UNIVERSITY OF
LUCERNE

The ABC of Computational Text Analysis

#7 Working with (your own) Data

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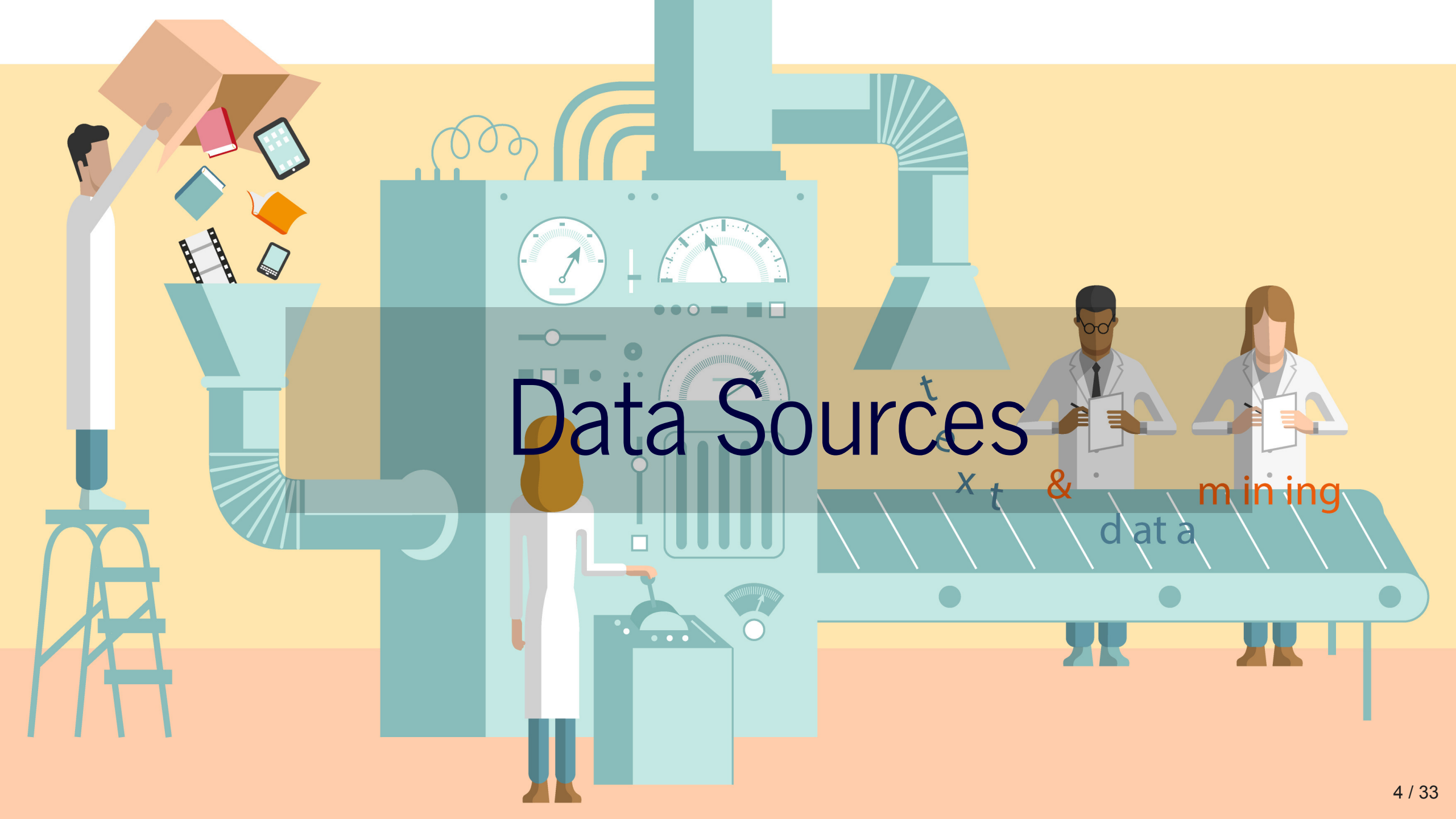
Recap last Lecture

- describe text as pattern using RegEx
- extract + replace textual parts 🧩
  - literal: `text a b c`
  - meta: `\w \s [^abc] *`
  - power of `.*`
- questions regarding assignment 2

Outline

- learn about available data sources
- Build and justify (!) your own dataset
  - any text ✅
  - “any” format ✅
  - from anywhere ✅


Data Sources
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What Data Sources are there?

- broadly social
  - newspapers + magazines
  - websites + social media
  - reports by NGOs/GOs
- scientific articles
- economic
  - business plans/reports
  - contracts
  - patents

👉 basically, any textual documents…

Some great (historical) Corpora

Ready off-the-shelf, machine-readable

- 1 August speeches by Swiss Federal Councilors

  provided via course repo
- Human Rights Reports by various NGOs
- United Nations General Debate Corpus

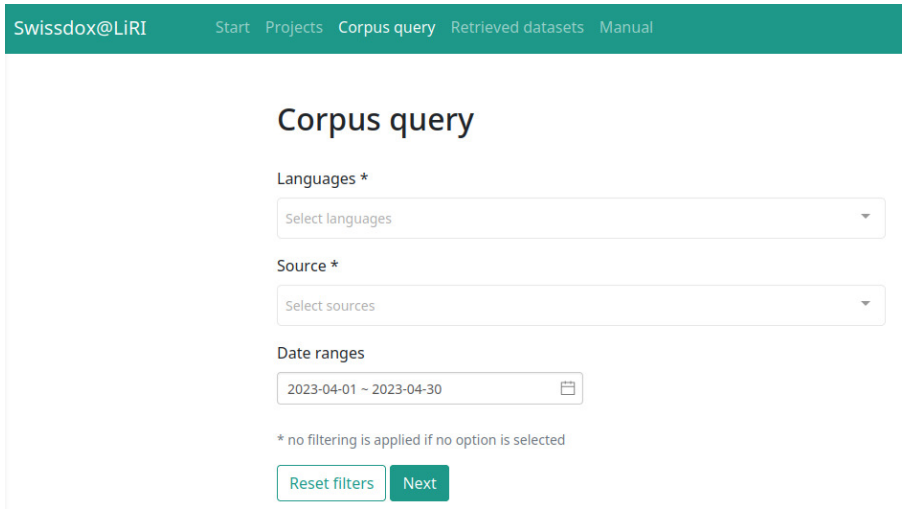
...

😓 There are still not many.

Swissdox: A game changer

Assemble corpus and export as `.csv`

- over 250 Swiss newspapers
- historical and updated daily
- needs registration



More Interesting Publishers

- Nexis Uni

  international newspaper, business + legal reports

  licensed by the university

- Constellate

  scientific articles of JSTOR across disciplines

  provides an easy dataset builder

- Project Gutenberg and HathiTrust

  massive collection of books

  open, HathiTrust requires agreement

👉 check out other resources licensed by ZHB

Search existing Datasets

- Harvard Dataverse

  open scientific data repository

- Google Dataset Search

  Google for datasets basically

👉 search for a topic followed by `corpus`, `text collection` or `text as data`

Online Computational Text Analysis

- Google Ngram Viewer
  - no filtering option
  - useful for quick analysis
- bookworm HathiTrust
  - great filtering by metadata
  - credible scientific source
- Impresso
  - many historical newspapers + magazines (CH, LU)
  - free, requires account

Search Techniques 🔍

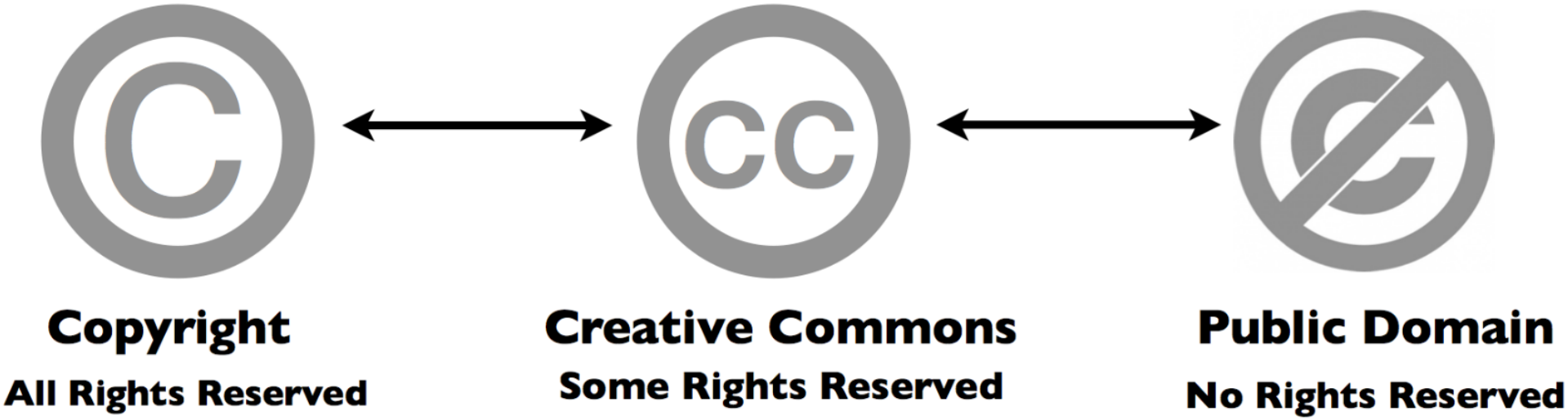
Make your web search more efficient by using dedicated tags. Examples:

- `"computational social science"`
- `site:nytimes.com`
- `nature OR environment`

Data is Property 🚫

... and has rights too

- copyright may further limit access to high quality data
- check the rights before processing data



Preparing your own Data

A world for humans ... ... and a jungle of file formats.

Common Conversions

news, press releases, reports from organizations

⬇️

digital native documents

`.pdf`, `.docx`, `.html`

⬇️

convert to `.txt`

⬇️

scans of (old) documents

`.pdf`, `.jpg`, `.png`

⬇️

Optical Character Recognition (OCR)

machine-readable ✅

Conversion of DOCX

Use case: news articles from Nexis

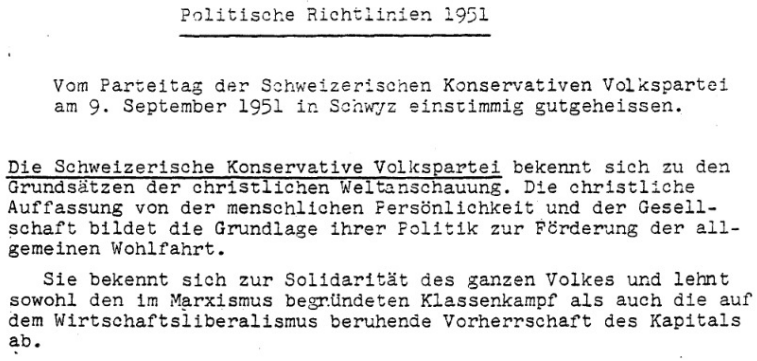
- `pandoc` to convert many file formats
- download as single articles in `.docx` on Nexis

```
# convert docx to txt
pandoc infile.docx -o outfile.txt

### Install first with
brew install pandoc     # macOS
sudo apt install pandoc # Ubuntu
```

PDF: Digitalized or Digital?

Two flavours of PDF documents



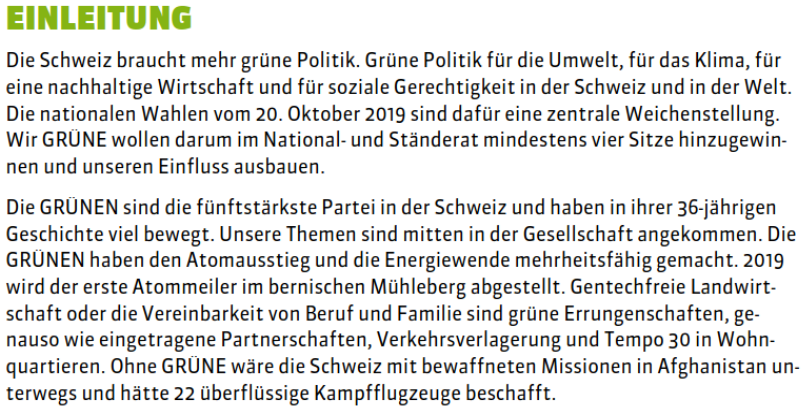
Politische Richtlinien 1951

Vom Parteitag der Schweizerischen Konservativen Volkspartei am 9. September 1951 in Schwyz einstimmig gutgeheissen.

Die Schweizerische Konservative Volkspartei bekennt sich zu den Grundsätzen der christlichen Weltanschauung. Die christliche Auffassung von der menschlichen Persönlichkeit und der Gesellschaft bildet die Grundlage ihrer Politik zur Förderung der allgemeinen Wohlfahrt.

Sie bekennt sich zur Solidarität des ganzen Volkes und lehnt sowohl den im Marxismus begründeten Klassenkampf als auch die auf dem Wirtschaftsliberalismus beruhende Vorherrschaft des Kapitals ab.

Digitalized PDF made from a scanned page



EINLEITUNG

Die Schweiz braucht mehr grüne Politik. Grüne Politik für die Umwelt, für das Klima, für eine nachhaltige Wirtschaft und für soziale Gerechtigkeit in der Schweiz und in der Welt. Die nationalen Wahlen vom 20. Oktober 2019 sind dafür eine zentrale Weichenstellung. Wir GRÜNE wollen darum im National- und Ständerat mindestens vier Sitze hinzugewinnen und unseren Einfluss ausbauen.

Die GRÜNEN sind die fünftstärkste Partei in der Schweiz und haben in ihrer 36-jährigen Geschichte viel bewegt. Unsere Themen sind mitten in der Gesellschaft angekommen. Die GRÜNEN haben den Atomausstieg und die Energiewende mehrheitsfähig gemacht. 2019 wird der erste Atommeiler im bernischen Mühleberg abgestellt. Gentechfreie Landwirtschaft oder die Vereinbarkeit von Beruf und Familie sind grüne Errungenschaften, genauso wie eingetragene Partnerschaften, Verkehrsverlagerung und Tempo 30 in Wohnquartieren. Ohne GRÜNE wäre die Schweiz mit bewaffneten Missionen in Afghanistan unterwegs und hätte 22 überflüssige Kampfflugzeuge beschafft.

Native PDF converted from digital document (e.g., docx)

Conversion of native PDF

Use case: Swiss party programmes

- `pdftotext` extracts text from non-scanned PDF

```
# convert native pdf to txt
pdftotext -nopgbrk -eol unix infile.pdf

### Install first with
brew install poppler             # macOS
sudo apt install poppler-utils   # Ubuntu
```

Optical Character Recognition (OCR)

- OCR ~ convert images into text

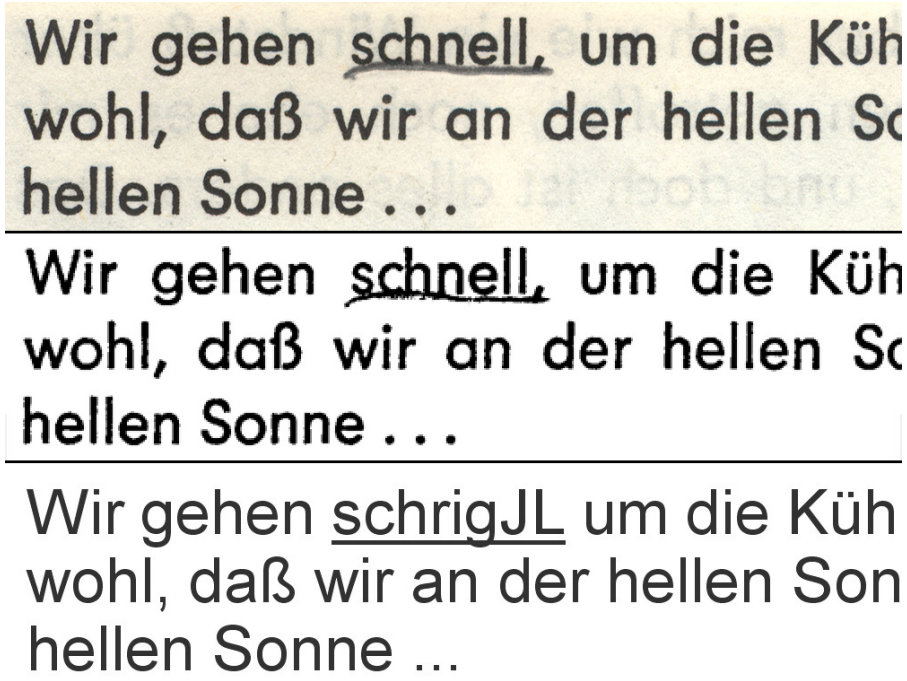
  extract text from scans/images

- `tesseract` performs OCR

  language-specific models

  supports handwriting + Fraktur texts

- image quality is crucial



Steps when performing OCR

Conversion of digitalized PDF

use-case: historical party programmes

1. extract image from PDF + improve contrast
2. run optical character recognition (OCR) on the image

```
# convert scanned pdf to tiff, control quality with parameters
convert -density 300 -depth 8 -strip -background white -alpha off \
infile.pdf temp.tiff

# run OCR for German ("eng" for English, "fra" for French etc.)
tesseract -l deu temp.tiff file_out

### Install first with
brew install imagemagick            # macOS
sudo apt-get install imagemagick    # Ubuntu
```

Configure ImageMagick

Only Windows Ubuntu: Paste the following in your command-line

```
# disable security policy for Windows
sudo sed -i '/<policy domain="coder" rights="none" pattern="PDF"/d'

# increase memory limits
sudo sed -i -E 's/name="memory" value=".+"/name="memory" value="8Gi
sudo sed -i -E 's/name="map" value=".+"/name="map" value="8GiB"/g'
sudo sed -i -E 's/name="area" value=".+"/name="area" value="8GiB"/g
sudo sed -i -E 's/name="disk" value=".+"/name="disk" value="8GiB"/g
```

#LifeHack: Make a PDF searchable

Use case: scanned book chapters

```
# output searchable pdf instead of txt
convert -density 300 -depth 8 -strip -background white -alpha off -
file_in.pdf temp.tiff

tesseract -l deu temp.tiff file_out pdf
```

Scraping PDF from Websites

Use case: Swiss voting booklet

- `wget` to download any files from the internet

```
# get a single file
wget EXACT_URL

# get all linked pdf from a single webpage
wget --recursive --accept pdf -nH --cut-dirs=5 \
--ignore-case --wait 1 --level 1 --directory-prefix=data \
https://www.bk.admin.ch/bk/de/home/dokumentation/abstimmungsbuechle

# --accept FORMAT_OF_YOUR_INTEREST
# --directory-prefix YOUR_OUTPUT_DIRECTORY
```

Interesting Resources

- Party Programmes across Europe

  covers over 1000 parties from 1920 until today in over 50 countries

- Swissvotes

  collection of resources on Swiss public votings

- Swiss voting booklets

  from 1978 until today

- 1 August speeches by Swiss Federal Councillors
- Nestlé Annual Reports
- … any organization of your interest 👍

What data are you interested in?

Think about the topic of your mini-project

Illustration of text analysis generated by Image Creator from Microsoft Bing

Basics of Batch Processing

perform the same operation on many files

```
# loop over all txt files
for file in *.txt; do

    # indent all commands in loop with a tab

    # rename each file
    # e.g. a.txt -> new_a.txt
    mv $file new_$file

done
```

Perform OCR for many PDF

```
for FILEPATH in *.pdf; do
    # convert pdf to image
    convert -density 300 $FILEPATH -depth 8 -strip \
    -background white -alpha off temp.tiff

    # define output name (remove .pdf from input)
    OUTFILE=${FILEPATH%.pdf}

    # perform OCR on the tiff image
    tesseract -l deu temp.tiff $OUTFILE

    # remove the intermediate tiff image
    rm temp.tiff

done
```


Questions?

In-class: Exercises I

1. Make sure that your local copy of the Github repository KED2024 is up-to-date with `git pull`. Check out the data samples in `materials/data` and the scripts to extract their text in `materials/code`.
2. Decide on one use-case that interests you most. Install the missing tool with the commands given on the respective slides (e.g., `pandoc`, `imagemagick`, `poppler`).
3. **Apply the commands to reproduce on the given data. Test them on your own data. Check the resources. Ask questions. Think about your mini-project.**

In-class: Exercises II

1. Use `wget` to download *cogito* and its predecessor *uniluAKTUELL* issues (PDF files) from the UniLu website. Start with downloading one issue first and then try to automatize the process to download all the listed issued using arguments for the `wget` command.
2. Convert the *cogito* and *uniluAKTUELL* PDF files into TXT files using `pdftotext`. Try with a single issue first and then write a loop to batch process all of them.
3. What is the University of Lucerne talking about in its issues? Use the commands of the previous lectures to count the vocabulary.
4. Do the same as in 3.), yet analyze the vocabulary of *cogito* and *uniluAKTUELL* issues separately. Does the language and topics differ between the two magazines?

In-class: Exercises III

1. Use `wget` to download a book from Project Gutenberg and count some things (e.g., good/bad, joy/sad).
2. `wget` is a powerful tool. Have a look at its arguments and search for more examples in tutorials on the web.

Resources

Make a more sophisticated script for PDF-to-TXT conversion

- Erick Peirson. 2015. Tutorial: Text Extraction and OCR with Tesseract and ImageMagick - Methods in Digital and Computational Humanities - DigInG Confluence. online


Have a nice
Easter break!