PHOT 110: Introduction to programming

Study guide: references to online materials

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Where to learn Python?

Obviously, I hope that you will learn Python during our PHOT 110 course:

- Please ask me, Ozan, and Hazan any questions about Python which you might have. This can be during class, or you can send us messages on MS-Teams, via email, or both. If I do not immediately respond, this just means I didn't see it yet.
- Tell me if anything is missing: course material which is not clear, mistakes in the slides, topics that are not covered sufficiently, etc.

However, there is also a lot of Python documentation to be found online, which can further help you to learn Python. Since Python has been around for a while, maybe even too much documentation. I listed below some of the online references, which are, in my opinion, good starting materials.

(1) The book we are following: "A Primer on Scientific Programming with Python", 5th edition by Hans Petter Langtangen. Although a lot to read, it gives you a thorough introduction to scientific computations. The emphasis is less on programming itself and more on implementing numerical methods using Python. Please also have a look at the extra materials (slides, exercises) of the textbook.

(2) There is the Python course with video recordings of David J. Malan from Harvard University, which is also for beginners and gives great insight into the Python language, although the emphasis here is not on scientific computations.

(3) There are great tutorials if you want to rehearse the basics of Python programming: especially https://www.learnpython.org/ is a gentle (and **interactive**) introduction.

(4) The tutorial at the official Python website gives more background and details but still builds up from scratch (I suggest starting from Chapter 3 in case you want to see code immediately.

(5) The websites of specialized libraries for plotting, numerical methods, data science, often offer very good documentation about the library:

- Numpy, and their tutorial for beginners
- Matplotlib is the plotting library that we use, their website provides good documentation and tutorials.
- Pandas is a library which provides functions to handle large tables of data (tables with millions of rows and or hundreds of columns). We will see Pandas towards the end of the semester.
- Scipy: A library which overlaps partially with Numpy, but has some extended functionality. This is for more advanced usage when Numpy is not given the optimal results.
- Scikit-Learn: This library is on machine learning, a topic which we will not see here in the course. I added it here to the list since their user guide is a great resource if you ever come into contact with machine learning.

(6) Aurelien Geron, the author of the book “Hands-On Machine Learning with Scikit-Learn Keras & Tensorflow”, has nice tutorials on Matplotlib, Numpy, Pandas, and linear algebra using Numpy:

- Aurelien Geron’s Matplotlib tutorial on Google Colab
- Aurelien Geron’s Numpy tutorial on Google Colab
- Aurelien Geron’s Pandas tutorial on Google Colab
- Aurelien Geron’s Linear Algebra tutorial on Google Colab