Hands-on Deep Learning for Computer Vision and Biomedicine

Practical Course
Winter Semester 2020/2021

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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/](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 **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.)