



PyQB

Monga

Third-party
libraries

NumPy

Programming in Python¹

Mattia Monga

Dip. di Informatica
Università degli Studi di Milano, Italia

`mattia.monga@unimi.it`

Academic year 2022/23, I semester



PyQB

Monga

Third-party
libraries

NumPy

Lecture XI: Using Third-party libraries



PyQB

Monga

Third-party
libraries

NumPy

Python is “sold” *batteries included* (with many useful built-in libraries). Moreover, like many modern programming environments, it has standard **online package directories** that list libraries produced by independent developers.

<https://pypi.org/>

The Python package index currently lists almost 300K libraries!



PyQB

Monga

Third-party
libraries

NumPy

The details are explained here: <https://packaging.python.org/tutorials/installing-packages/>

- In most cases it is very easy, the pip program does all the magic
- It is **very** important to understand the difference between a **system-wide** and a **project-specific** installation.

System-wide vs. Project-specific



PyQB

Monga

Third-party
libraries

NumPy

If you don't take special precautions, a package is installed in a way that makes it available to your Python system: every Python interpreter you launch sees them.

- In many cases, this is **not** what you want
- **Different projects/programs might depend on different versions of the libraries**
- Libraries themselves depend on other libraries, you want to understand exactly which packages your program is using in order to **reproduce** the settings on other machines



PyQB

Monga

Third-party
libraries

NumPy

Python provides the idea of **virtual development environments** (venv)

- You can create one with: `python -m venv CHOOSE_A_NAME`
- You must activate it (syntax depends on your OS):
`CHOOSE_A_NAME\Scripts \activate .bat`
- In an active virtual environment all the installation are **confined** to it
- You can get the list of installed packages with `pip freeze`



PyQB

Monga

Third-party
libraries

NumPy

Virtual environments are key to avoid messing up your system.
Many tools simplify their administration.

- `pipenv` (my preferred one, we will use this)
- `poetry` (similar to `pipenv`, currently less popular, but it has a better dependency control, a bit more complex)
- `conda` (uses its own package index, great flexibility and complexity, manage different python versions)



PyQB

Monga

Third-party
libraries

NumPy

When you are working in a Python virtual environment, remember to launch **all** your development tools “inside” the virtual space.

For example, to use IDLE don't click on the main application launcher, instead: `python -m idlelib`.



NumPy is a third-party library very popular for scientific/numerical programming (<https://numpy.org/>).

- Features familiar to `matlab`, R, Julia programmers
- The key data structure is the `array`
 - 1-dimension arrays: `vectors`
 - 2-dimension arrays: `matrices`
 - n-dimension arrays

In some languages array is more or less synonym of list: Python distinguishes: `lists` (mutable, arbitrary elements), `arrays` (mutable, all elements have the same type), `tuples` (immutable, fixed length, arbitrary elements).