Basics

Introduction and Course Outline

Learning goals

- Understand the scope of the course
- Answers to all open question
- Get an impression of the workload

PEOPLE

Lecturers and tutors:

- Prof. Dr. Hinrich Schütze (weeks 9-13)
- Prof. Dr. Christian Heumann (weeks 1, 2, 8)
- Dr. Matthias Aßenmacher (weeks 3-7)
- Dr. Yihong Liu (exercise sessions)
- Adrian Mülthaler (exercise correction)

Time:

- Lecture: Wednesday, 10.00 - 12.00
- Exercise: Friday, 10.00 - 12.00
- Tutoring: Wednesday, 13.00 - 15.00

STRUCTURE OF THE COURSE

Central building blocks of the lecture

- Basic concepts (2 weeks)
- Transformer in-depth (1 week)
- BERT (1 week)
- BERTology, BERT's successors and distillation (1 week)
- Other encoder models & T5 (1 week)
- GPT series (1 week)
- Decoding Strategies (1 week)
- Prompting (1 week)
- Generative LLMs & RLHF (2 weeks)
- Math behind training LLMs (1 week)
- Multilinguality (1 week)

STRUCTURE OF THE EXERCISE

Assignments:

- Training RNNs (week 2 – 3)
- Transformer (week 4 – 5)
- Fine-tuning BERT & T5 (week 6 – 7)
- Inner workings & Decoding (week 8 – 9)
- LLama-2 & Prompting (week 10 – 11)

STRUCTURE OF THE EXERCISE

Central other building blocks of the exercise:

- Python essentials & PyTorch logic (week 1)
- (public holiday in week 3)
- Debugging (week 5)
- Huggingface universe (week 7)
- Prompting (week 9)

PREREQUISITES

Machine learning basics:

- A proper understanding of
  - linear algebra
  - loss functions
  - regularization
  - classification vs. regression
  - backpropagation and gradient descent
  - simple neural networks (MLPs)
- Great resource: *I2ML course*

MANAGING EXPECTIONS

What to expect

- A solid and proper understanding of
  - the central concepts and models of contemporary NLP
  - the capabilities and limitations of different models
- Challenging exercises that deepen your unterstanding, i.e.
  - you will have to invest quite some time in trying to solve them
  - just checking our solutions won't get you far
- An (inter)actively taught course with motivated lecturers, i.e.
  - we expect you to actively participate in the lecture and ask questions
  - you won't get much out of this course by just enrolling and not showing up

MANAGING EXPECTIONS

What not to expect

- A prompt engineering course
- Riding the hypetrain
- Only the latest state-of-the-art LLMs (you also need to know the relevant basics to understand what is going on)
- Low workload and easy exercises (you will only learn this thoroughly be investing some time)

MANAGING EXPECTIONS

Honesty

- No intention to overload you with (unnecessary) work
- Building up proper skills requires **time investment**
- Coding assignments freshly created, we put a lot of work into creating creative and helpful content for you to acquire necessary skills to succeed in this field
- Up-front communication of what is going to be required

MANAGING EXPECTIONS

Workload

- This is a 6 ECTS course
- 1 ECTS := 30h (i.e. this course = 180h)
- 13 weeks $\times$ 4h presence $\approx$ 52h
- 130h for preparation, self-study, **working on assignments**
- 130h / 14 weeks = **9h / week** (*additionally to in-class time*)

Any Questions?