

Python for Neuroscientists - Syllabus

The course is aimed at students who are already semi-proficient with other programming languages, namely Matlab. Examples (and homework) will be derived from common problems and tasks in neuroscience, to improve the analysis of your own data by increasing its automation and reproducibility.

Monday, 16:00-19:00, Sherman 009.

Prerequisites:

1. Basic knowledge of programming.
2. Extended Mathematics course (in the Life Sciences faculty), or a parallel one.

Final Grade:

- 40% - Homework assignments (one submission is skippable).
- 60% - Final project as part of Sagol's yearly hackathon.

Course Structure

Each 3-hour lecture will combine an oral presentation with individual work.
Main topics:

1. Motivation, transition from Matlab (or other languages).
2. Data structures (lists, tuples, sets, dictionaries), functions and iteration.
3. Object-oriented programming.
4. Important programming tools and habits - package management, git, environments.
5. File I/O and exception handling.
6. Python's scientific stack - NumPy, SciPy, Pandas, Matplotlib, xarray.
7. Advanced Pandas - use cases, data organization.
8. Tests and test-driven development.
9. Performant code - Cython, Numba, multiprocessing.
10. Advanced Python subjects - FFIs, generators, decorators, `itertools`, `collections`.
11. Software design principles.
12. Image processing and basic machine learning.
13. Distributing and publishing a Python package.