Data Science for Economists
Syllabus, Fall 2025/2026

Philipp Bach

Course Information

This module introduces tools and methods for **data science with Python**, specifically designed for **Bachelor students in economics**. Participants will learn fundamental programming concepts and Python syntax, become familiar with essential libraries, and apply their skills in practical data science projects. The course equips students with valuable competencies that complement the standard economics curriculum.

Python is a modern and powerful programming language that is widely used in industry and academic projects. Students will learn how to find a code-based solution to basic and complex problems. The course is based on many examples that illustrate how to tackle a potentially complex data science problem as well as how to implement a solution.

Upon completion of the course, students …

- … will be able to implement solutions to complex problems in Python
- … know basic concepts of programming and algorithms (loops, functions, object classes)
- … be able to apply basic techniques of data manipulation and visualization
- … will be able to read and write code
- … will acquire experience in working with core Python libraries (numpy, pandas, matplotlib, scikit-learn)
- … will know how to collaborate in a team to find a solution for a problem at hand

Please note that this course is specifically designed for **economics students**. That is, **it is not required to have any prior knowledge or experience in programming to attend this course**. The teaching format will make it possible to account for different levels of programming skills such that every student can take the most out the course.

Course Structure and Literature

The course is based on a hands-on approach with a three-fold structure:

1. **Lectures**: In the lectures, we will introduce concepts and illustrate them in reproducible examples.

2. **Hands-on Tutorials**: Students will practically apply the concepts of the lecture in hands-on examples. The participants solve problems in groups.

3. **Project Work / Lab Phase**: In the final phase of the course, students will work on a data science project in groups, applying the skills and knowledge they have acquired throughout the course.

The core content of the course is organized in two blocks

Part I: Introduction to Programming with Python

In the first part, an introduction to the basic concepts of programming in Python is provided. Students will learn the Python syntax, data types, as well as how to implement loops, functions and object classes in Python. We will introduce core Python libraries, too, including numpy and pandas. Once these concepts are understood, we will learn how they can be used to solve problems.

Part II: Data Science with Python

In the second part, we will cover basic data science tools in Python referring to data manipulation, descriptive and explorative analysis as well as visualization. At the end of the course, an outlook will be provided on the next steps in Python for Data Science, including statistical analysis and machine learning.

Reading

We will use the books by Wentworth et al. (2020), Porter and Zingaro (2024), McKinney (2012).

Lecturer and Contact Information

- Name: Dr. Philipp Bach, Assistant Professor for Econometrics
- Mail: philipp.bach@fu-berlin.de
- Office hour: Upon request; feel free to contact the lecturers before or after class.

Examination

We plan to have a term paper ("Hausarbeit") as an examination. More details will be provided during the course.

Usage of AI

AI tools and assistants/agents such as ChatGPT, GitHub copilot, and Cursor are now in daily use for software development in industry and academia. In this course we allow students to use AI tools as devices that help them in their learning journey. However, using AI assistants should not be used to replace the participants' learning and thinking. In the assignments, students are allowed to use AI tools. Students are required to indicate and briefly describe if and how AI tools have been used in their solution.

Set up for Programming in Python

Please bring your own laptop to all lectures and tutorials. Please follow the installation instructions carefully and make sure to install all required software before the first session.

- We will use Python 3. Please install Python 3 on your computer, for example using anaconda, as described on this link: https://docs.anaconda.com/anaconda/install/
- You can work in Python either using a code editor (vscode is recommended) and/or using Jupyter notebooks in the browser
- Alternatively, you can run Python notebooks online, for example using https://colab.research.google.com/ (registration necessary) or https://www.kaggle.com/notebooks

References

McKinney, Wes. 2012. *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython.* O'Reilly Media, Inc.

Porter, Leo, and Daniel Zingaro. 2024. *Learn AI-Assisted Python Programming: With Github Copilot and ChatGPT.* Simon; Schuster.

Wentworth, Peter, Jeffrey Elkner, Allen B Downey, and Chris Meyers. 2020. *How to Think Like a Computer Scientist: Learning with Python 3 Documentation.*