



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

Programming in Python¹

Mattia Monga

Dip. di Informatica
Università degli Studi di Milano, Italia

`mattia.monga@unimi.it`

Academic year 2021/22, II semester



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

Lecture XVI: Matplotlib

Graphical output is an operating system service



PyQt

Monga

Matplotlib

Graphical commands

OO plotting

- Output is a service provided by the operating system: *textual* output is very standardized even across different platform, **graphics is not so stable**
- When you deal with graphical programs: expect installation headaches, portability glitches, etc.



A real world example

On the Win10 platform where I try the programs:

- the current `matplotlib` library doesn't work: it installs, but when used it complains about missing DLLs (Dynamic libraries shared among the programs)
- according to the "Internet" ... the problem can be solved by installing Visual Studio (!): I didn't try...
- The last version I found working properly is 3.3.1: I will stick to that (thanks to the virtual environments this is not a problem)
- On other platforms (Linux, Mac): no problems, but better if we use all the same version

BTW, it depends on `numpy`

PyQB

Monga

Matplotlib

Graphical commands

OO plotting



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

- You need always two objects: a Figure and a Axes
- plotting happens on axes, framed in a figure
- very flexible: you can add plots on the same axis, or you can have many axes collected in a single figure

Basic example



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

```
import numpy as np
import matplotlib.pyplot as plt

x = np.linspace(-2*np.pi, 2*np.pi, 100)

fig, ax = plt.subplots()

ax.plot(x, np.sin(x))

fig.show()
```

Many different types of charts



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

If `ax` is a `Axes`

- Scatter-plots `ax.scatter`
- Bar-plots `ax.bar`
- Histograms `ax.hist`
- 2D `ax.imshow`



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

- add labels, legends, titles
- add a grid
- combine multiple plots on the same axis
- combine multiple axes on the same figure

Save your pictures!



PyQB

Monga

Matplotlib

Graphical commands

OO plotting

A Figure can be saved in a file with `savefig`. You should keep in mind the difference between:

- bitmap formats (`png` `jpg` ...): the file is matrix of pixels
- vector formats (`svg` `pdf` ...): the file is a set of instructions to reproduce the picture, less portable but it can be magnified