Data Science Lab

Structuring Python projects

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Structuring Python projects

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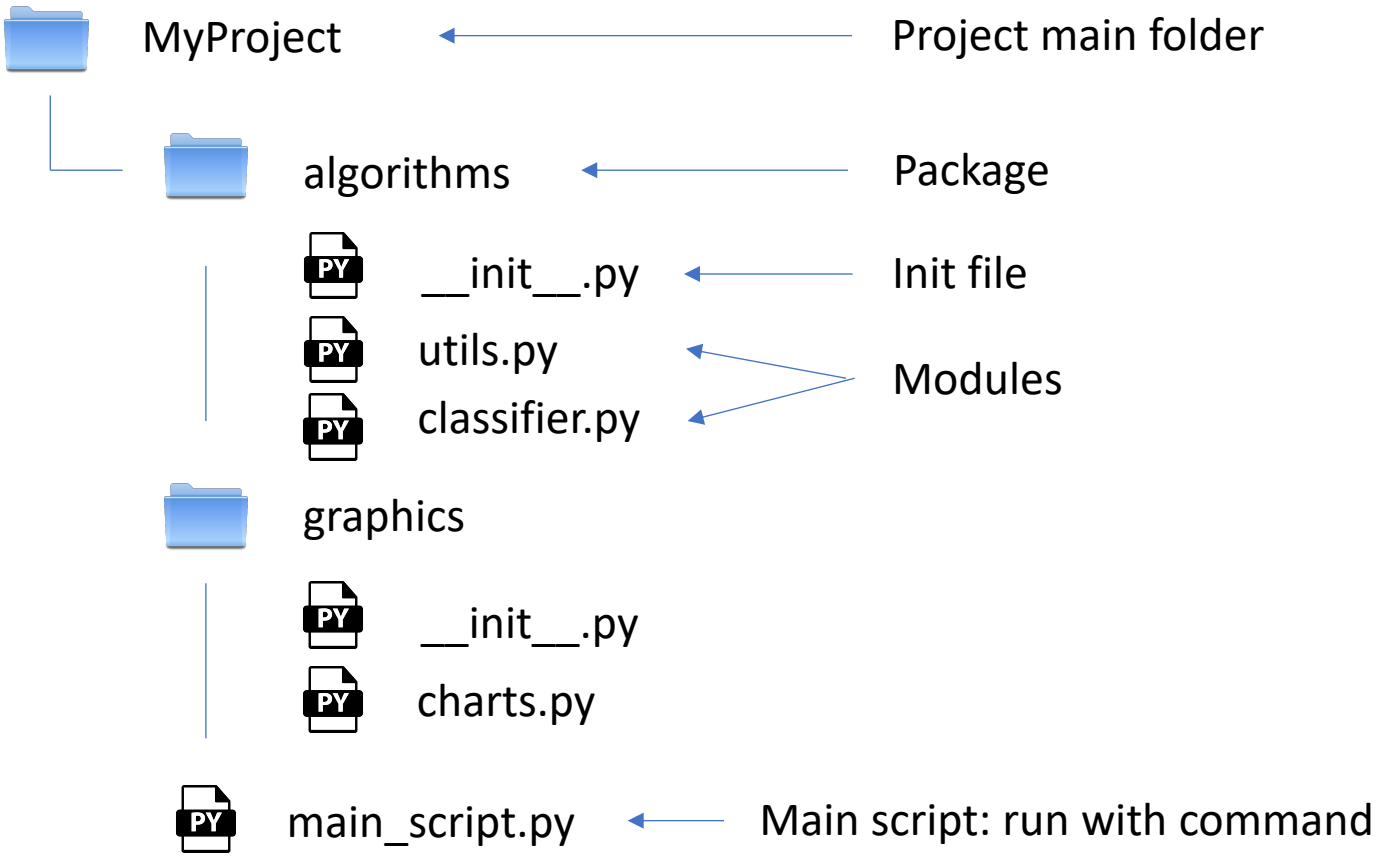
- The code of a Python project is organized in **packages** and **modules**
- **Package**:
  - Represented with a directory in the file system
  - Collects a set of Python modules
  - Until Python 3.3, a folder used to have to contain a **__init__.py** file to be considered a Python package
- **Module**
  - Represented with a Python file (.py)
  - Contain **attributes**, **functions** and **class** definitions

- **Example: project structure**



- **Example: content of Python module**

graphics

__init__.py

charts.py

charts.py

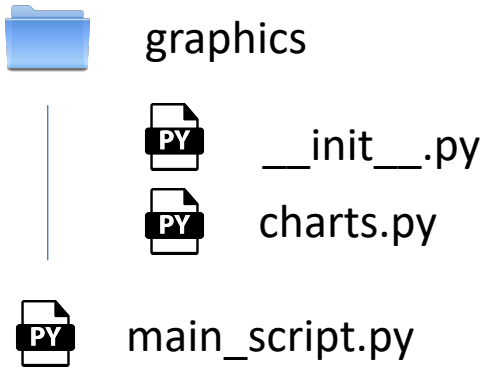
```
import matplotlib.pyplot as plt
import os

def plot_result():
    ...
    plt.plot(...)
    ...

plot_path = "../Data/plots"
if not os.path.exists(plot_path):
    os.makedirs(plot_path)
```

Function definition

Attribute

Initialization operations

- **Importing a module**
  - To use attributes, functions and classes defined in a module, it must be imported with the **import** command



main_script.py

```
import graphics.charts
```

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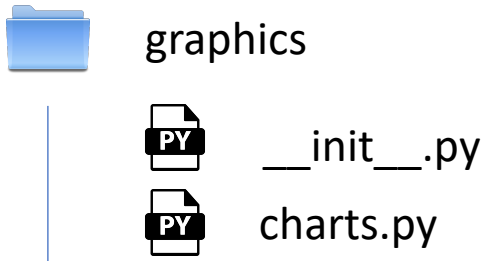
- **Operations executed when importing a module (e.g. graphics.charts)**
  - Execute **__init__.py** file in the package
    - This file can be empty or contain some initialization instructions for the package
  - Execute the content of the module (**charts.py**)
    - This will load its attributes/functions/classes and run its initialization code (if any)



- **Operations executed when importing a module (e.g. graphics.charts)**

```
import graphics.charts
```

charts.py

```
...
def plot_result():
    ...
plot_path = "../Data/plots"
if not os.path.exists(plot_path):
    os.makedirs(plot_path)
```

1) Load a function

2) Load an attribute

3) Initialize directories

- **Importing a module**
  - After import, any attribute, function or class can be used from the module

main_script.py

```
import graphics.charts
graphics.charts.plot_result()        # Function
print(graphics.charts.plot_path)     # Attribute
```

- **Importing the content of a module**
  - Avoids to write the name of the module when using attributes or functions

main_script.py

```
from graphics.charts import *
plot_result()      # Function
print(plot_path)   # Attribute
```

Warning
Avoid using `import *`! Modules that use the same names will overwrite one another

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- **Other ways of importing modules**
  - Renaming a module

```
import graphics.charts as ch
ch.plot_result()
```

  - Importing a single function/attribute

```
from graphics.charts import plot_result
plot_result()
```

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- **The main script file(s)**
  - Typically contains a **main function**
  - Can also contain functions and classes as any other **module**
  - **2 use cases**
    - Run "python main_script.py" from terminal
      - Execute the main function
    - Import some content (e.g. a function) of the main script
      - "from main_script import my_func"

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- **The main script file(s)**
  - Use case 1: "python main_script.py"
  - Python defines a variable called **__name__**
  - The if statement is satisfied and main() is called

main_script.py

```
def main():
    print("This is the main function")

if __name__ == '__main__':
    main()
```

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- **The main script file(s)**
  - Use case 2: import content to another file
    - main_script.py is executed by the **import**, but main() is not called since __name__ does not contain '__main__'

main_script.py

```
def my_function():
    ... do something ...


...


if __name__ == '__main__':
    main()
```

main_script2.py

```
import main_script
main_script.my_function()
```