Introduction to Python

2 ECTS

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Summary

This course is an introduction to the basics of computer programming using Python, a widely used open source programming language. No previous programming experience is required (students already familiar with the topics described hereafter are *discouraged* to take the course). Our aims are to show how programming can be used for developing tools in support to our daily research and to incentivize scientific reflection.

Goals

At the end of the course students:

- Should be able to develop simple codes for their own projects and
- Should have the basics to improve their programming skills by taking further courses, by training and exercising on their own.

The course is organized in 3 one-day workshops (each of them alternates between theory and hands-on exercises), and 3 half-day sessions, one (optional) for project development and 2 for the exam. The topics are organized as follows.

Before the course

To introduce basics concept of Python it is mandatory to perform (prior to the starting of the course) a given tutorial. The material will be provided on the Moodle page of the course.

Course outline

> **Group Session 1.** Thursday, October 26th, 2023
> 9-12h and 13h30-16h30 @ UNIL-Sorge

Morning

- Course description
- Installation and Introduction to Python

- Basic programming concepts (variables, data types, basic data structures)
- `Numpy` for scientific computing (vector, array)
- Arithmetic operators and basic functions with arrays.
- User interaction (input)

Afternoon

- Functions & Scripts
- Importing / exporting data (reading / writing text files, csv & xls files)
- `Pandas` for data manipulation and exploration (DataFrame)
- Control flow statements (if-else-end, for-end, while-end)
- Define and analyze the needs of your own project (with a form that will be distributed on-site).

Individual private presentations. Thursday, November 2nd, 2023
@ Centre de Recherche en Radiologie (see location below)

Students present the project they would like to implement in the context of their research interests and needs (with slides as support, 5 min presentation). The filled form of Session 1 aims at helping students in defining their project and prepare this presentation. After approval of the project by the teachers, students should start writing a function to import their data in Python (within vector, matrices, dataframe or any relevant structure), to be delivered at the end of Session 2.

Group Session 2. Thursday, November 9th, 2023
9-12h and 13h30-16h30 @ UNIL-Sorge

Morning

- Plotting
- `DataFrame` – continued
- Functions & Scripts – continued
- Installing additional libraries
- How AI can help you code.

Afternoon
Hands on on your project: importing the data for the student project. The function for importing data must be completed before the end of the session.

Group Session 3. Thursday, 16 November 16th, 2023
9-12h and 13h30-16h30 @ UNIL-Sorge

All Day

- Develop your own project. This is a hands-on-session where students develop their Python project with the help of the organizers.

Group Session 4. Thursday, November 30th, 2023
9-12h and 13h30-16h30 @ UNIL-Sorge

Exam session.

Location

Sessions 1, 2, 3 & 4 will take place room 204.2 in the basement of the AM-PHIPOLE building. *Individual private presentations* will take place at the Centre de Recherche en Radiologie, Rue Pépinet 3, 2nd floor, CH-1003 Lausanne.

Evaluation

Evaluation is based on both a short written exam (20% of the mark) and the development of their own project (80%). Participants will develop a short project using Python, related to their own research activity. The project must contain (at least) the following steps:

1. Loading/creation of data
2. Processing
3. Visualization of the results
4. At least one 'own' function
5. Proper commenting of the code

The use of external functions or libraries is allowed but should remain minority. It is important to clearly distinguish what you wrote – your own code – from external sources (including AI-generated code), using for instance comments.

Evaluation criteria. All the following points will be graded and weighted for the evaluation.

- Clear and precise definition of the research context and project's goals (Filled form by Session 1 – Afternoon and Presentation 1 during private session, **20**% of total grade).

- Function to import their data in Python (within vector, array, DataFrame or any relevant structure), to be delivered at the end of session 2 (**10**%).

- Students must send their script and data by *Thursday, November 23rd, 2023, to the course organizers*. The course organizers should be able to run and understand the scripts based on students' written instructions (**30**%)

- Session 4: written exam (**20**%)

- Session 4: students will explain their code and results in a presentation format (Presentation 2, **20**%).

- **Participation to Sessions 1, 2, 3, 4 and private presentation is mandatory.**

Reading materials

Course materials are stored on the UNIL e-learning platform Moodle. You can access by doing the following:

- go to "https://moodle2.unil.ch"

- log in with your institutional/university address

- click on "Faculté de Biologie et de Médecine" → "Ecole doctorale / doctoral school" → "Lemanic Neuroscience Doctoral School"

The materials are stored under "Introduction to Python". Please use the self-enrollment method to access them.

Registration

The course is limited to 12 participants. Register before September 20 by writing a mail to lndscourses@gmail.com (with your supervisor in copy) and stating "Introduction to Python" as subject.