - returns value from a function

2.2 Python Functions Argument

```
# function with two arguments
def add_numbers(num1, num2):
    sum = num1 + num2
    print('Sum: ', sum)
```

```
# function with no argument
def add_numbers():
    # code
```

```
# function call with two values
add_numbers(5, 4)
```

```
# function call with no value
add_numbers()
```

```
# function with two arguments
def add_numbers(num1, num2):
    sum = num1 + num2
    print("Sum: ", sum)
```

```
# function call with two values
add_numbers(5, 4)
```

```
# Output: Sum: 9
```

```
# function that adds two numbers
def add_numbers(num1, num2):
    sum = num1 + num2
    return sum
```

```
# calling function with two values
result = add_numbers(5, 4)
```

```
print('Sum: ', result)
```

```
# Output: Sum: 9
```

2.3 Python Library Functions

- In Python, standard library functions are the built-in functions that can be used directly in our program.

For example,

- `print()` - prints the string inside the quotation marks
- `sqrt()` - returns the square root of a number
- `pow()` - returns the power of a number

- These library functions are defined inside the module. And, to use them we must include the module inside our program.

2.4 Used cases

```
import math

# sqrt computes the square root
square_root = math.sqrt(4)

print("Square Root of 4 is",square_root)

# pow() computes the power
power = pow(2, 3)

print("2 to the power 3 is",power)
```

OUTPUT

```
Square Root of 4 is 2.0
2 to the power 3 is 8
```

2.5 Benefits of Functions

- **Code Reusability:** We can use the same function multiple times in our program which makes our code reusable.

```
# function definition
def get_square(num):
    return num * num

for i in [1,2,3]:
    # function call
    result = get_square(i)
    print('Square of',i, '=',result)
```

```
Square of 1 = 1
Square of 2 = 4
Square of 3 = 9
```

Benefits of Functions

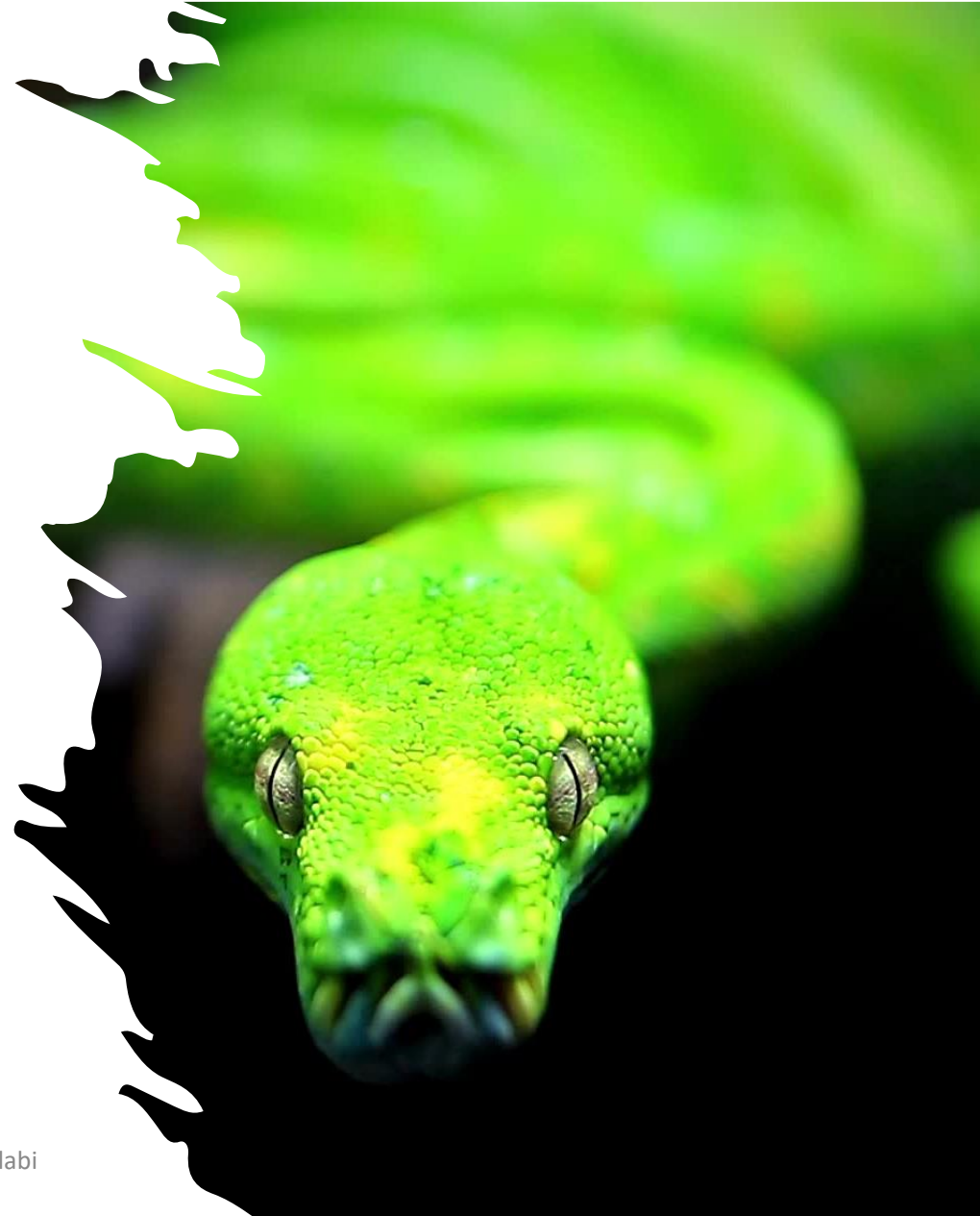
- Code Readability - Functions help us break our code into chunks to make our program readable and easy to understand.

```
# function definition
def get_square(num):
    return num * num

for i in [1,2,3]:
    # function call
    result = get_square(i)
    print('Square of',i, '=',result)
```

3.0 Modules in Python

- A module is a python file that contains functions, variables etc., in it and has .py extension.
- It is simply a python file that can be imported into another python program.
- The name of the module is the name of the python file itself.
- We can simply import those modules whenever needed using import statement.
 - *import module_name*
- In order to access the classes and functions in the module, we will use the dot operator:
 - *module_name.function ()*



3.1 Example

```
# Fibonacci numbers module

def fib(n):    # write Fibonacci series up to n
    a, b = 0, 1
    while a < n:
        print(a, end=' ')
        a, b = b, a+b
    print()

def fib2(n):   # return Fibonacci series up to n
    result = []
    a, b = 0, 1
    while a < n:
        result.append(a)
        a, b = b, a+b
    return result
```

Now enter the Python interpreter and import this module with the following command:

```
>>> import fibo
```

```
>>>
```

T H A N K Y O U

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Resources

- <https://docs.python.org/3/py-modindex.html>
- <https://docs.python.org/3/installing/index.html>
- <https://docs.python.org/3.10/tutorial/>
- <https://colab.research.google.com/>

Book:

Functions

- https://www.w3schools.com/python/python_functions.asp

Modules

- https://www.w3schools.com/python/python_modules.asp