Lecture I - Introduction

Programming with Python

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About this course

About me

- Post-doctoral researcher from the University of Hamburg
- **Field:** Optimizing and simulating complex systems
- **Languages:** of choice: Julia, Python and Rust
- **Interest:** Mathematical Modelling, Simulations, Machine Learning
- **Teaching:** Operations Research, Algorithms, and Programming
- **Contact:** vlcek@beyondsimulations.com

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> ℹ Note
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> I really appreciate active participation and interaction!

Course outline

- **Part I:** Introduction to Programming with Python
- **Part II:** Data Science Tools with Python
- **Part III:** Programming Projects

Participation

- Prequisite for course *Management Science* (Prof. Goel)
- Try actively participating in this course
- You will find it much (!) easier to follow Prof. Goel's course
- Materials will be provided in the KLU portal
- Slides are hosted at python.beyondsimulations.com

Teaching

- **Lecture:** Presentation of tools and concepts, based on examples
- **Tutorial:** Hands-on examples to be solved in groups
- **Difficulty:** Difficult at first, but gradually easier

Passing the course

- Pass/fail course
- 75% attendance required for passing the course
- 2 assignments and 1 little project
- You will be given programming exercises to solve with Python
- You can group up (3 students) and work together
- Each student group submits one solution together

Solution

- Provide a code solution to the problem (`.py` files)
- Code files need to be executable
- Detailed explanations of your code should be provided
- Use comments or docstrings in your code
- Provide a general (verbal) introduction to each problem

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> 💡 Tip
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> I'd encourage you to start and submit your solution early

Difficulty of the course

- We'll cover the basics of programming (in Python) at the beginning
- This is similar to learning a new foreign language
- First, you have to get used to the language and learn the first words
- Later, you'll be able to apply the language and see results
- Similar to learning a language: *Practice, practice, practice!*

What to expect

- Some **investment** in the beginning to see the **return** later
- You can ask questions and get support anytime
- After completing the course, you will be able to read code
- **and** write your own program using Python
- **That's quite something!**

Goals of the course

- Essential concepts and tools of modern programming
- Automated solutions for recurrent tasks
- Algorithm-based solutions of complex problems
- **Usage of AI** in a specific context

Python as language

- **Simple Syntax**: Python's syntax is straightforward and easy to learn
- **Versatility**: Used in web development, data analysis, artificial intelligence, and more
- **Community Support**: A large community of users and extensive documentation

Help from AI

- You are allowed to use AI (GitHub Copilot, ChatGPT, LLama3 ...)
- These new tools are really powerful for learning Python!
- They can help you a lot to get started with programming

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> ⚠ Warning
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> But you should *not* simply use them to *replace* your learning.

Why learn programming?

Analytics

Research

Visualization

Finance

Logistics

Photo by Choong Deng Xiang on Unsplash

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How to learn programming

My recommendation

1. **Be present**: Attend the lecture and participate
2. **Put in some work**: Repeat lecture notes and try examples yourself
3. **Do coding**: Run code examples on your own, play around, *google/find help*, modify, and solve problems on your own

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ℹ Note

Great resources to start are books and small challenges. In my opinion both are much more helpful than watching videos! You can find a list of book recommendations at the end of the lecture. Small challenges to solve can for example be found on Codewars.

Don’t give up!

- Programming is **problem solving**, don’t get **frustrated** too easily!
- Learn something new: Expect to **stretch** your comfort zone
- Collaborate with your colleagues and figure out solutions together

Learning path

- At first, the learning path can be quite steep!
- **First of all help each other!**
- Try to find help in lecture materials and books, the python documentation, and online (google, ChatGPT, StackOverflow.com)
- In case you get frustrated with programming, read the following helpful blog post about the challenges on medium.com

Setting up python

Install python

- You could download python from the official Python website
- **But** I would recommend we start by using Thonny
- It is an open source IDE that runs on Windows, Linux and Mac OS X
- It comes with a built-in python interpreter!

Thonny

- Install Thonny by following the instructions on the website
- Install and verify your installation by running the following in your terminal.

```
python --version
```

Your code

```
# This is a comment in Python
print("Hello, World!")
```