1. Introduction

Course: Python

Who are we?

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What is this course about? (Scope & Goal)

- The basic **concepts** of programming
- Programming in **Python**
- The **tools** you need to programm (as far as necessary)
- Gaining **practical experience** with all of the above
- Disclaimer: the actual **work** starts **after** this **course**!

How do we do it? (Organization)

- We provide you with:
  - **Concepts** and **tools** for Python program development (the theory)
  - **Exercises** and programming tasks (the practice)
- You need to:
  - **Ask** questions (at any time) and **engage** with your classmates! (we are a **small group**)
  - **Work** through the tasks (on your device)
- Course Material:
  - **We are using Moodle!**
  - **Slides**
  - **Lecture Notes**

What do we cover? (Content)

- Introduction
  - Foundation of Programming
  - Practical / Setup
- Primitives (Data Types)
- Operations
- Collections
- Control Statements
  - If-statements
  - Loops
- Functions
- Classes

1.1 Getting started

- What is a python program?
- Environment

What is a Python program?

Problem

Program

Python

Algorithm

Programming Language

Problem

Description: A **task** or question that requires a solution or answer

Example: Calculate the mean of some given numbers

Algorithm

Description: An abstract **step-by-step procedure** to solve a problem

Example:

1. Sum up all numbers
2. Count all numbers
3. Divide the sum by the count

Program

Description: A set of **instructions** telling your computer how to execute an Algorithm

Example:

```
sum = 0
count = 0
for number in numbers:
    sum = sum + number
    count = count + 1
mean = sum / count
```

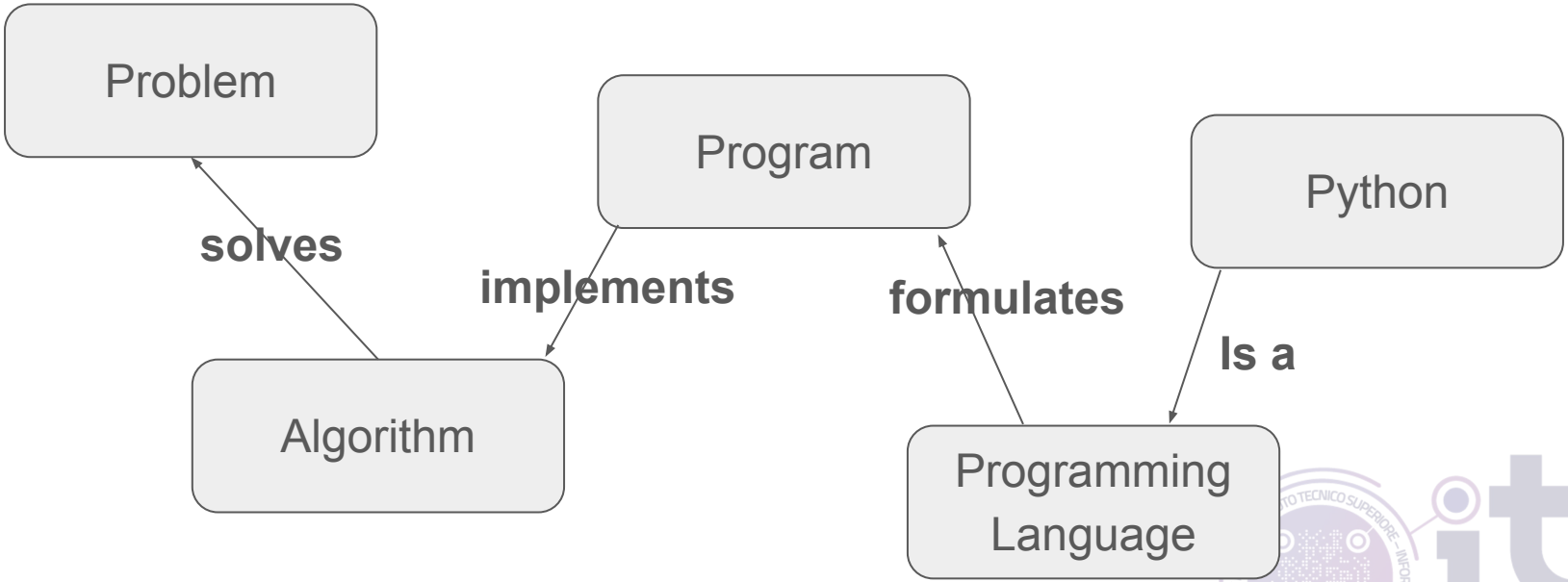
The Programm **text** is the program **code**

Programming Language

Description: A **specific language** for formulating programs

Example: **Python**

What is a Python program?



What environment does a program need?

Permanent Storage

- Your computer's “hard drive”
- “Slow” to access
- E.g. HDD, SSD, NAS, cloud storage, etc.

Your Data

Python program code

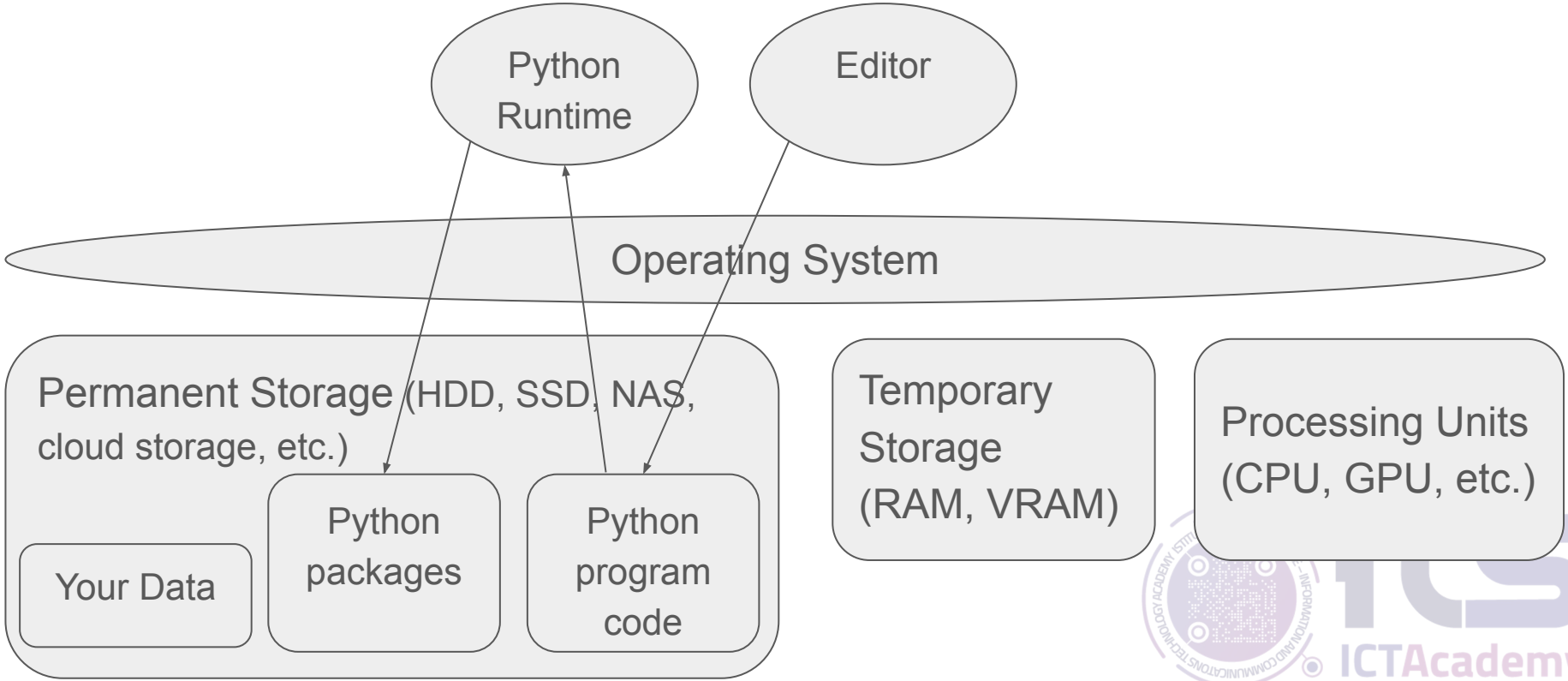
Processing Units

- Do the actual computation
- Central Processing unit (CPU)
- Graphics Processing Unit (GPU)

Temporary Storage

- Your computer's “memory”
- Fast to access
- Only temporary
- E.g. RAM, VRAM

How does the program interact with the environment?

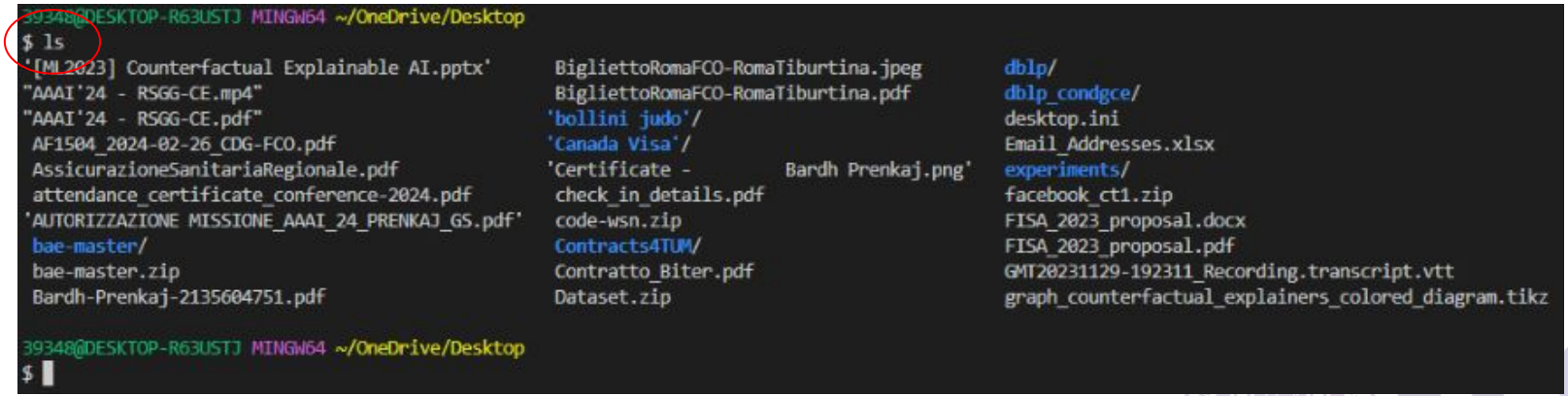


1.2 Setting up our tools: Command Line

- Commands:
  - ls
  - cd
  - mkdir
  - touch
  - rm

Command-Line

- With the **command-line** (cmd) you can communicate directly with your computer (i.e. operating system)
- Example: For listing the content inside a folder (`ls`)



Command-Line - Try it yourself

1. Open command-line: (Use the shortcut **ctrl+alt+t**)
2. Go to your desktop: **`cd`** `Desktop`
3. Create now folder: **`mkdir`** `<name of your folder>`
4. Show your Desktop content:
   - Linux: `ls`
5. Remove folder: **`rm -r`** `<name of your folder>`

Command-line - Navigating directories

- Change your current directory (**working directory**) with `cd <target>`

```
39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop
$ cd dblp

39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp
$ mkdir cartella-di-prova
```

- For going up the folder structure use “..” as target

```
39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp
$ cd cartella-di-prova/

39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova
$
```

```
39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova
$ cd ..

39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp
$
```

Create your first “empty” Python file

You can do that using the command **touch** *<file_name>*

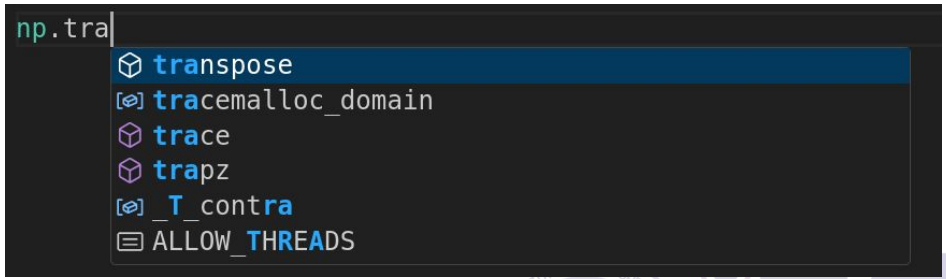
```
39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova
$ touch first_python_program.py

39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova
$ ls
first_python_program.py

39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova
$
```

1.3 Setting up our tools: Integrated Development Environment (IDE)

- IDE
- VSCode

Visual Studio Code - Programming more comfortably!

- **Code editors** are great for developing programs!
  - Visual Studio code is actually more like a *Integrated Development Environment* (IDE)
- Write code and **save** it as a file
- **Highlight errors** in code
- **Autocomplete** and recommendations



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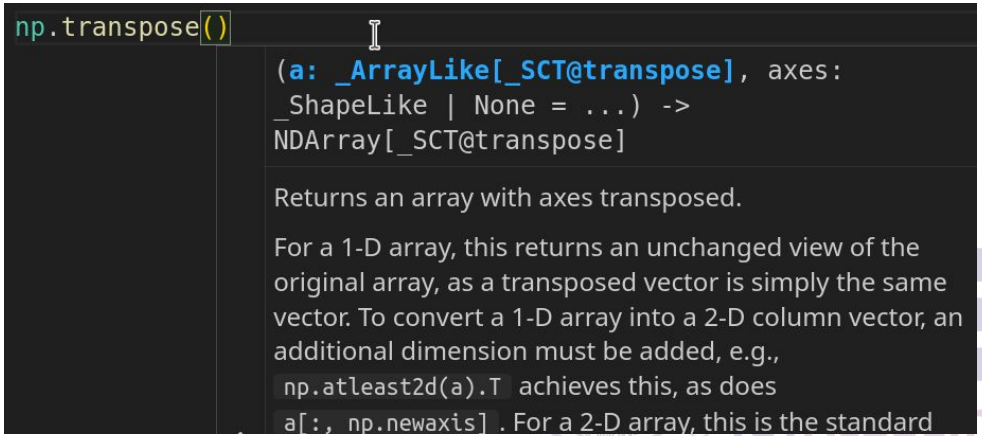

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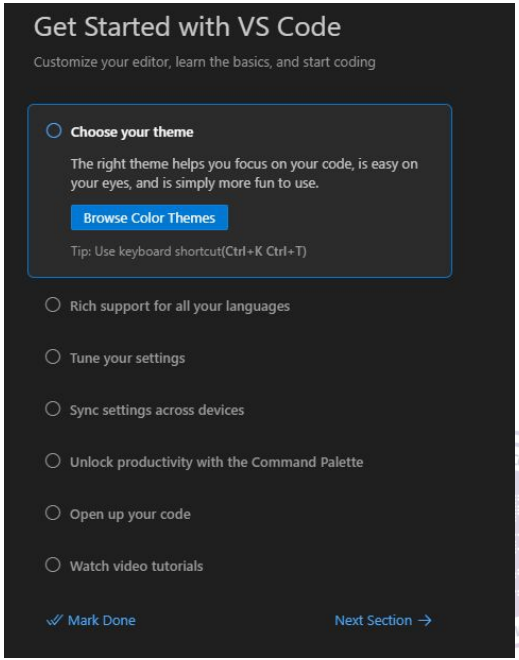
- Write code and **save** it as a file
- **Highlight errors** in code
- **Autocomplete** and recommendations
- **Documentation** and references
- Code **versioning** control with Git → more on Git later!

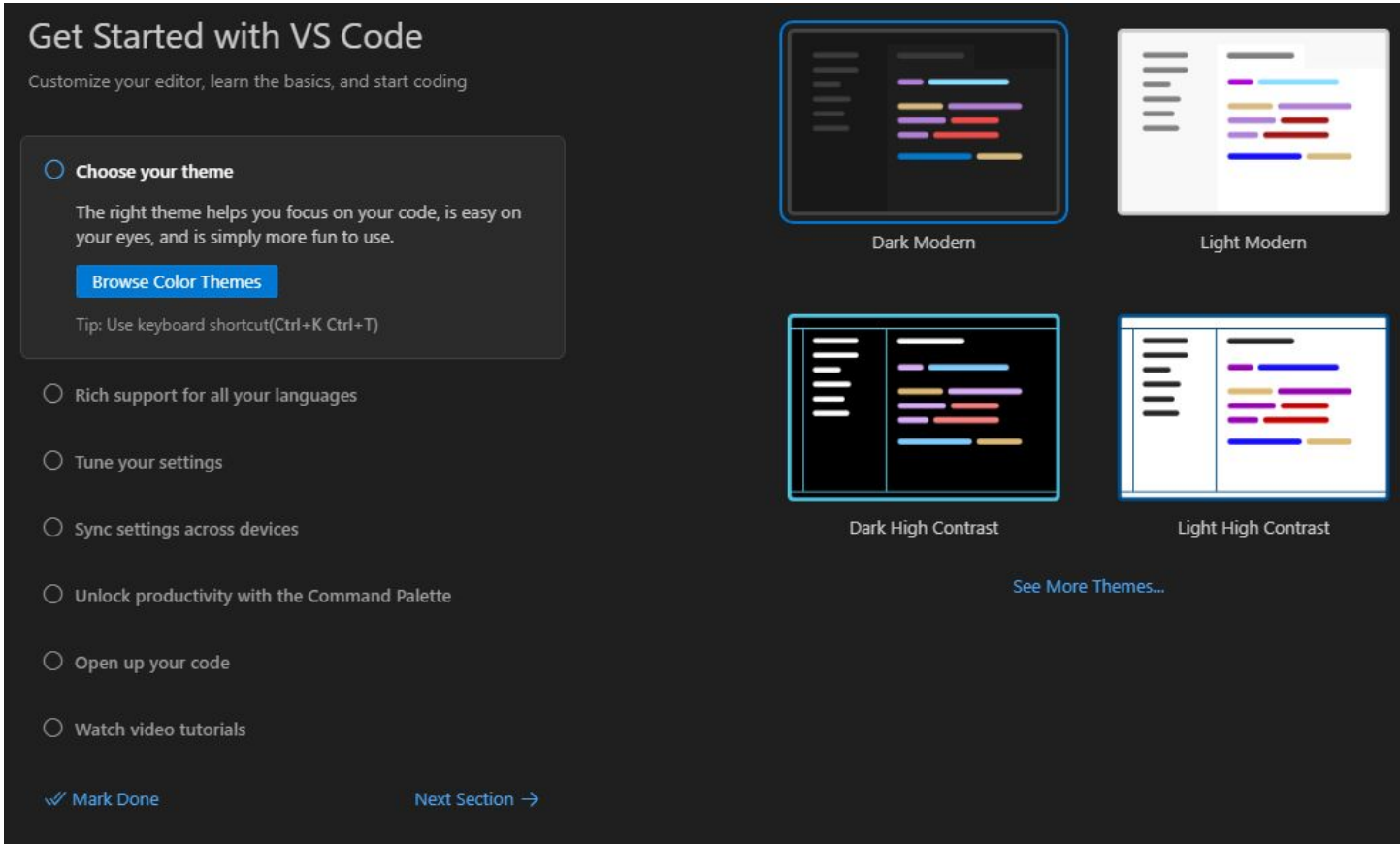
Visual Studio Code - Installation

- Go to code.visualstudio.com
- **Download** installer & **Install** (should be similar for Windows & Mac)
  - Select **all** additional tasks
- **Wait** for the others if you are at "Get Started with VS Code" (We will do the setup together)



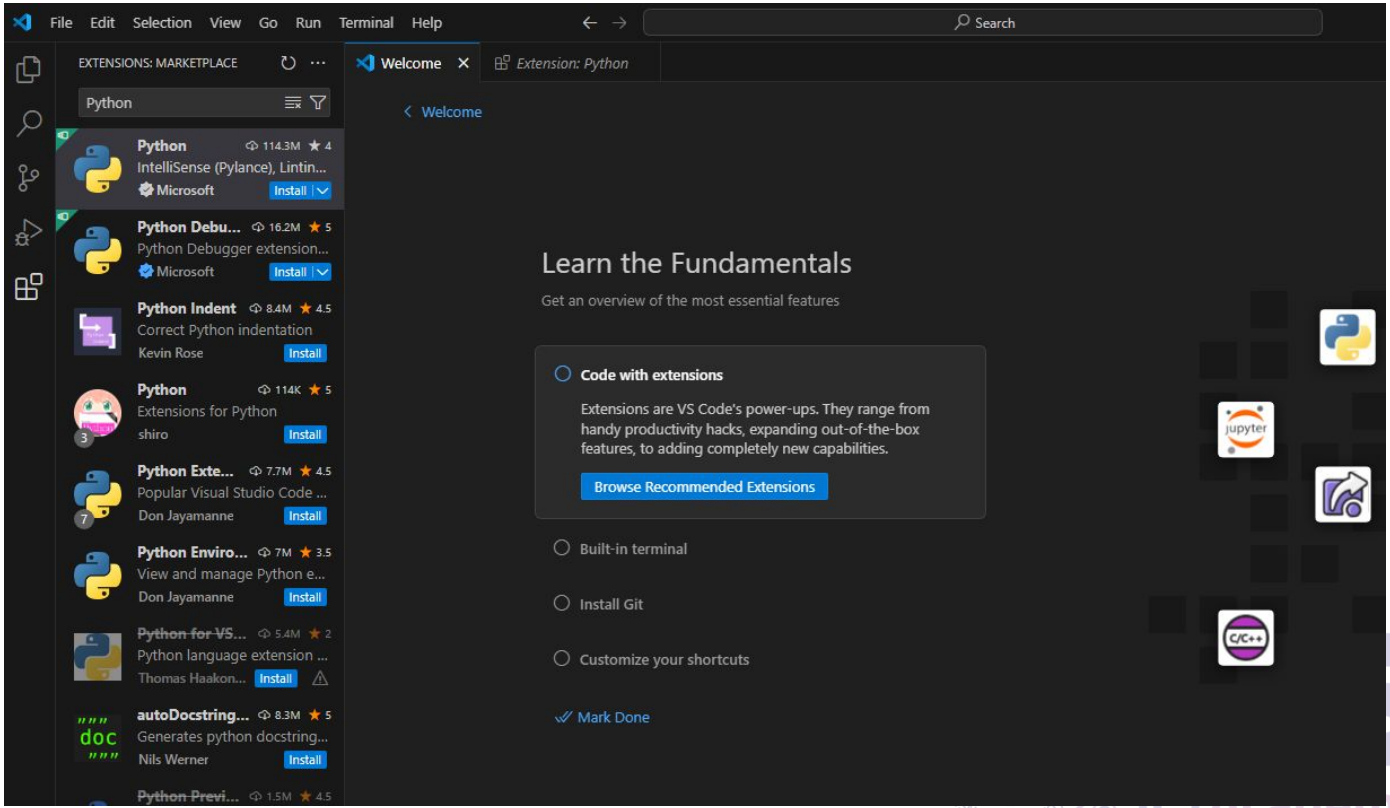
Visual Studio Code - Setup - Theme

1. **Choose** Theme
2. Click “**Next Section**”

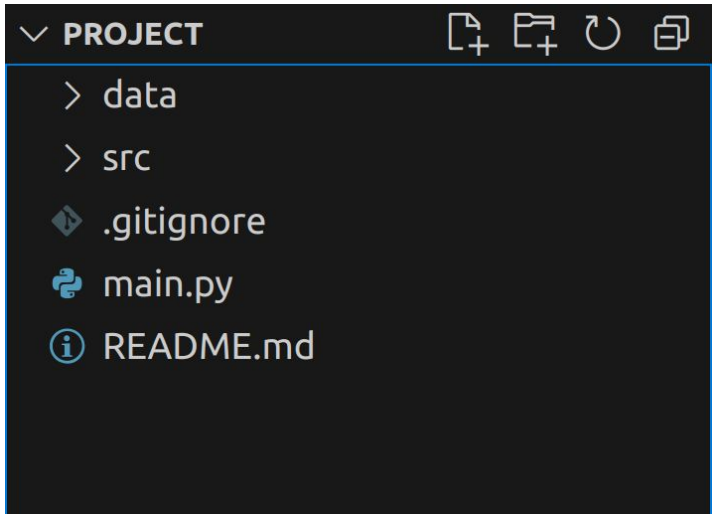


Visual Studio Code - Setup - Python Extension

1. Click “**Browse Recommended Extensions**”
2. Type “**Python**” in the extension **search** bar
3. **Install** the “**Python**” extension
4. If you get the “Get Started with Python Development” Tab opens; **wait** for the others

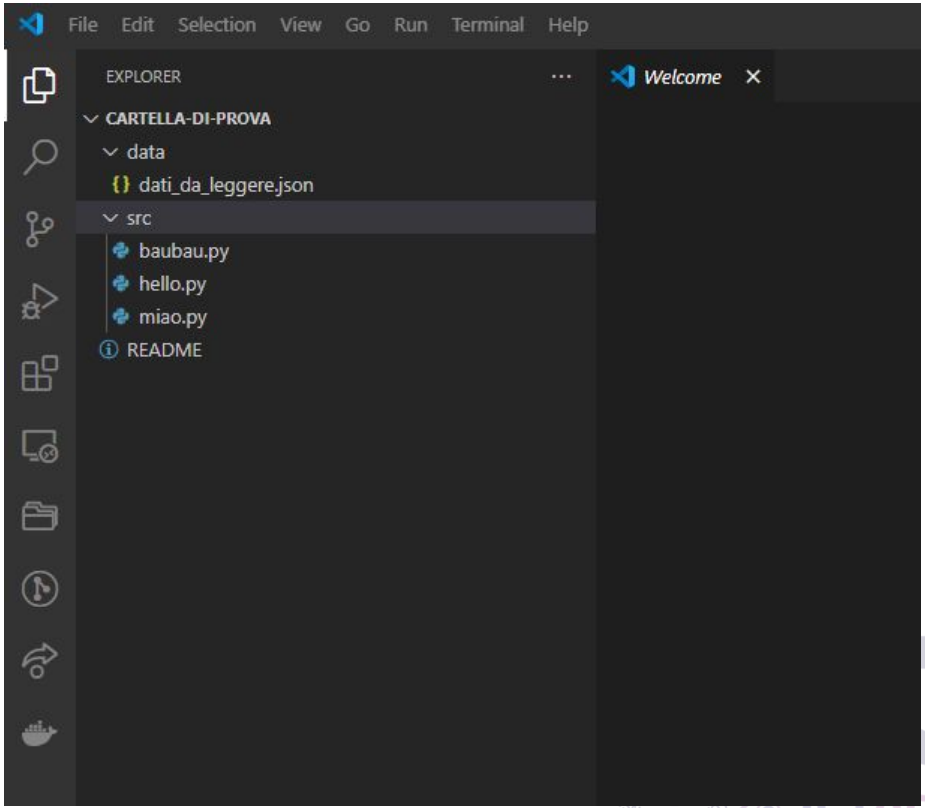


Exercise: Let’s create a “standardized” Python project structure using: mkdir, cd, touch, ls



Visual Studio Code - Setup - Open the project

1. Click “**File > Open Folder**”
2. Choose the parent folder you just created
3. Open the file `hello.py` and write `print(“Hello World”)`



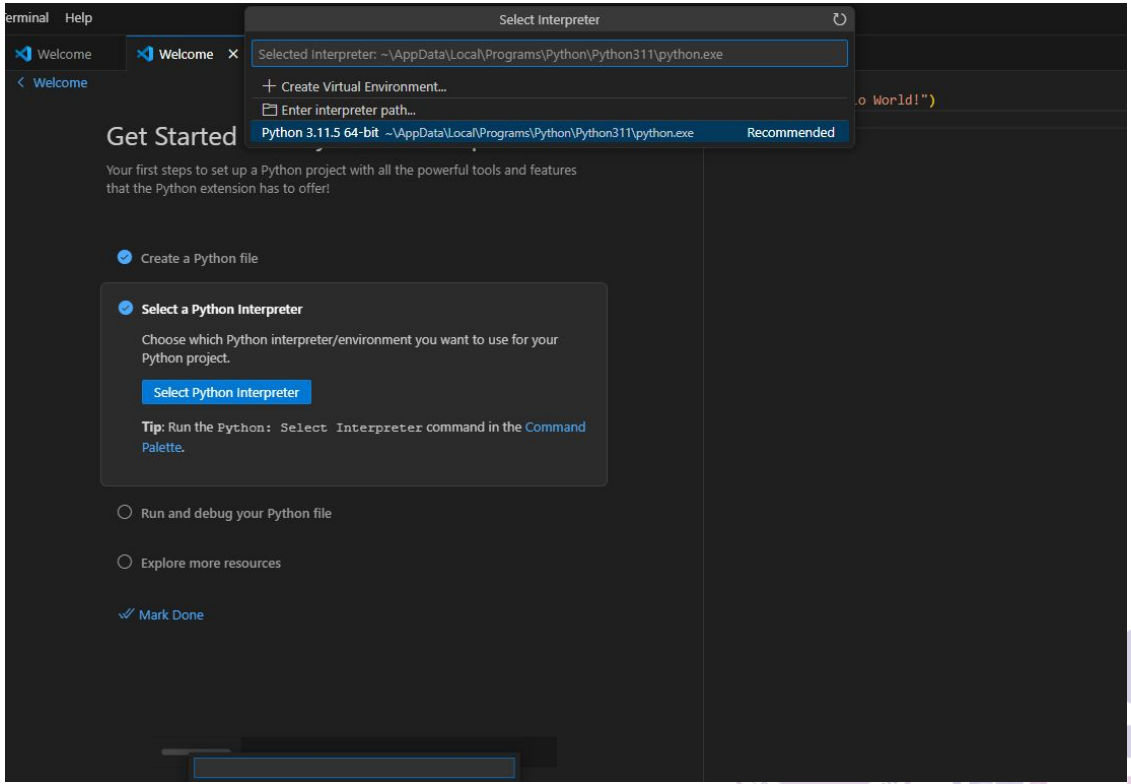
Visual Studio Code - Setup - Running hello.py

1. Click “**Terminal > New terminal**”
2. Navigate to the parent folder of `hello.py`
3. Once there, write `python hello.py`

```
39348@DESKTOP-R63USTJ MINGW64 ~/OneDrive/Desktop/dblp/cartella-di-prova/src
$ python hello.py
Hello World
```

Visual Studio Code - Setup - Python environment

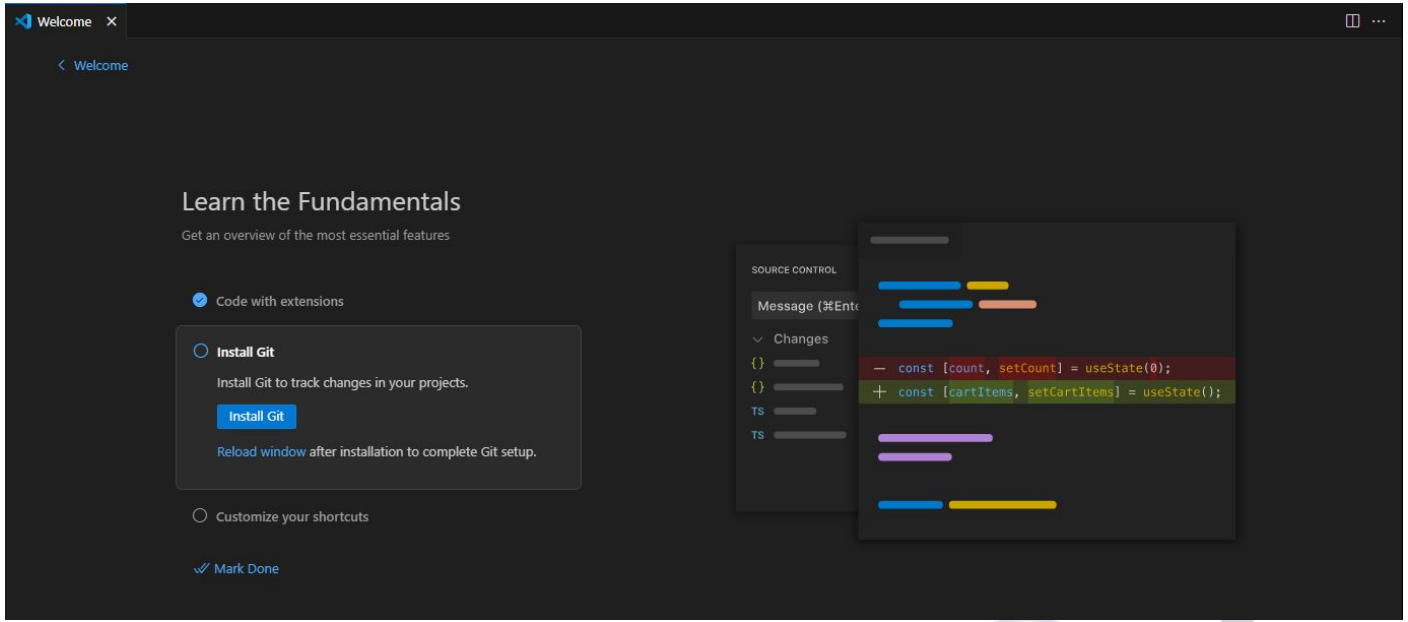
1. Click “**Create Python File**”
2. **Write** in file:
   `print(“Hello World!”)`
3. Go to “**Select** a Python **Interpreter**”
4. **Select** your python **version**.
5. **Go back** into the python **file**



Visual Studio Code - Setup - Git Installation

1. Click “**Install Git**”
2. **Follow** the **instructions** on the pop-up Website.

A. **Download** & **execute** Installer
B. Use **default** settings.
C. **Use VScode** as “**default editor**”
D. Otherwise default options again (there are many)



3. Click “**Reload window**” in VScode