

Hands-on Deep Learning for Computer Vision and Biomedicine

Practical Course
Summer Semester 2020

Vladimir Golkov
Prof. Dr. Daniel Cremers

These slides will be available on the course website

Learning Goals

- Theory & Practice:
 - Basics and advanced techniques
- Practical experience in deep learning **craftsmanship**
 - **Understand real open problems**
 - **Create methods, solutions, insights, systematizations, publications**
 - Creating things is crucial for profound understanding of existing things
- The projects are geared towards producing scientific publications
- Topics include biomedicine, computer vision, etc.
- Presentation skills

Prerequisites

- Good programming skills
 - Python
 - Array programming in NumPy (or Matlab or similar)
 - PyTorch (or TensorFlow or similar)
- Curiosity
- Passion for mathematics
- Time for regular hard work
- Proactivity, soft skills
 - Project success depends on a two-way communication between the students and supervisors
 - If you expect to just passively receive detailed instructions and directions rather than also establishing communication and asking questions, then this practical course is not for you
- Knowledge of deep learning
- Knowledge of biomedicine is not required
 - You will learn from your supervisor if you choose a biomedical project

Structure of Practical Course

- Three lectures in the beginning of the semester (Tuesday 2-4pm)
- Practical project
 - Students get matched to projects based on their preferences
 - Each project consists of a “pool” of tasks
 - *Requirements elicitation* and agreeing upon solutions
 - Usually 1 or 2 students per task
 - Access to computers and GPUs in Garching and remotely
 - Deep learning requires early and regular efforts
 - Regular communication with supervisors (important for progress of learning and project success)
 - Final presentations
 - Presentation dates chosen based on your wishes & availability

Next Steps

- **7-12 February: Apply for a place at <https://matching.in.tum.de/>**
- There are many applicants
- Sending info about yourself to dlpractice@vision.in.tum.de is crucial
- Email us info **until 15 February:**
 - Your interests, learning goals
 - Short description of your knowledge and programming skills
 - Some code you wrote in any context
 - All grade transcripts
 - Ongoing courses
- If you require project info in advance, contact us
- If you want to propose own projects ideas, they should be discussed with us until **15 February**
- Places in the course will be assigned on **20 February**

After **20 February**

- Projects will be announced and assigned (based on your preferences) as soon as possible
 - Read project descriptions very carefully, ask as soon as possible whenever something is unclear, select projects wisely
 - Follow the recommendations that will be announced

Other Options

- If you don't get a place in the practical course:
 - Email us, enter the waiting list
 - Apply in subsequent semesters
- Whether you get a place or not, also consider applying for:
 - Bachelor Thesis
 - Master Thesis
 - Interdisciplinary Project
 - Guided Research
 - etc.

Literature

- <http://www.deeplearningbook.org/>
- <http://www.mlyearning.org/>
- NumPy: Advanced Array Indexing
<https://docs.scipy.org/doc/numpy/reference/arrays.indexing.html>
- Christopher M. Bishop: “Pattern Recognition and Machine Learning”, Springer, 2006. (Skim the Chapters 1, 2, 5.)