PROGRAMMING IN PYTHON II

Introductory Information (Lecture + Exercise)

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Van Quoc Phuong Huynh (based on materials from Michael Widrich)
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Write mails only for personal questions
Institute ML Homepage

Important Note on Writing Mails

Due to the high number of students, it is imperative that you always include the following information if you write a mail to any of the lecturers:

- Full name, e.g., `Andreas Schörgenhumer`
- Matriculation number/ID, e.g., `01234567`
- ID number of the corresponding course/courses, e.g., `365.225`

RECAP PYTHON I

Recap Python I

- In Python I, we have learned about Python programming:
  - Command line, Python interpreter and PyCharm Editor
  - Python scripts
  - Python syntax/style
  - Data types
  - Control structures (conditions, loops)
  - Data structures
  - Functions
  - Modules
  - Exceptions
  - ⋮

Recap Python I

- In Python I, we have learned about Python programming:
  - ⋮
  - File handling
  - Basics on classes and some advanced topics
  - Argument parsing
  - Regular expressions
  - Subprocess handling and multiprocessing
  - Numerical computations with NumPy
  - Plotting with matplotlib

OUTLINE PYTHON II

What Awaits You in Python II?

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  - Preprocessing of the data

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  - Implementation of a Neural Network (inference)

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  - Evaluation of performance

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  - Implementation of a Neural Network (training)
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  - Evaluation of performance
- For the schedule, always check both KUSSS and Moodle.

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  - Fundamentals and pitfalls in design, training and evaluation of an 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 an ML project

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- Please use the Moodle lecture forum for any questions.

Lecture Grading

- Multiple-choice exam via Moodle (info):
  - Exam: **21.06.2023** (topics: entire lecture)
  - Optional retry exam: **27.09.2023** (topics: entire lecture)
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- Please use the Moodle exercise forum for any questions.
- If you have any questions regarding grading/feedback, send a mail to `python@ml.jku.at`.

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- Exceptions can be made in extraordinary situations (e.g., illness). If so, send a mail to the exercise lecturer.

Exercise Grading (1)

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- Once you submitted an assignment, you will be graded.

Grading VL + UE

Points	**Grade**
$\geq 87.5\%$	(1) Sehr Gut
$\geq 75\%$ and $< 87.5\%$	(2) Gut
$\geq 62.5\%$ and $< 75\%$	(3) Befriedigend
$\geq 50\%$ and $< 62.5\%$	(4) Genügend
$< 50\%$	(5) Nicht Genügend

Exercise Grading: Example 1

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
95	100	39	13	86	24	350	82

- Checking rules:

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  - **A)** ≥ 5 assignments with $\geq 25\%$ (A4 and A6 are below): ✓
  - **B)** Total assignment points are $707 \geq 50\%$:

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  - **C)** Exam points are $82 \geq 50\%$: ✓
- Calculating total points and grade:
  - Total assignment points + exam points are $707 + 82 = 789$

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  - **C)** Exam points are $82 \geq 50\%$: ✓
- Calculating total points and grade:
  - ☐ Total assignment points + exam points are $707 + 82 = 789$
  - ☐ If the bonus assignment was submitted, add it now
    - Example: 47 bonus points
    - Total points are $789 + 47 = 836$

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  - **B)** Total assignment points are $707 \geq 50\%$: ✓
  - **C)** Exam points are $82 \geq 50\%$: ✓
- Calculating total points and grade:
  - Total assignment points + exam points are $707 + 82 = 789$
  - If the bonus assignment was submitted, add it now
    - Example: 47 bonus points
    - Total points are $789 + 47 = 836$
  - Course percentage is $\frac{836}{1100} = 76\% \rightarrow$ (2) Gut

Exercise Grading: Example 2

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
0	100	100	13	100	100	99	100

- Checking rules:

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  - **A)** ≥ 5 assignments with $\geq 25\%$ (A1, A4 and A7 are below):

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A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
0	100	100	13	100	100	99	100

- Checking rules:
  - **A)** ≥ 5 assignments with $\geq 25\%$ (A1, A4 and A7 are below): X

Exercise Grading: Example 2

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
0	100	100	13	100	100	99	100

- Checking rules:
  - **A)** ≥ 5 assignments with $\geq 25\%$ (A1, A4 and A7 are below): X
  - **B)** Total assignment points are $512 \geq 50\%$:

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0	100	100	13	100	100	99	100

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  - **C)** Exam points are $100 \geq 50\%$: ✓
- Rule **A** not fulfilled $\rightarrow$ (5) Nicht Genügend

Exercise Grading: Example 3

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
100	100	100	100	100	100	400	49

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A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
100	100	100	100	100	100	400	49

- Checking rules:
  - **A)** ≥ 5 assignments with $\geq 25\%$: ✓

Exercise Grading: Example 3

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
100	100	100	100	100	100	400	49

- Checking rules:
  - **A)** ≥ 5 assignments with $\geq 25\%$: ✓
  - **B)** Total assignment points are $1000 \geq 50\%$:

Exercise Grading: Example 3

A1	A2	A3	A4	A5	A6	A7 (Project)	Exam
100	100	100	100	100	100	400	49

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- If we identify plagiarism (even in parts), this will immediately lead to a **negative grade for all participants**!
- This does not mean that you cannot discuss assignments with your friends and colleagues! On the contrary, we highly encourage such discussions and that you help each other, but please refrain from copying/sharing each others code – even with good intent.

Exercise Outline

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Thursday Group	Monday Group
04.05.2023	03.04.2023
18.05.2023	01.05.2023
08.06.2023	29.05.2023

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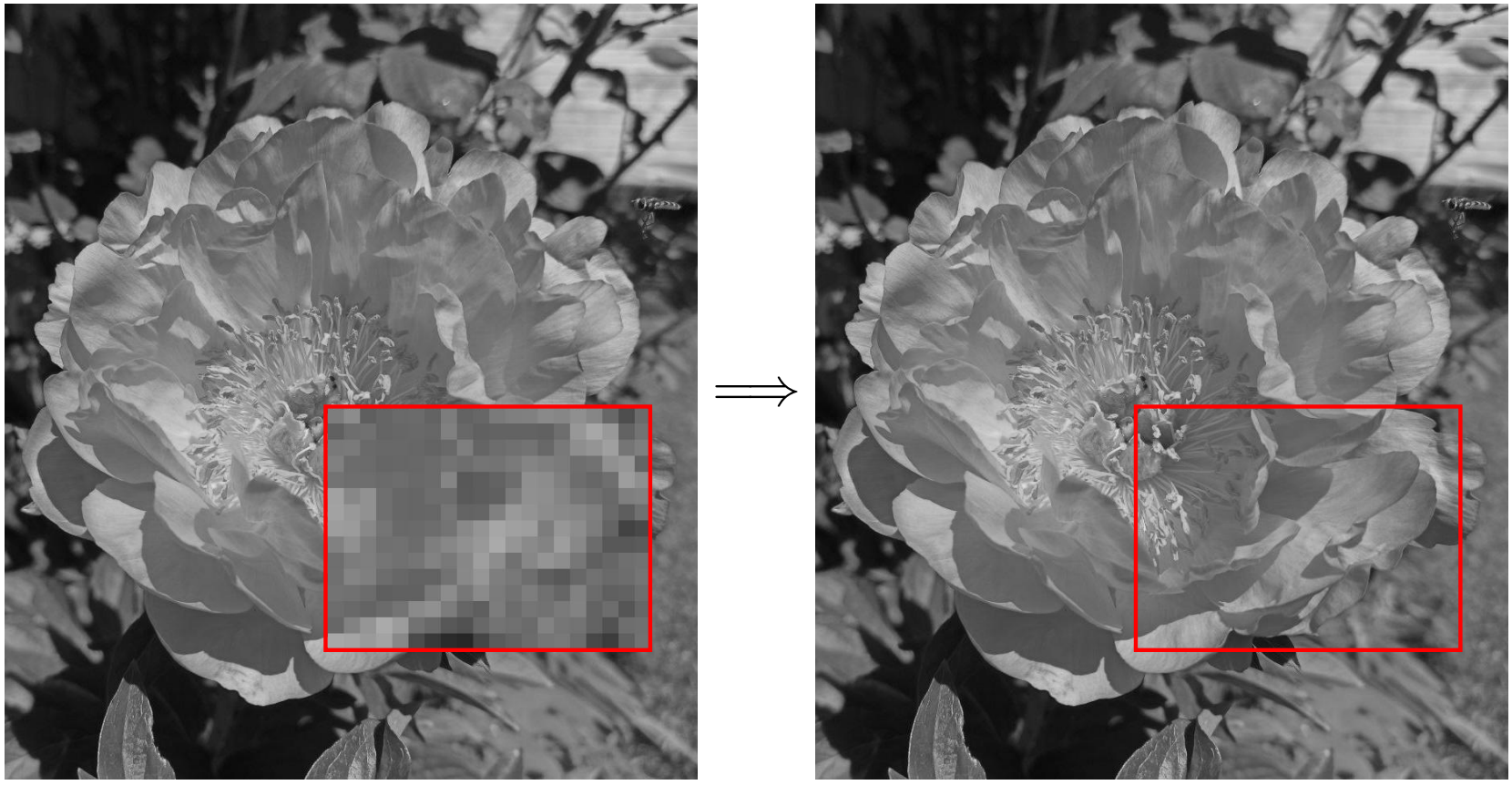
18.05.2023	01.05.2023
08.06.2023	29.05.2023

- In such cases, please **join a different group** of the same exercise week:
  - Thursday class does not take place: Join either a preceding Wednesday group or the following Monday group.
  - Monday class does not take place: Join either a preceding Wednesday group or a preceding Thursday group.

PYTHON II PROJECT

Python II Project: Image Depixelation



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- We will perform analysis and preprocessing of the data

Python II Project: Hardware, Software and Methods

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  - 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

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- More information during the semester