## Lecture X - Programming Projects

Programming with Python

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# **Quick Recap of the last Lecture**

### **General**

#### **Congratulations**

You've learned your first steps to program with Python! 

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#### **Structure**

- · Over the upcoming weeks you will work on a project
- · You will present it in the last week of this course
- · You can work in groups of up to 3 people
- · Choose from a list of ideas or propose your own idea!

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You have enough time to discuss different ideas in your group today. From my experience, it is a good idea to choose a project that you are **really interested in**.

#### **Presentation**

- Each group has 10 minutes for the presentation with 5 additional minutes for questions
- · Introduce your idea and the development cycle
- Provide code examples and/or visualizations
- · Comment on challenges and what you've learned

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Your project does not have to be perfect! To pass, you simply have to show that you tried your best. Try, fail potentially and learn - that's the best way to improve your coding skills.

### **Project Ideas**

#### Idea 1: Data Analysis and Visualization

- · Collect and clean a data of your choice
- · Use libraries like Pandas and Matplotlib for analysis
- · Create visualizations to communicate insights
- · Explore data storytelling techniques

#### Idea 2: Web Scraping and Data Collection

- · Identify target websites and data to collect
- · Use a library like BeautifulSoup
- Handle data storage and management
- · Visualize the collected data in a dashboard

#### **Idea 3: Machine Learning**

- · Choose a problem and dataset
- · Preprocess data and select features
- · Train models using libraries like scikit-learn or TensorFlow
- · Evaluate model performance and iterate

#### Idea 4: Web Dashboard Development

- · Design a complex dashboard as web application
- · Visualize some data or implement calculations
- · Make it interesting and interactive
- · Deploy the dashboard

#### **Idea 5: AI Chatbot Development**

- · Define chatbot purpose and scope
- Use prompt engineering to define chatbot behavior
- · Integrate it with an API of your choice
- · Deploy the chatbot in your terminal or as a web service

#### **Idea 6: Computer Vision and Image Processing**

- · Work with image or video datasets
- Explore real-time image processing applications
- · Use a library like supervision and YOLO

#### **Idea 7: Simulation**

- · Define the system or process to simulate
- · Model complex interactions and dynamics
- · Analyze simulation results and validate models
- · Visualize the results

#### **Idea 8: Game Development**

- · Design game mechanics and storylines
- · Use a library like Pygame to create the game
- · Test and refine gameplay for user experience

#### **Idea 9: Automation**

- · Define a task or process to automate
- Use a library like pyautogui to automate the task
- · Test and refine the automation for reliability

#### Idea 10: Other Ideas?

- · Have an idea that is not on the list?
- · Let me know and we can discuss it!
- · The best ideas often come from you!

## Help over the upcoming weeks

#### **Ask Questions**

- · In case you need help, you can always ask me!
- The next lectures are there to work on your project
- You can also write me an email at vlcek@beyondsimulations.com



I am always happy to help you with your project. There are no stupid questions!

#### Use of Al

- · Feel free to use AI to help you with your project
- · However, you should understand the code you use
- · I'd currently recommend to use VS Code as your IDE
- · If you want to try Al pair programming, use Cursor as IDE
- · It has Claude and ChatGPT integrated

# Discuss your ideas!

### How to continue?

#### How to continue after the presentations?

- The best way to continue learning is to keep programming in the future
- · Potentially, you will continue to do so during your studies
- · Coding in your Thesis is a another great way to improve
- Try to find a way to apply programming in your work
- · There are many interesting topics to explore!

#### **Advent of Code**

- Advent of Code is a fun way to keep programming
- · Here you can solve programming puzzles during Advent
- It is completely free and ad-free and starts at 01.12.

#### That's it for the Lecture Series!

- · We now have covered the basics of Python
- I hope you enjoyed the lecture and found it helpful
- If you have questions or feedback, please let me know!
- I wish you all the best for your studies and your career!

### Literature

#### **Interesting Books**

- Downey, A. B. (2024). Think Python: How to think like a computer scientist (Third edition). O'Reilly. Link to free online version
- Elter, S. (2021). Schrödinger programmiert Python: Das etwas andere Fachbuch (1. Auflage). Rheinwerk Verlag.

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For more interesting literature to learn more about Python, take a look at the literature list of this course.