The ABC of Computational Text Analysis

#7 Working with (your own) Data

Alex Flückiger
Faculty of Humanities and Social Sciences
University of Lucerne

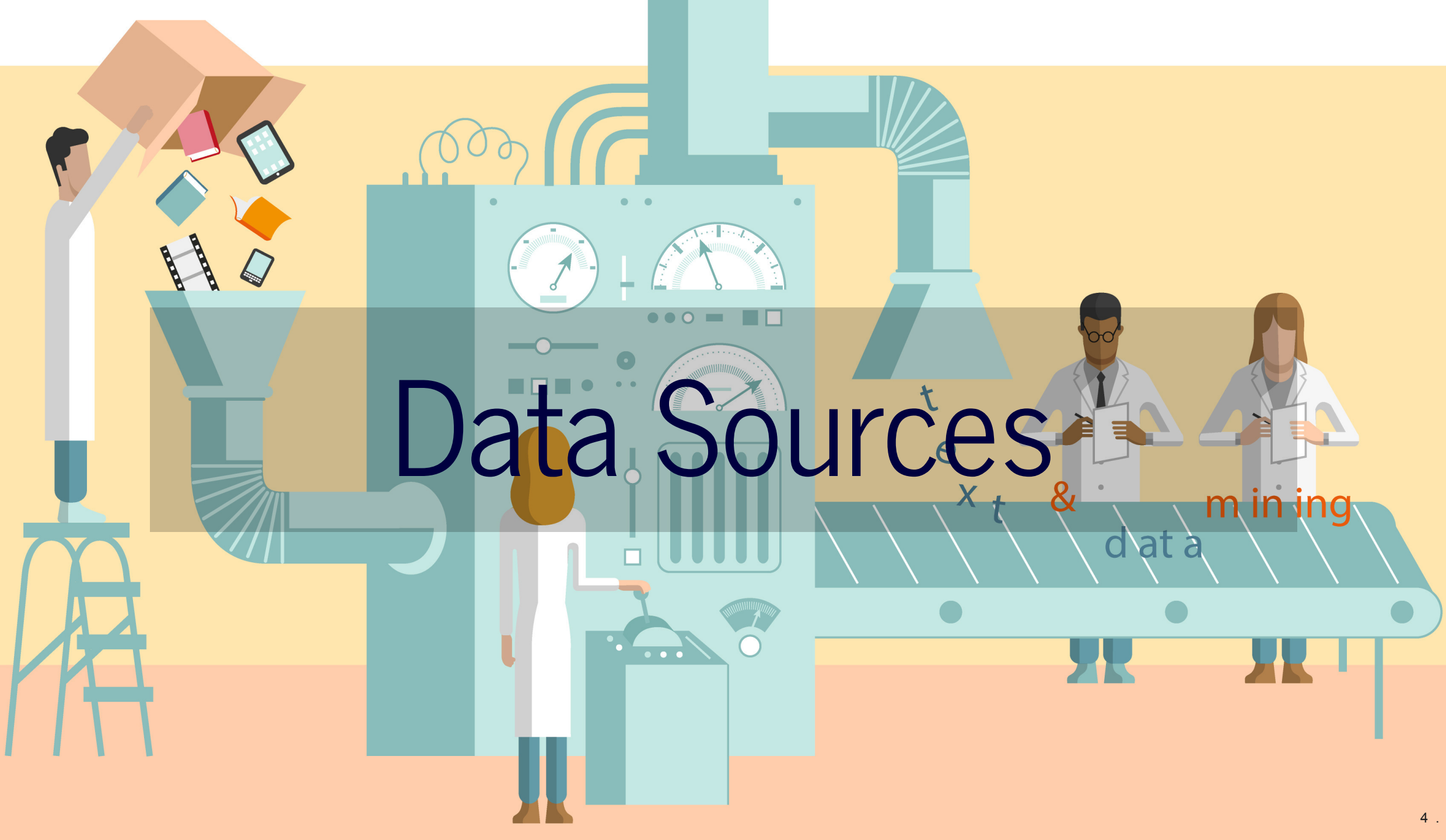
14 April 2022

Recap last Lecture

- describe text as pattern using RegEx
- extract + replace textual parts
  - literal: `abc`
  - meta: `\w \s [^abc] *`
  - power of `.*`

Outline

- learn about available data resources
- use your own textual data
  - any text ✔
  - “any” format
  - from anywhere ✔


Data Sources
t
e
x t
&
m in ing
d at a

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…

Interesting Publishers

- Nexis Uni
  - newspaper, business + legal reports (international)
  - licensed by the university
- Constellate
  - scientific articles of JSTOR across disciplines
  - provides an easy dataset builder
- HathiTrust and Project Gutenberg
  - massive collection of books (international)
  - open, HathiTrust requires agreement

👉 check out other resources licensed by ZHB

Dataset Search

- Harvard Dataverse

  open scientific data repository

- Google Dataset Search

  Google for datasets basically

- corpora by the Department of Computational Linguistics @ UZH

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

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.

Online Computational Text Analysis

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

Search Techniques

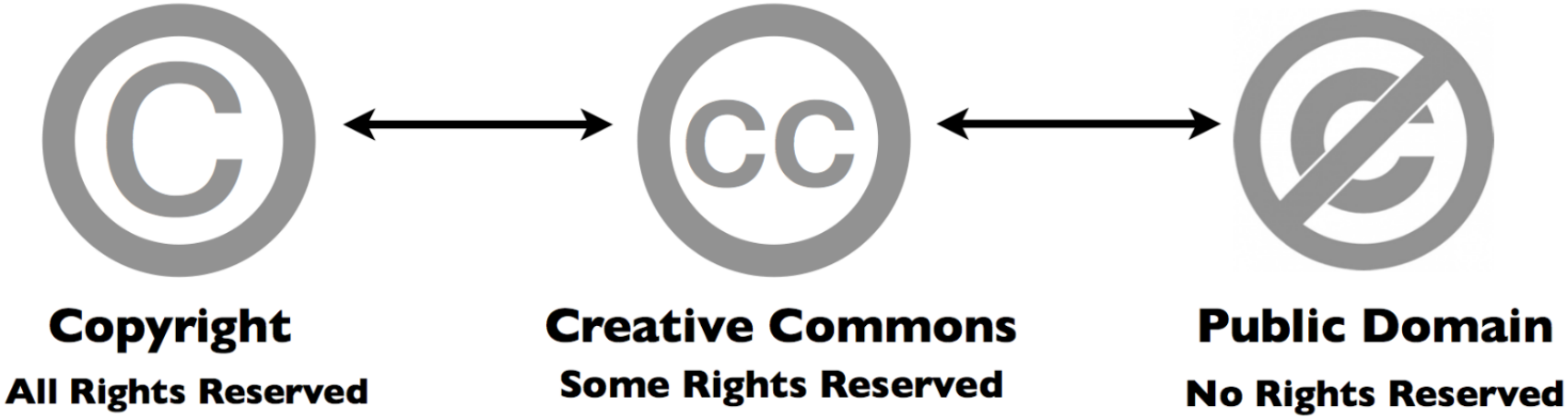
Make your web search more efficient by using dedicated tags. Examples:

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

Data is property 🚫

... and has rights too

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



Copyrighs may restrict some data use (src)

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
```

Conversion of native PDF

use case: Swiss party programmes

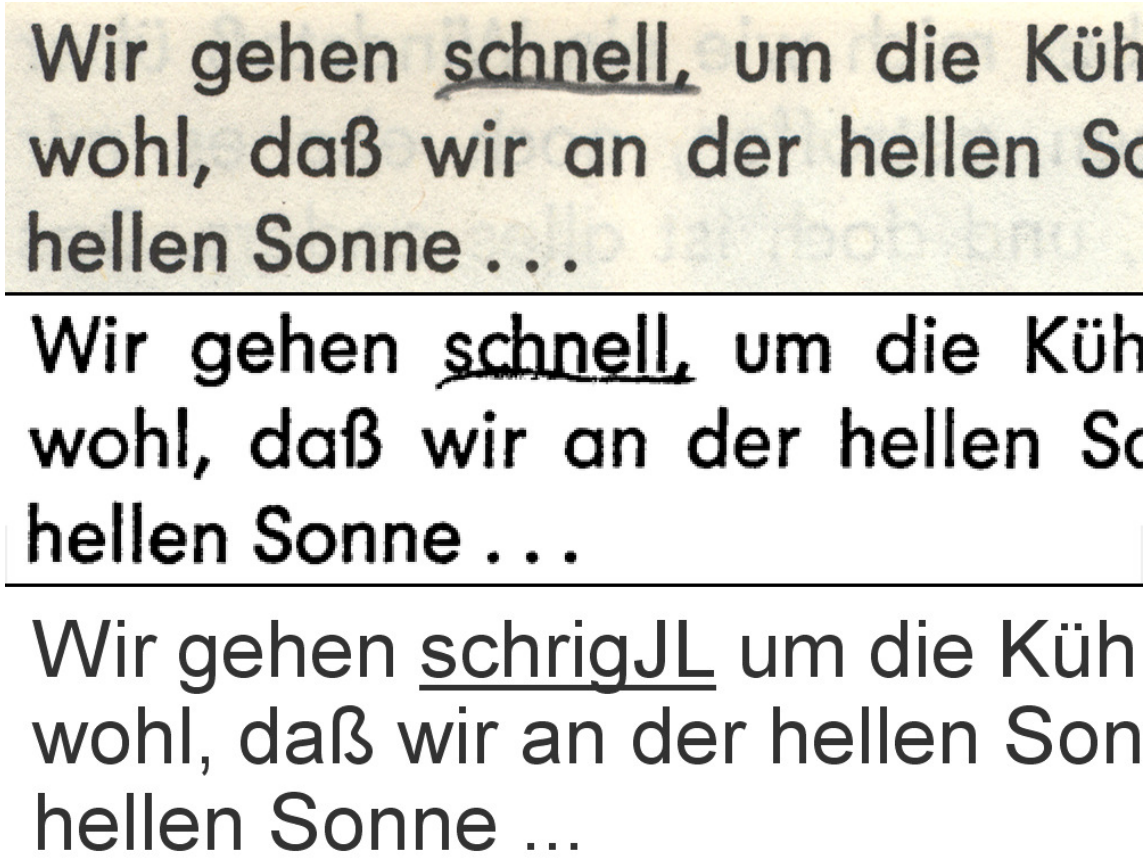
- `pdftotext` extracts text from non-scanned PDF

```
# 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 (Wikipedia)

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 properly

Windows Ubuntu users need to execute the following

```
# disable security policy for Windows
sudo sed -i '/<policy domain="coder" rights="none" pattern="PDF"/d' /etc/ImageMagick-6/policy.xml

# increase memory limits
sudo sed -i -E 's/name="memory" value=".+"/name="memory" value="8GiB"/g' /etc/ImageMagick-6/policy.xml
sudo sed -i -E 's/name="map" value=".+"/name="map" value="8GiB"/g' /etc/ImageMagick-6/policy.xml
sudo sed -i -E 's/name="area" value=".+"/name="area" value="8GiB"/g' /etc/ImageMagick-6/policy.xml
sudo sed -i -E 's/name="disk" value=".+"/name="disk" value="8GiB"/g' /etc/ImageMagick-6/policy.xml
```

#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 -compress group4 \
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/abstimmungsbuechlein.html

# --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
- Swiss voting booklets
  from 1978 until today
- 1 August speeches by Swiss Federal Councillors
- Nestlé Annual Reports
- … any organization of your interest 👍

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
```

Preprocessing → RegEx


Questions?

In-class: Exercises I

1. Make sure that your local copy of the Github repository KED2022 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. Install the missing tools with the commands given on the respective slides: `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 `tesseract`. 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!