Hands-on Deep Learning for Computer Vision and Biomedicine

Practical Course
Summer Term 2017

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Learning Goals

• **Basics** of machine learning and deep learning
• Convolutional neural networks
• Recurrent neural networks
• Tasks beyond supervised learning
• Deep learning **craftsmanship**
  – Understanding real data and practical problems
  – Design of architectures, choice of loss functions
  – Tuning of hyperparameters
  – Training procedures
  – Evaluating and understanding results
• Practical project experience with real-world open problems
  – The projects are geared towards scientific publications
• Presentation skills
Structure of Practical Course

- Three lectures in the beginning of the semester
  - Dates will be chosen to fit students’ schedules
- Practical project
  - Own project for each group
  - Two students per group
  - Most projects: Python, NumPy
  - Deep learning requires early and regular attention
  - Regular discussions with supervisors (important for learning progress and project success)
- Final presentations
  - Introduction, Methods, Results, Conclusions
  - Probably 20min presentation + 10min Q&A
  - Groups can learn from each other and discuss
  - Presentation dates will be determined by voting (end of semester)
Next Steps

• Apply for a place at https://matching.in.tum.de/
• There are many applicants
• Additional info about yourself helps us for two reasons:
  – Matching
  – Assignment of projects with appropriate difficulty
• Feel free to email us until February 12:
  – Your programming skills
  – Your interests
• If you want to propose own projects ideas, they should be discussed with us until February 13
• Places in the course will be assigned on February 15
After February 15

• If you get a place in matching system, you have two options:
  – Either form a group of two and submit project preferences together
  – Or submit your individual project preferences and we assign you a partner
• Projects will be announced, discussed and assigned as soon as possible
• Example of project preferences that a student or group sends us:
  1. Project “C” (most preferred)
  2. Project “T” or “U”
  3. Project “A”
  4. Project “G”
• We will consider your preferences, and also our knowledge about which of your preferred projects match your programming skills

• If you don’t get a place:
  – Enter the waiting list
  – Email us
  – Apply in subsequent semesters
  – Also consider applying for interdisciplinary project, guided research, thesis
Prerequisites

- Good programming skills
  - Python
  - Array programming in NumPy (or Matlab or similar)
- Curiosity
- Time for regular hard work
Literature

• http://www.deeplearningbook.org/
• http://neuralnetworksanddeeplearning.com/
• NumPy: Advanced Array Indexing
  https://docs.scipy.org/doc/numpy/reference/arrays.indexing.html
FAQ – Answers

- You will get access to appropriate computers and GPUs
  - in Garching and remotely
- Registration on matching.in.tum.de is crucial
- Sending us info is extremely beneficial
- If you require project details in advance, feel free to contact us
- Prior knowledge (deep learning, computer vision, biomedicine) is not required
  - You will learn from your supervisors
- But good programming skills are important to be able to do deep learning