Hands-on Deep Learning for Computer Vision and Biomedicine

Practical Course
Summer Semester 2020

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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, systematisations, 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/](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.)