Python Course IMAU 2024

Welcome to the IMAU Python Course 2024. This is an introductory workshop series on python specifically for the Climate Physics master programme at the Institute for Marine and Atmospheric research Utrecht (IMAU), Utrecht University

Purpose

The main goal of the workshop is to bring all of you up to the same level of python programming. The other goal is that there are many specificities in working with geo-scientific data, so we want to provide some tools to help you in your studies.

Course outline

Topics covered

There are four modules covering the following topics:

0. Basics of programming in python
    - How to use notebooks
    - Data types, lists, dictionaries, loops, conditionals, functions, basic unix commands, classes
1. Packages: numpy, matplotlib, and scipy
    - Arrays, indexing, slicing, matrix operations
    - Plotting data, contour plot, subplots, quiver plots
2. Loading data with pandas, xarray and NetCDF4
    - DataFrame, operations, advantages of pandas
    - Reading and writing NetCDF data
    - Advanced xarray operations
3. Geo-scientific data: cartopy and modelling
    - Plotting spatial data, map projections, xarray integration
    - Numerical modelling with python

If you are already familiar with python, you can probably skip the first two modules. Modules 2 and 3 focus on specifics of the field of goesciences, so these modules could prove useful for all students. I will make the workshop materials available in advance, so that you can decide whether there is anything new to you.

Module 0 is a *take-home assignment* that you can do at your own leisure. If you have no experience with python we recommend that you do the entire module. For everyone else, feel free to scroll through the module. There still might be something useful in there (on classes for example). If you have any questions about Module 0 or about python installation, you can ask them during the Module 1 session or you can send me an email (w.s.j.kroese@uu.nl).

During the workshop I will shortly introduce the content lecture-style, but most of the time is reserved for exercises and questions that may arise. I will sent one more email before the first workshop. The main communication will be through Blackboard.

Schedule

There are 3 sessions on Friday from 13:15 to 15:00 in the same room as the ACCP practical.
I will be there from 13:00 for those who need help with their installations.

	Date	Time
Module 0	-	-
Module 1	13-09	13:15 - 15:00
Module 2	20-09	13:15 - 15:00
Module 3	27-09	13:15 - 15:00

Python/Jupyter installation instructions:

For both the workshop and almost all master courses, you will need to have Python installed on your pc. In the workshops we will work with Jupyter Notebooks. If you have not installed Python and Jupyter yet, please see `Installation of Anaconda and Jupyter Notebook.pdf` for installation instructions. Please note that on Friday September 6th there is a python assignment, so make sure you have everything installed before then.

Course evaluation

This course has *no* course evaluation because it is not an official course that gives you EC's, but if you have feedback, please send it me (w.s.j.kroese@uu.nl) so that we can improve the course next year.

Resources

- Python introduction from w3schools where you can run code in the browser.
- Earth and Environmental Data Science full semester course by Ryan Abernathey at Columbia University from which much content is copied
- IMAU's Python for Lunch workshop series a collection of workshop materials on topics of interest from IMAU students and researchers