



Frankfurt School

**WELCOME TO
FRANKFURT SCHOOL**

Data Science Techniques and Real-World Applications

Intro to the course & organizational coordination

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Most important notes:

- Canvas:
 - Slides, resources, and assignments
- GitHub Link: for data files, other supporting materials
<https://github.com/sharafi-zahra/Data-Science-Course-WS2025>
- Course calendar:
 - Session 1: 11.09.2025
 - Session 2: 18.09.2025
 - Session 3: 25.09.2025
 - Session 4: 02.10.2025
 - Session 5: 09.10.2025
 - Session 6: 16.10.2025
- We start from **9:30** to **17:15** every Thursday
- Bring your laptops!

What is Data Analytics?

- What is Data?
 - Data table (e.g. CSV files)
 - Observations
 - Variables
 - Dataset
- Data analytics:
 - Collection
 - Structuring
 - Cleaning
 - Visualization
 - Inference

This course...

This course is for **Bachelor's students**:

- Basic Understanding of programming
- Pre-knowledge in Business and Management
- Open to learn!

Teaching materials are in Python (Jupyter notebooks)

- Open source
- Similarity to the natural language
- Multiplatform (Windows, Mac, Linux, Raspberry Pi, etc)
- Cloud computing integration
- Great community
- Various libraries

This course is **not**:

- A Programming Course!
- A Machine Learning course!

But

- **How to apply these tools in a structured and meaningful way to analyze data and uncover new insights.**

A relatively new course

- The first time I am offering this course at FS
- Innovative in terms of content & format

Students are expected to:

- Be patient with your own fails & lecturer's fails
- Improve their own ability to apply data analytics
- Help each other: contribute to the learning of fellow students
- Engage in a collaborative work environment: Share experiences & learnings with others
- Make proposals to improve the course

This course is different...

- No final exam
 - Case assignments
- Lots of exercises & collaboration
 - You should discuss your solutions in class
 - Focus on Business applications
- Research oriented
 - Perfect foundation for an empirical project (bachelor thesis)
- Build on other people's work: public libraries & GitHub...

Your Workload

September

- We focus on programming skills
- Lots of exercises
- Case studies

October

- Less exercises / more practice
- Your presentations
- Case studies

Grading Requirements

- Submission of all the case studies (graded)
- Submission of at least 5 homework assignments (not graded).
 - HWs are announced at the end of each session.
 - Submission deadlines: Given on Canvas
 - Should be uploaded to Canvas
 - We will have in total around 7 HWs.
 - Working in groups is recommended, but submitted individually

Estimated Roadmap (subject to changes)

1. Intro to Python: review of basics
2. Data science toolkit (Pandas, Numpy, Matplotlib, etc.)
 - Case Study 1 (18th September, submission deadline: Oct 2nd)
3. Statistics
4. Data acquisition:
 1. (a) APIs
 2. (b) Website scraping
 - Case Study 2 (25th September, submission deadline: Oct 16th)
5. Textual analysis:
 - a) Sentiment Analysis
 - b) Topic Modelling
 - Case Study 3 (2nd of October, submission deadline: Oct 23rd)
6. Presentations: October 2nd
7. Managing big data: SQL and Python
8. Machine Learning:
 - a) Concepts: bias/variance trade-off, how good is good?
 - b) Regressions: Lasso, Ridge, Trees

Grading

- 75% based on **3 written assignments**
 - Should be prepared as a Jupyter notebook file
 - 2-3 weeks of time
 - Main points are related to the economic interpretations of your analysis (less important is your coding skills)
 - **The contributions of every single individual in a group should be explicitly mentioned** in a cover letter (or at the beginning of the notebook) for each case study.

For example: Person one contributed to ..., the share of contribution (all equally, or otherwise mention the percentage of the team members)

 - Including the contribution of LLMs (very important!)
- 25% based on presentations
 - You will lecture on a topic for around 30 minutes.
 - A list of possible topics will be announced by the 2nd week of the course
 - Topics include introduction of programming tools/packages...

Case Solutions & Case Gradings

- Discussion of case solutions only in class
 - Your solution will not be discussed privately with you
- Grading only at the end of the course
- No “bargaining” & “negotiations” of grades, if you do well, you’ll be fine! 😊

- Are we allowed to work in teams (on cases)?
 - Yes
 - There should be a clear statement of who did what in the case
 - Number of members depends on the class size (max. 4 members)
- Plagiarism policy...?
 - Plagiarism would be punished with 5.0

Presentations

- Produced in teams (tbd, depending on class size)
- Range of topics (libraries, websites, data science topics)
 - We will suggest a list of topics at the end of today
- Students give a lecture (produce videos) in the class, depending on the topics
- You will love it because:
 - It is required for grading 😊
 - Other students learn from you
 - Introduce all students to important topics that cannot be covered deeply within the course

Resources

- “Data Analysis for Business, Economics, and Policy” (Gabor Bekes , Gabor Kezdi) Cambridge University Press
 - Codes: https://github.com/gabors-data-analysis/da_case_studies
- “Python for Finance: Mastering Data-Driven Finance [2nd ed.]” (Yves Hilpisch) - O’Reilly Media
- “Web Scraping with Python: Collecting Data from the Modern Web” (Ryan Mitchell) - O’Reilly Media
- “Applied Text Analysis with Python” (Benjamin Bengfort, Rebecca Bilbro, Tony Ojeda) - O’Reilly Media
- A course taught at Goethe University: “Data Analytics in Finance & Accounting”
- An online course: <https://github.com/pytopia/Data-Processing-for-ML/tree/main>
- Etc.

Our Goal

- After this course
 - Life would be much easier!
 - You will be able to find genius solutions with a little more Google!
 - You will be more patient:



I HATE PROGRAMMING
I HATE PROGRAMMING
I HATE PROGRAMMING
IT WORKS !
I LOVE PROGRAMMING

Questions?

A photograph of a modern, multi-story building with a grid-like facade of windows, partially obscured by a semi-transparent blue overlay. In the foreground, there is a green lawn, a paved walkway, and a few trees. The sky is visible at the top with some clouds.

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**THANKS
FOR YOUR
ATTENTION**



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