

# Programming in Python<sup>1</sup>

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Lecture X: Using Third-party libraries

# Third-party libraries



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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!

### <u>Installing a</u> library



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- 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



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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

### Virtual environments



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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
- In an active virtual environment all the installation are confined to it
- You can get the list of installed packages with pip freeze

# Simplified venv administration



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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)

### Virtual environments caveats



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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



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).

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### State of the homework



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- One-triangle: tried by 26, ok for 18
- triangle-kinds: tried by 22, ok for 11
- dna-hamming: tried by 22, ok for 14
- newton-sqrt: tried by 21, ok for 15
- py-triplets: tried by 19, ok for 13
- flatten-list: tried by 19, ok for 6
- dna-files: tried by 20, ok for 7
- dna-forensics: tried by 14, ok for 5