

PROGRAMMING IN PYTHON II

Introduction



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Outline

1. Recap Python I
2. Outline Python II
3. Python II Project

RECAP PYTHON I



Recap Python I

- In Python I we have learned about programming and Python...

Recap Python I

- In Python I we have learned about programming and Python. . . a lot of it actually:

- ☐ Basics about hardware and datatypes
- ☐ Command line, Python Interpreter
- ☐ Usage of PyCharm Editor
- ☐ Python scripts
- ☐ Debugging
- ☐ Python syntax/style
- ☐ Floats, ints, strings, lists, dictionaries
- ☐ Conditions, loops, list comprehensions
- ☐ Exceptions
- ☐ ⋮

Recap Python I

⋮

- ☐ Functions
- ☐ Regular expressions
- ☐ Classes
- ☐ os/sys (Python as pseudo shell-script)
- ☐ Matplotlib/Pyplot (Plotting in Python)
- ☐ Numpy (efficient computation in Python)
- ☐ Multiprocessing (subprocesses in Python)
- ☐ Numba (compiling and speeding up Python programs)
- ☐ PyTorch (optimized programming for ML)

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...need a recap? Materials available here:

<https://github.com/widmi/programming-in-python>

OUTLINE PYTHON II



What awaits you in Python II?

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- A full-fledged Machine Learning project

What awaits you in Python II?

■ A full-fledged Machine Learning project

- ☐ Collection of data
- ☐ Setup of a project with git integration
- ☐ Analysis of the data
- ☐ Preprocessing of the data
- ☐ Loading of the data
- ☐ Implementation of the Neural Network (inference)
- ☐ Implementation of the Neural Network (training)
- ☐ Implementation of data augmentation
- ☐ Evaluation of performance

Goals of this course

- **Main goal:** You will be able to set up your own ML project
 - Implementation in Python and PyTorch
 - Usage of git to access resources on github
 - Fundamentals and pitfalls in data preparation
 - Fundamentals and pitfalls in design, training, and evaluation of a ML model
 - Knowledge about where theory and math comes in (we will keep it on the practical side!)
 - Practical tools and knowledge on how to implement a ML project

PYTHON II PROJECT



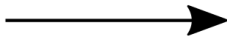
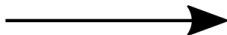
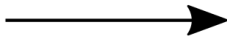
Python II Project: Goal

- Extrapolate image data



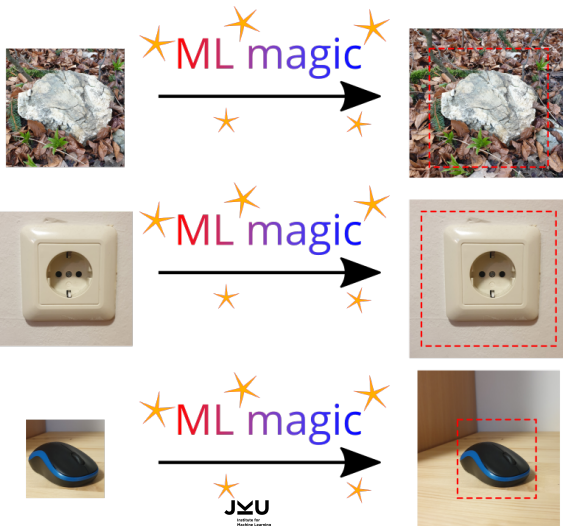
Python II Project: Goal

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Python II Project: Goal

- Extrapolate image data



Python II Project: Data

- We will create our own dataset
- JPG images up to 850kB
- 100 images per student
- We will crop out small images and pretend they are the original images
 - we do not need to collect labels!
- Evaluation on testset with different images
- We will perform analysis and preprocessing of the data

Python II Project: Hardware/Software and Methods

■ Hardware/Software

- ☐ Hardware is up to you (see introduction slides)
- ☐ Python 3.6 or higher (recommended: 3.7)
- ☐ PyTorch

■ Methods

- ☐ Simple **Convolutional Neural Network (CNN)**
- ☐ You may also use other NN types/more complex settings
- ☐ Design and fine-tuning is up to you

Python II Project: Evaluation

- We will have a challenge server where you can evaluate your model on testsets
- Testset will be private (you will not know the ground-truth)
- Leaderboard based on model score
- Model score determines achieved points

Python II Project

- More information during semester