Deep Learning KU (DAT.C302UF) - Winter Semester 2025

Lecturer

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Teaching Assistants

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Course Date & Times

- The practicals will be held on **Wednesday @ 11:30 - 12:45 in HS i12**.
- **No mandatory presence**, except for the presentation session at the end of the semester.
- There will be **no recordings** of the session. Last year's recordings with similar content will stay available on TUbe.

Communication

1. If a question may be relevant for *all* students, please post it to **TeachCenter Forum**.
2. There will be time to ask in-person questions during our weekly sessions (usually at the end of the class).
3. In all other cases, contact me via email.

Content

The content that will be covered closely follows the lecture (Deep Learning VO, DAT.C301UF) and thus, it is *highly recommended* that you also attend this course. Still, it is possible to only take the practicals. In this course, we will mostly focus on the implementation of central Deep Learning concepts and models using `Python` and the `PyTorch` framework. We will also cover some pivotal mathematical underpinnings, which will be part of some pen & paper exercises.

We assume a basic familiarity with the `Python` programming language, as well as basic knowledge of Linear Algebra, Calculus, Probability Theory, and central Machine Learning concepts (cf. Machine Learning 1 VO/UE). Knowledge of packages like `numpy` and `matplotlib` is an advantage, but not strictly necessary.

Covered Topics

Topics might change slightly, but you can roughly expect the following contents.

Date	Covered Topics	Assignment Handout
22.10.2025	Organization, Ass1 Handout	Assignment 1 (Deadline 05.11)
22.10.2025 (extra)	Math Preliminaries	
29.10.2025	Intro to PyTorch, AutoDiff	
05.11.2025	Neural Nets in PyTorch	
12.11.2025	Optimization, Ass2 Handout	Assignment 2 (Deadline 03.12)
19.11.2025	Regularization	
26.11.2025	CNNs, ResNets	
03.12.2025	Transformers, Ass3 Handout	Assignment 3 (Deadline 14.01)
10.12.2025	Project Topic Presentation. Group/Topic Registration Deadline: 21.12	Project (Deadline 21.01)
17.12.2025	Diffusion Models, UNets	
07.01.2026	Q&A Projects, Ass3	
14.01.2026	Q&A Projects	
21.01.2026	**No Session**	
28.01.2026	Presentation Sessions (Slot Registration & Slide Upload Deadline: 27.01)	

Grading

There will be 3 assignments (worth 10 points, 25 points, and 25 points), and a final project (worth 40 points). Thus, there are 100 points in total. Assignment 1 is a **solo assignment** (i.e., work on it on your own). Assignment 2 and 3 can be done in groups of **at most 2 students** (you can *choose to work alone*, but preferably you should work in groups of 2). Teams can possibly be different for both assignments. Each submission of Assignment 2, Assignment 3 and the final course project must contain the **cover letter (found on TeachCenter) as the first page** (this indicates the group members).

The final project is a **mandatory group project** that will be worked on in groups of **3 or 4 people**. You can choose the topic of your project either from a list of predefined topics, or – even better – you can suggest your own Deep Learning project (reach out to us before the project registration deadline if you have a custom project).

In order to get a positive grade, you have to satisfy both the following conditions:

1. In total, you have achieved **50 points or more**.
2. You have received at least **10 points** on the final course project.

Note: If you **submit at least one assignment**, you will receive a grade at the end of the semester (even if you deregister yourself from the course).

If you fulfill both requirements to get a positive grade, we use the following lookup table to determine your final grade:

Points	Grade
≥ 87.5	1
$\in [75, 87.5)$	2
$\in [62.5, 75)$	3
$\in [50, 62.5)$	4
< 50	5

Assignments and Course Project

For each assignment, **exactly one team member** submits the solutions via TeachCenter. No other form of submission (e.g., email) will be accepted. When we have finished grading an assignment, you will see the corresponding feedback in TeachCenter. If the grading is unclear, **please send an email to the responsible teaching assistant(s)** (as noted on the Assignment sheet).

Note: All deadlines are **strict**, i.e. submission after the deadline will not be possible (which implies 0 points on the missed assignment). **All deadlines are at 23:59** (unless specified otherwise).

Assignment 1 [10 Points]

- **Content**: Maximum Likelihood Estimation
- **Handout**: 22.10.2025
- **Deadline**: 05.11.2025

Assignment 2 [25 Points]

- **Content**: Training Neural Networks
- **Handout**: 12.11.2025
- **Deadline**: 03.12.2025

Assignment 3 [25 Points]

- **Content**: Language Modeling with Transformers
- **Handout**: 03.12.2025
- **Deadline**: 14.01.2026

Course Project [40 Points]

- **Content**: Pick a topic from a list (to be announced), or suggest your own
- **Info**: Group and Topic Registration Deadline: 21.12.2025. Multiple presentation sessions will be between 27.01.2026 - 29.01.2026.
- **Handout**: 10.12.2025
- **Deadline**: 21.01.2026

Assignment Interviews

After the deadline of each of the 3 assignments, we will invite a (semi-)random set of groups to brief (i.e., 15 minutes) **assignment interviews**. The goal is to check if every group member *understands* the submitted solution of this particular assignment. Point deductions of up to 100% are possible.

Plagiarism

Do not share solutions between groups. We **automatically check the submitted solutions** for plagiarism. If we find parts that were plagiarised, *all* involved groups will receive 0 points on the respective exercises. If a group member is involved in a plagiarism strike *twice*, the participant will receive the grade “Ungültig aufgrund von Täuschung”.

Large Language Models

Do not use Large Language Models (LLMs) to generate solutions (code and/or report). That includes, but is not limited to, *ChatGPT*, *GitHub Copilot*, *Jetbrains AI* etc. These tools might output the same (or very similar) code for different teams, which would be problematic in our plagiarism checks. Also, the value of this course is mostly in *coming up with solutions to the problems on your own*.