

# Hands-on Deep Learning for Computer Vision and Biomedicine

Practical Course  
Winter Semester 2020/2021

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 (date tba)
- 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

- **16-21 July: Apply for a place at <https://matching.in.tum.de/>**
- There are many applicants
- Sending info about yourself to [dlpractice@vision.in.tum.de](mailto:dlpractice@vision.in.tum.de) is crucial
- Email us info **until 23 July**:
  - 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 **23 July**
- Places in the course will be assigned on **30 July**

## After 30 July

- 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.)