

# The ABC of Computational Text Analysis

#1 INTRODUCTION +  
WHERE IS THE DIGITAL REVOLUTION?

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# Outline

1. digital revolution or hype?
2. about us
3. goals of this course

# AI: A non-standard introduction

# The world has changed, hasn't it?



# The era of AI: Big data, big government, big business

... and big empowerment

# Group discussion

What makes a device looking intelligent?

AI is a moving target with respect to ...

- human capabilities
- technological abilities

# Transfer of human intelligence



## from static machines to more flexible devices

- mimicking intelligent behavior
  - perception: reading + seeing + hearing
  - generation: speaking + writing + drawing
  - moving in the physical world
- flexibility and contextual adaptability
- reproducing any media form

# Seeing like a human?



An image segmentation by Facebook's [Detectron2](#) (Wu et al. 2019)

# Hearing and speaking like a human?

- Speech-to-Text 
  - robust understanding complex environments (e.g. language, accent, noise) (Radford et al. 2022)
- Text-to-Speech 
  - respect emotions beyond correct pronunciation
  - [clone your voice](#)
- Speech-to-Speech 
  - [speech translation](#) (Duquenne et al. 2023)

# Simulating (multiple) humans?

## Beyond linear conversations

- Generate interactive podcasts based on any text
- Generate songs following instructions



# Outsmarting humans?

# Debunk some myths around ChatGPT

- is a brand, **large-language models (LLM)** is the technology
- generates fluent text, **not necessarily truthful**
- is highly **useful**, although it understands little
- what is tough for humans **might be easy for a model**; and vice-versa
- is **English**-focused, multi-linguality is limited
- generates **non-reproducible** outputs
- generated text **cannot be detected** (except verbatim parts)
- yesterday's **version** might be different from today's
- **open-source** is chasing OpenAI and the other Silicon Valley giants

# Where does the smartness come from?

## Number of words exposed

- ~100'000'000 for a typical 13-year old kid (Timiryasov and Tastet 2023)
- ~4'300'000'000 words in entire Wikipedia
- >15'000'000'000'000 for current LLMs 🤦 (Grattafiori et al. 2024)

An LLM is amazing but ...

... it is also a stochastic parrot. 

(Bender et al. 2021)

# The LLM apocalypse

A post-apocalyptic take on education (Mollick 2023)

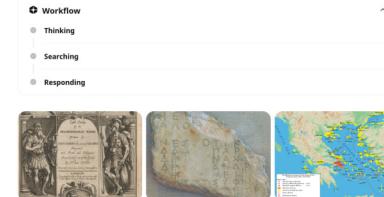
- chat bots are another tool like Google Search
- chat bots are your personal tutor
  - productivity tool to become faster and better
  - helping you to think, not replacing thinking
  - don't trust blindly
  - be transparent

LLMs are a tool, learn how to use it 

# The future of search

- chat bots challenge search engines
  - combine search and generation
  - generate direct answers with source attribution instead of text snippets
- Microsoft Copilot, Google Gemini, [you.com](#)
- agents pursuing more complex tasks
  - chat bots are an interface rather than a single model

explain the background, action, and consequences of the peloponnesian war



## Background of the Peloponnesian War

The Peloponnesian War (431–404 BC) was a significant conflict between two of the most powerful city-states in ancient Greece: **Athens** and **Sparta**, along with their respective allies. The roots of the war can be traced back to the **Penteconia**, a period of tension following the Persian Wars, during which Athens emerged as a dominant naval power and began to expand its influence through the Delian League. This expansion fostered fear and resentment among other Greek city-states, particularly Sparta and its allies, who viewed Athenian imperialism as a direct threat to their autonomy and security.

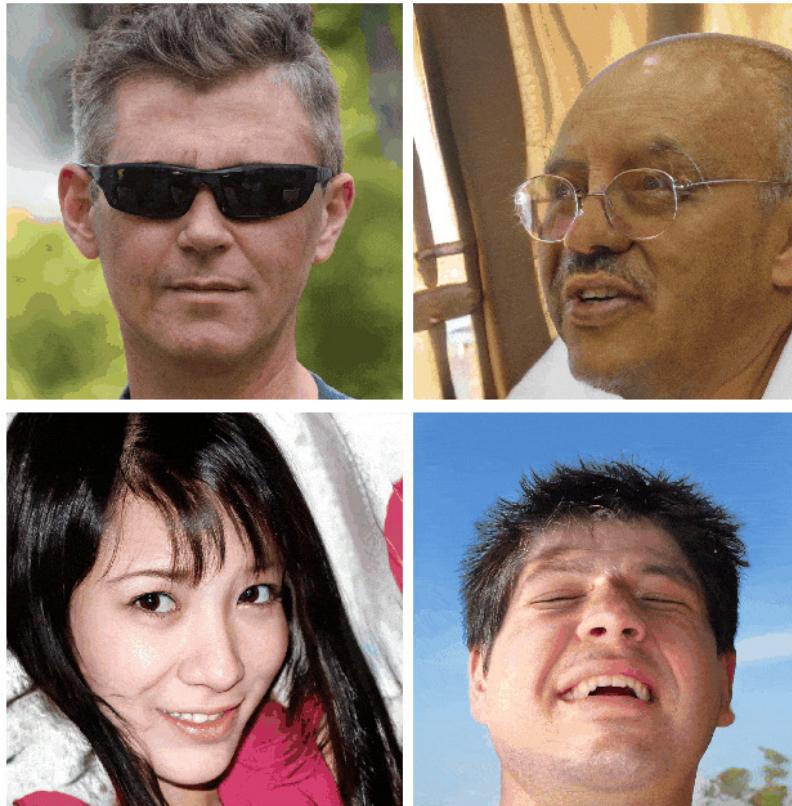
The immediate causes of the war included disputes over trade and alliances, as well as the growing power of Athens, which was perceived as aggressive and expansionist. Tensions escalated when Athens refused to dismantle its defensive walls, which had been a point of contention for Sparta. The conflict was characterized by a struggle for power and dominance in the Greek world, leading to a series of military engagements that would last nearly three decades.

*More complex query on [you.com](#)*

# Trends towards generative and multimodal AI

# These people do not exist

**Generated Images by a neural network** (Karras et al. 2020)



*Faces generated by [StyleGAN](#). Generate [more faces!](#)!*

# Multimodality and guidance

## Guided generation of text, audio, images, video

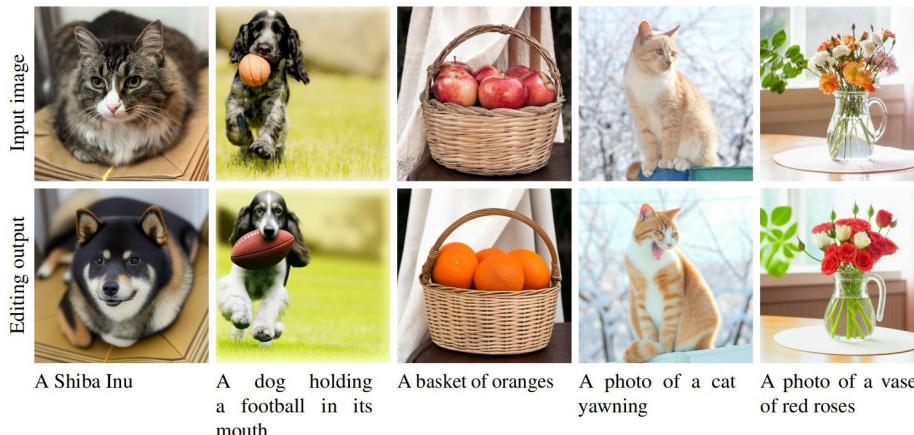
Prompt: Elephant amigurumi walking in savanna, a professional photograph, blurry background



*State-of-the-Art image generation model Imagen3. (Imagen-Team-Google et al. 2024)*  
*Use on Gemini platform.*

# Adapt images using text prompts

- **Generate** (Imagen-Team-Google et al. 2024)
- **Edit** (Sheynin et al. 2023)  
e.g. virtual try-on of clothes
- **Enhancing**
- **Explain**



*Editing pictures with Muse using natural language* (Chang et al. 2023)

# Erase or edit reality

For your Instagram or fake politics



*Modify pictures thoroughly in [Google Photos](#)*

# From image to video generation



## Synthesize any content with ever increasing quality

- use words and images to synthesize videos (Bar-Tal et al. 2024; Brooks et al. 2024)  
Veo 2 constitutes the current research frontier
- real-world dubbing for movies



Performance Google Veo 2 vs OpenAI Sora (end vs start 2024)

## Real-time, multimodal interaction

Fusing the digital and the physical world   

Interact with Google's [Gemini](#) using text, voice, video, or screen sharing

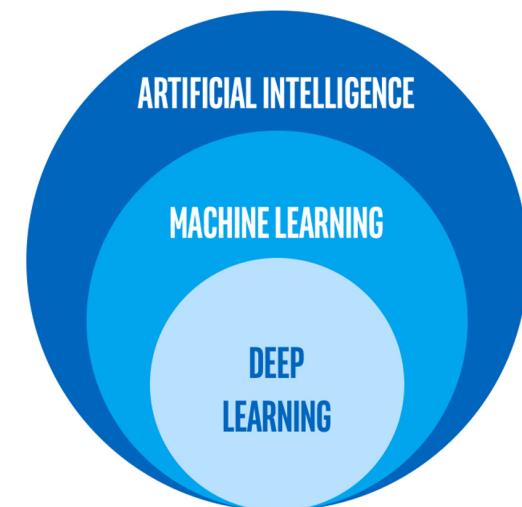
# Artificial Intelligence (AI)

## (Converging) Subfields

- Natural Language Processing (NLP)
- Computer Vision (CV)
- Robotics 

# How does computer intelligence work?

- concepts with overlapping meaning
  - Artificial Intelligence (AI), Machine Learning (ML), **Deep Learning** (DL)
- learn **patterns** from lots of data
  - more recycling than genuine intelligence
  - theory agnostically
- supervised **training** is the most popular
  - learn relation between input and output



AI is different from  
Human Intelligence



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AI is also hype 

```
AI = from humankind import solution
```

# Looking beyond the technology

## trends in AI

- **smarter:** ever more powerful
- **cheaper:** intelligence is getting commoditized
- **democratized (?)**: open vs closed models
- **competitive:** geopolitical rivalry
- **unecological:** raising ecological costs

Jevons Paradox: increased efficiency offset by increased demand (Luccioni, Strubell, and Crawford 2025)

# Why this matters for Social Science

# Computational Social Science

## data-driven research

- computational social science (Lazer et al. 2009, 2021; Salganik 2017)  
Digital Humanities, Computational History, Data Science
- new, interdisciplinary approaches to long-standing questions
- machine learning empowers researchers (Lundberg, Brand, and Jeon 2022)
- early computational history already in 1960s (Graham, Milligan, and Weingart 2015)

# Group discussion

What kind of data is there?

What data is relevant for social science?

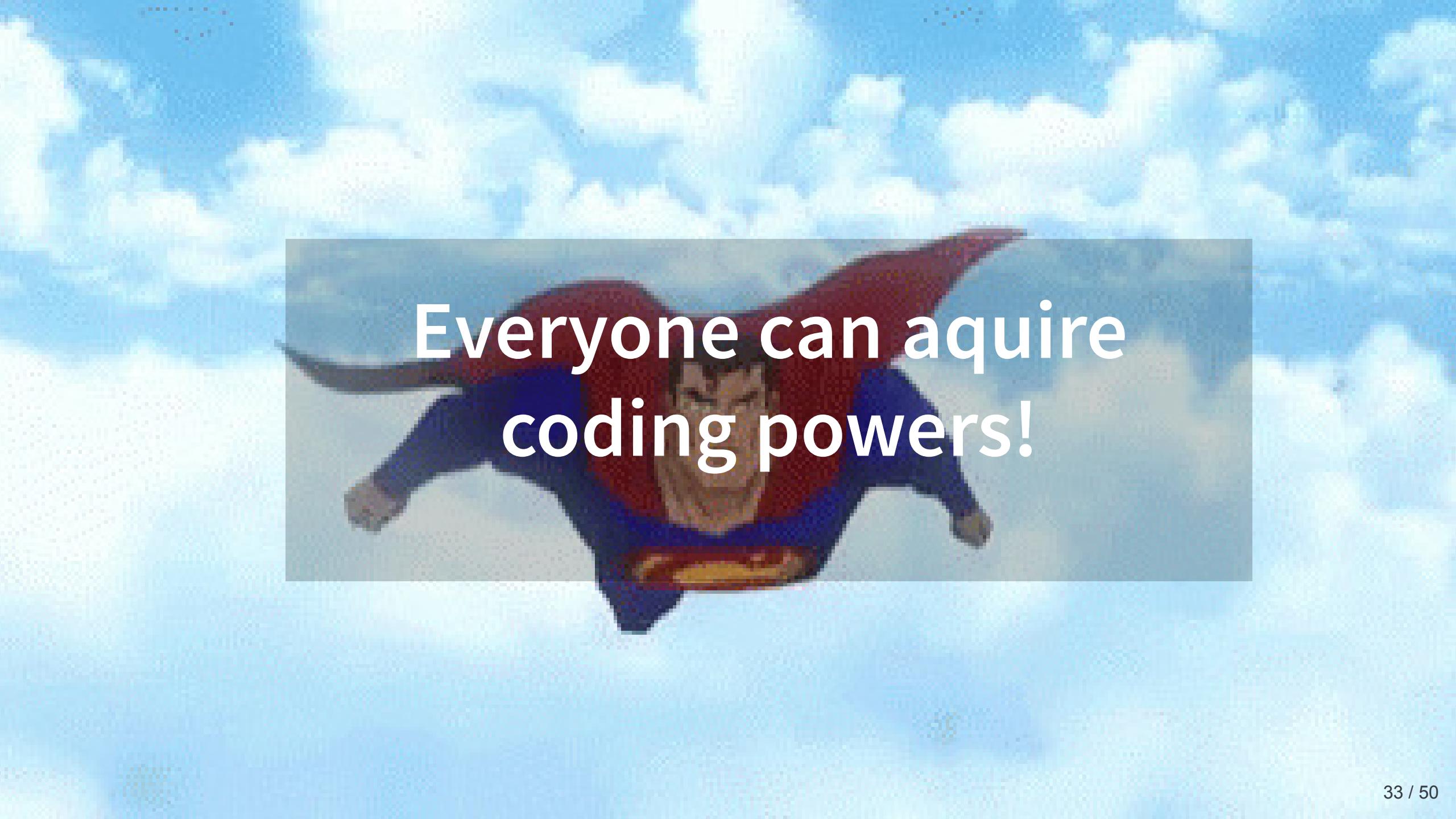
- data as traces of social behaviour
  - tabular, text, image
- datafication
  - sensors of smartphone, digital communication
- much of human knowledge compiled as text

# About the mystery of coding

coding is like...

- cooking with recipes
- superpowers

... to tackle complex problems on scale 

A superhero with a red cape and a blue suit is flying through a cloudy sky. The superhero is positioned in the center of the frame, moving from left to right. The background consists of white clouds against a blue sky.

Everyone can acquire  
coding powers!

# About us

# Personal example

directed country mentions in UN speeches



# Goals of this course



# What you learn

- collect and curate **data**
- **computationally analyze**, interpret, and visualize **texts**
- **digital literacy** + scholarship
- problem-**solving** capacity

# Learnings from previous courses

- too much content, too little **practice**
- programming can be overwhelming
- **learning by doing**, doing by **googling (ChatGPT?!)**

# Levels of proficiency

1. **awareness** of today's computational potential
2. **analyzing** existing datasets
3. **creating** + analyzing new datasets
4. applying advanced **machine learning**

# How I teach

- computational **practice**
- **critical perspective** on technology
- lecture-style introductions
- hands-on coding sessions
- discussions + experiments in groups

# Provisional schedule

Date	Topic
20 February 2025	Introduction + Where is the digital revolution?
27 February 2025	<i>no lecture (Fasnacht)</i>
06 March 2025	Text as Data
13 March 2025	Setting up your Development Environment
20 March 2025	Introduction to the Command-line
27 March 2025	Basic NLP with Command-line
03 April 2025	Introduction to Python in VS Code
10 April 2025	Working with (your own) Data
17 April 2025	Data Analysis of Swiss Media
24 April 2025	<i>no lecture (Osterpause)</i>
01 May 2025	Ethics and the Evolution of NLP
08 May 2025	NLP with Python
15 May 2025	NLP with Python II + Working Session
22 May 2025	Mini-Project Presentations + Discussion
29 May 2025	<i>no lecture (Christi Himmelfahrt)</i>

TL;DR 

You will be tech-savvy...  
...yet no programmer applying fancy machine learning

# Requirements

- no technical skills required 
- self-contained course
- laptop (macOS, Win11, Linux) 
- update system
- free up at least 15GB storage
- backup files

# Grading



- 2 assignments during semester
  - no grades (pass/fail)
- mini-project with presentation
  - data of your interest
  - backup claims with numbers
  - work in teams
- optional: writing a seminar paper
  - in cooperation with Prof. Sophie Mützel

# Organization

- seminar on Thursday from 2.15pm - 4.00pm
  - additionally, streaming via Zoom
- course website [KED2025](#) with slides + information
- readings on [OLAT](#)
- communication on [OLAT Forum](#)
  - forum for everything except personal
  - subscribe to notifications
  - direct: [alex.flueckiger@doz.unilu.ch](mailto:alex.flueckiger@doz.unilu.ch)

# Registration via UniPortal



Registration period: 3 February – 9 March 2025



# Assignment #1



- get/submit via OLAT
  - starting tonight
  - deadline: 28 February 2025, 23:59
- discuss issues on OLAT forum

# Course website





Questions?

# References

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Lazer, David, Eszter Hargittai, Deen Freelon, Sandra Gonzalez-Bailon, Kevin Munger, Katherine O’Gormanova.