MAI4CAREU

Master programmes in Artificial Intelligence 4 Careers in Europe

University of Cyprus

HUMAN-CENTERED INTELLIGENT USER INTERFACES - MAI648

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LAB 5

Python Programming

CONTENTS

- Introduction to Python
- Setting up the Environment
- Working with the Shell
- Create a Hello World Program
- Recap on programming priniciples
- Variables, Conditions, Loops
- Functions
- Strings
- Lists
- Files

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Introduction to Python

- Python is a modern programming language developed by Guido van Rossum in 1990 and first released in 1991. While there are a number of programming languages that could be used as a first introduction to programming, Python offers a number of features that make it particularly useful.

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Introduction to Python

- Open-source
- Scripting but is much more than that
  - Multi-purpose (scripting, GUI, Web, etc.)
- Object-oriented language
- Focuses on readability and productivity
- Attractive for Rapid Application Development

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History of Python

- Conceived in the late ‘80s and implementation began in Dec. 1989 by Guido van Rossum
  - Name based on “Monty Python’s Flying Circus”, a BBC comedy series from the 1970s
- Python 2.0 was released on 16 October 2000 and had many major new features
- Python 3.0 was released on 3 December 2008 after a long testing period
  - Python 2.7's end-of-life date was set at 2015, then postponed to 2020

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Who uses Python

https://wiki.python.org/moin/OrganizationsUsingPython

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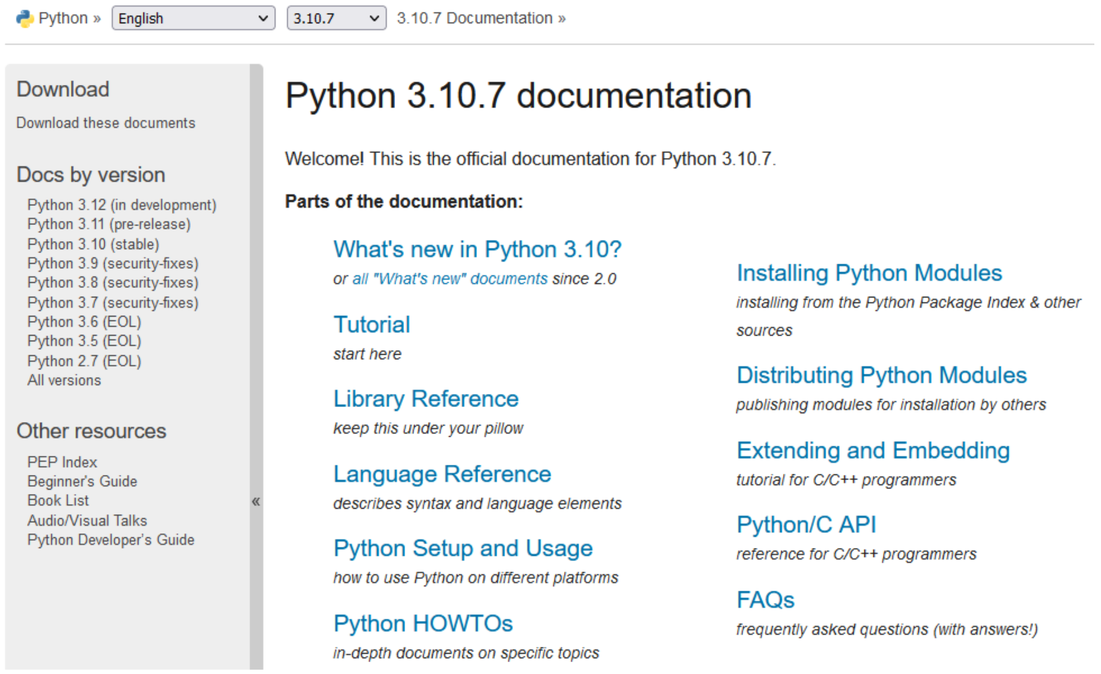
Python Documentation *https://docs.python.org/3*



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Integrated Development Environments

- PyCharm
- Sublime
- IDLE
- Atom
- Visual Studio Code
- WinPython

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Python Libraries

Popular Python libraries

- NumPy – *arrays, linear algebra, fourier transform, matrices*
- SciPy – *scientific and mathematical problems*
- Pandas – *data manipulation*
- SciKit-Learn – *machine learning*

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Python Libraries

Visualization libraries

- Matplotlib – *2D plotting*
- Seaborn – *data visualization library based on matplotlib*

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Download Python

- Python is available for any platform (Windows, Mac, Linux) and can be freely downloaded from:
- http://www.python.org

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Installing Python

- When you install Python on your computer, you get a number of features:
  - a Python shell, a window in which you can type Python commands directly and where the interaction between you and the programs you write appears
  - a simple text editor, IDLE, where you can type your programs, update them, save them to disk and run them
  - access all the information about Python on your local computer

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Starting with Python

- To start the Python IDLE on Windows, go to:
- Start Menu - All Programs - Python 3.X IDLE (Python GUI)

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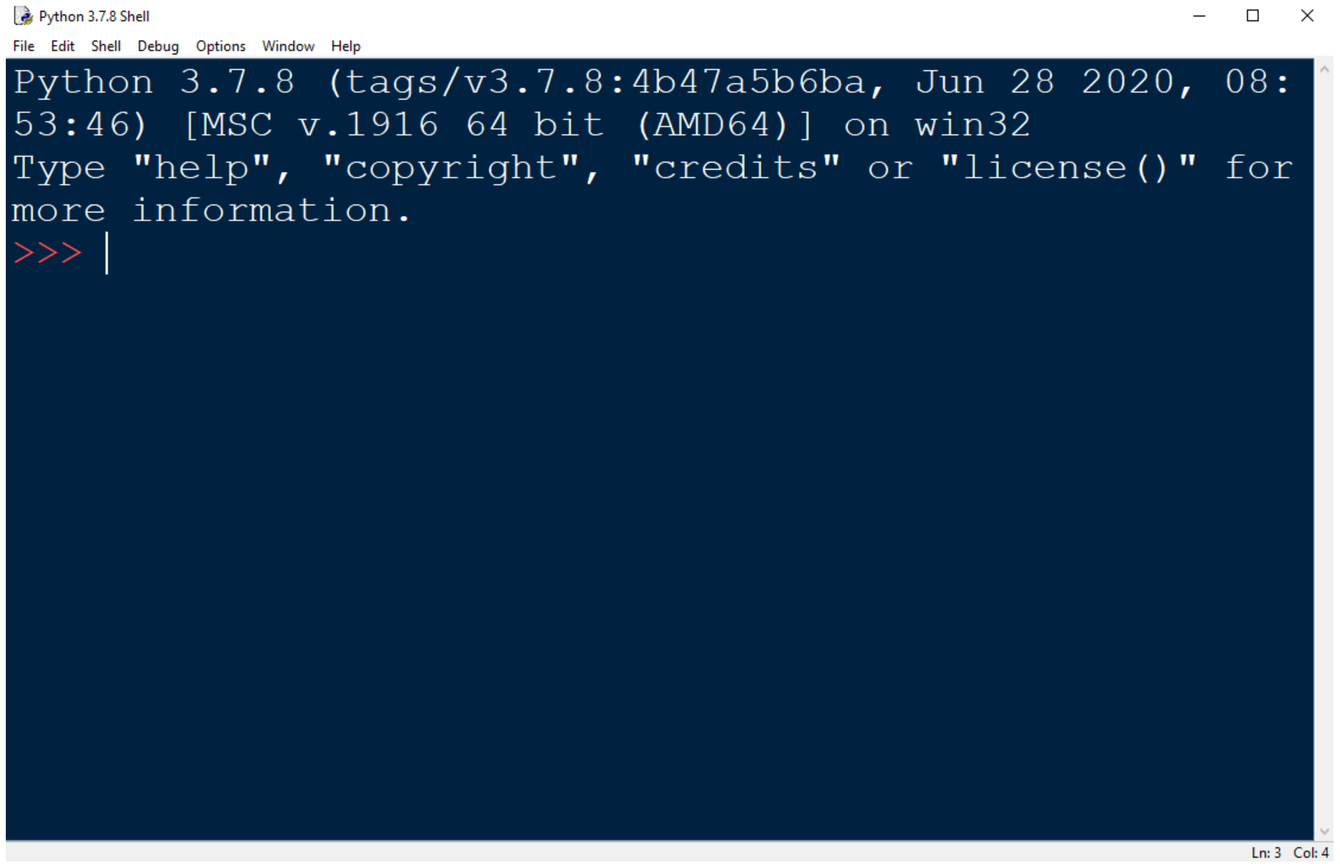
Working with the shell

- You should get a window that looks pretty much like the following:



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Working with the shell

- This is the Python shell. The shell is interactive in which you can write Python commands in the shell and Python will execute them, producing a result.

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Working with the shell

- Try writing:
  - `4 + 4 <Enter Key>`
  - `print("Tessera kai Tessera") <Enter Key>`
- The result should appear as in the following window:

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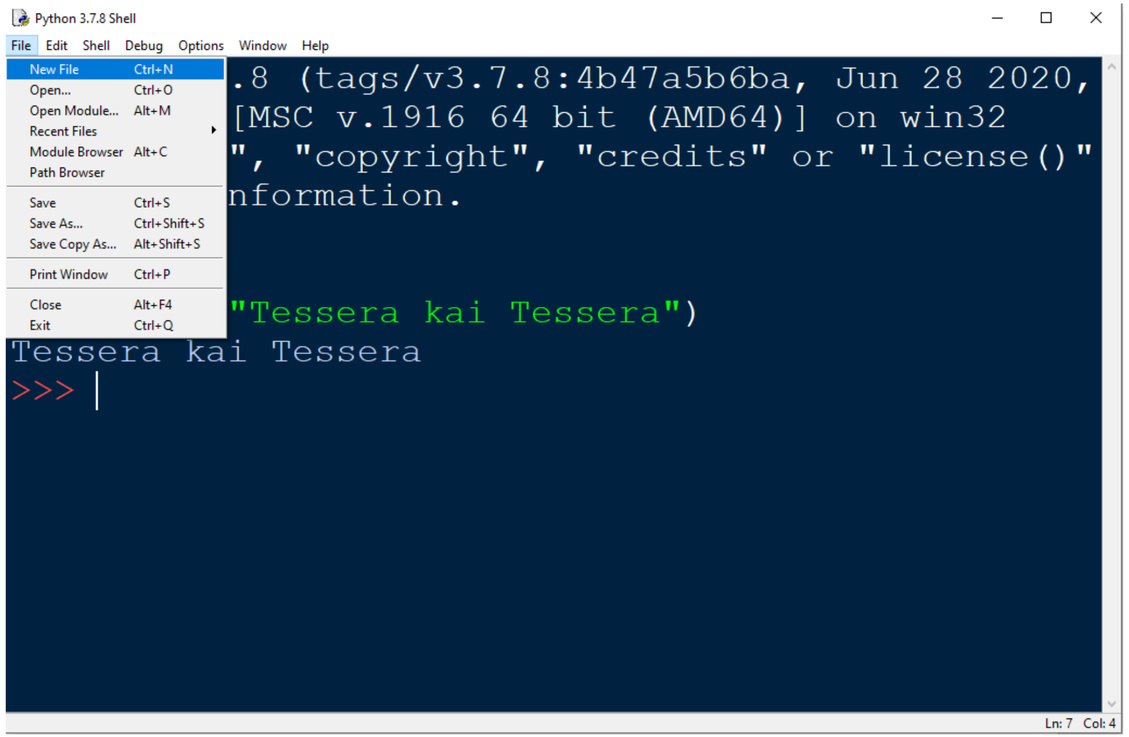
Create a Hello World Program

- Typing in the shell can be useful in some cases, but the commands you type there are not saved as a file and therefore cannot be reused. If the commands are saved to a file, then we can run the program over and over again.
- To create a file, left-click on File New File as in the image below:



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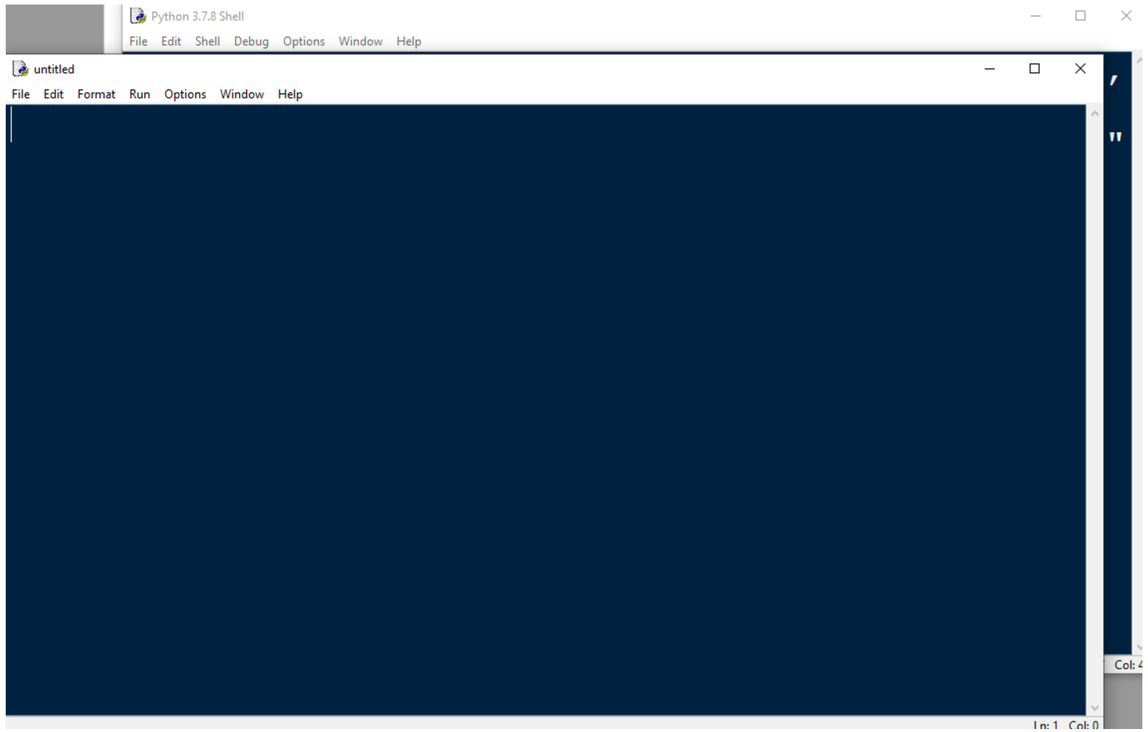
Create a Hello World Program

- A second window will appear in which you can write Python commands. This window is a text editor in which you can write and save your program.
- Write the following command and save (File - Save As) the program to a helloWorld.py file.
  - `print("Hello World")`



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Some further notes

- All files containing Python programs must have the extension .py
- All Python files must have all Python files with the following attributes.
- To run the program, go to Run - Run Module.

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Recap on core programming principles

- Variables
- Conditions
- Loops
- Strings
- Lists
- Files

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Variables

- Var_int = 5
- Var_float = 4.5
- Var_string = “this is some text”
- Var_Boolean = True
- Var_list = [1, 2, 3]

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Conditions

```
if age > 70:
        print(“You are wise")
elif age> 18:
        print(“You are an adult")
elif age < 1:
        print(“You are a baby")
else:
        print(“You are a teenager")
```


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Simple programming example

- Write a Python code that:
  - Asks the user for two integers
  - Prints the smaller one on the screen

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Simple programming example

```
x = int(input(“Provide an integer"))
y = int(input("Provide an integer"))
if x < y:
        print(“The smallest number is {}.".format(x))
else:
        print(" The smallest number is {}.".format(y))
```


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Loops - While

- While loop

```
number = 1
while number < 1001:
        print(number)
        number = number + 1
```


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Loops - For

- For loop

```
for number in range(1,1001):
        print(number)
```


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Simple programming example

- Write a Python program that should keep asking the user for numbers until the user gives the number -1
- Then the program prints the number and the product of the numbers given by the user and terminates

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Strings

- A text (string) consists of a sequence of characters/symbols such as letters, numbers, punctuation marks, spaces, etc.
- A character sequence is defined using single or double apostrophes (' ' or " ") and can be stored in a variable
  - var = “text”
  - var = ‘text’

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Strings

- Given that a string is a sequence of characters we can refer to the positions of the characters in the sequence
  - This position is called the index
- We assume that the positions of the characters start from 0
- To refer to a specific position in the string we use square brackets [ ] after the name of the variable where the string is stored and the number of the position of the element we want:

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String - Example

```
str = 'Hello World’
print(str[2])          # l
print(str[0])          # H
print(str[-1])         # d
```


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String Method

- Python has several methods for processing and manipulating
- https://docs.python.org/3/library/stdtypes.html#string-methods

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Functions

- A function is a block of code that is executed once called
- You may pass parameters to a function
- Function may also return data

```
def f_add(n):
        r = n+n
        return r
```


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Lists

- Data type
- A list is a data structure that can contain a sequence of values of either the same type or different types in a specific (serial) order
- v = [1,2,3,4,5]
- d = ["Monday", "Tuesday", "Wednesday"]
- c_data = [“Mario", 37, 1.87, “00123456"]

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Lists

- Similar to strings, because a list is a sequence of values we can refer to the positions of the values in the list
  - This position is called an index
- Similar to strings, we assume that the positions of the values in the list start from 0
- list = [‘m’, 6, False, 3.14]

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Files

- Variable type filestream
- Link (Open) to File
- Write to File
- Read from File
- Disconnect (Close) from File

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Files – Example 1

```
in = open(“file.txt", "r")
line = in.readline()
while line != "":
        print(line)
        line = in.readline()
in.close()
```


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Files – Example 2

```
in = open(“file.txt", "r")
for line in in:
        print(line)
in.close()
```


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Files – Example 3

- in = open(“file.txt", "r")
- content = in.read()
- print(content)
- in.close()

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Example

- Write a program that performs the following:
  - Asks the user to enter the name, age and telephone of a person
  - Stores the provided data in a text file
  - Finds the average age of the persons stored in the text file
  - Finds the telephone of a person based on the provided name

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Sources

- Python course and laboratories, Department of Computer Science, University of Cyprus

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