UNIVERSITY OF LUCERNE

The ABC of Computational Text Analysis

#2 Text as Data

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Outline

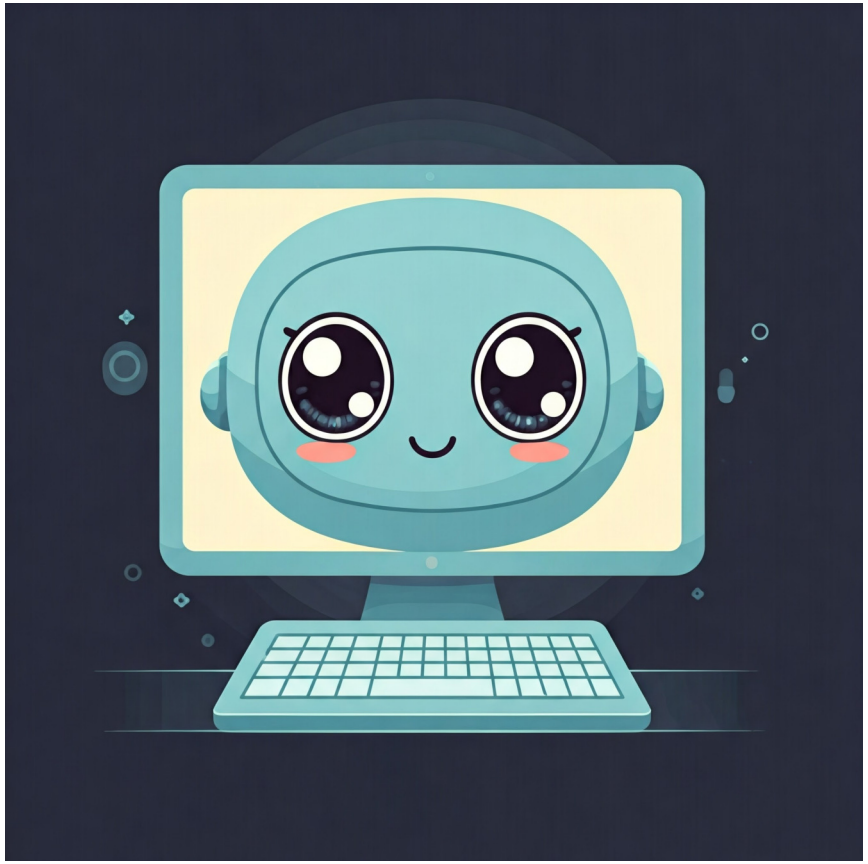
- questions ❓

  assignment, website, course

- recap last lecture
- methodical foundation 😬
- first computational text analysis ✨

The chatbot is your personal tutor

Ask for explanations, not solutions!



Recap last lecture

computer as …

- … an intelligent device
- … a tool for a **new social science**

datafication

- abundance of data
- exploit new forms of data

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

Why analyzing texts?

Ceci n’est pas une banane

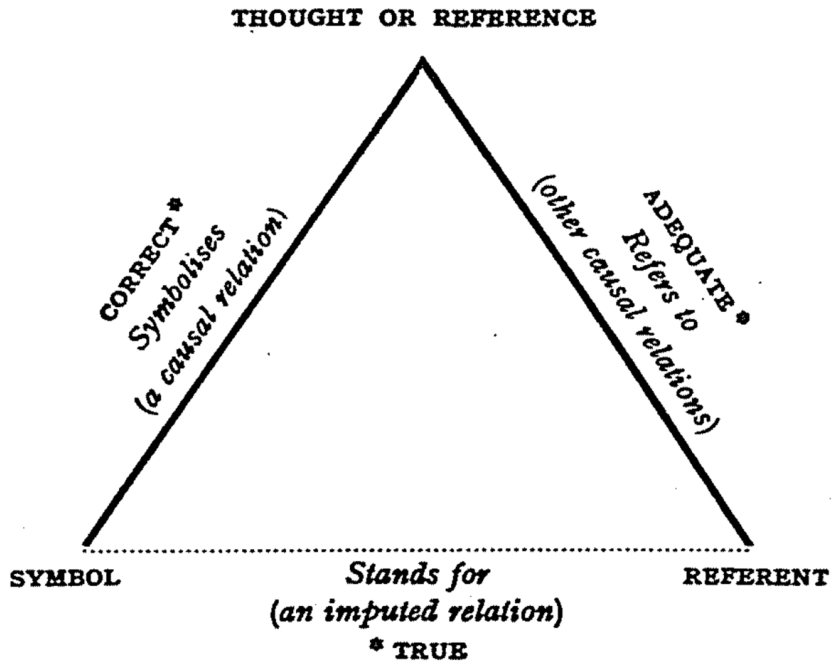
Max Gruber / Better Images of AI

Semiotic Triangle

Loose coupling between

- World
- Cognition
- Language

    synonyms, ambiguity



Semiotic Triangle *(Ogden and Richards 1923)*

«Language shapes the way we think,
and ~~determines~~ what we can think about.»

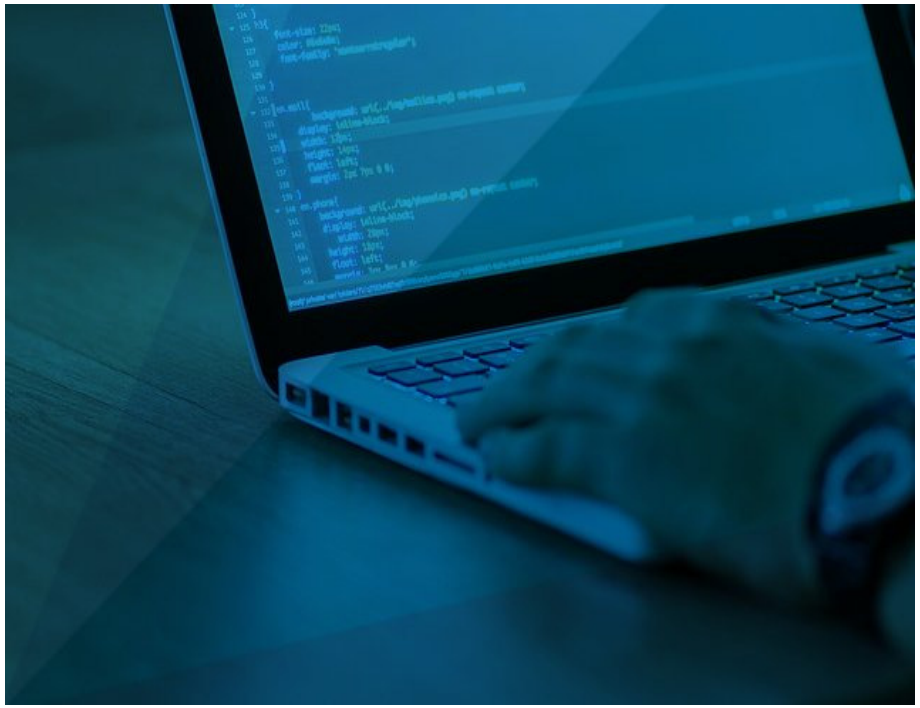
—**Benjamin Lee Whorf**

Working with texts

A micro and macro perspective I

Identifying trends beyond individual cases

Close reading to understand a text in depth

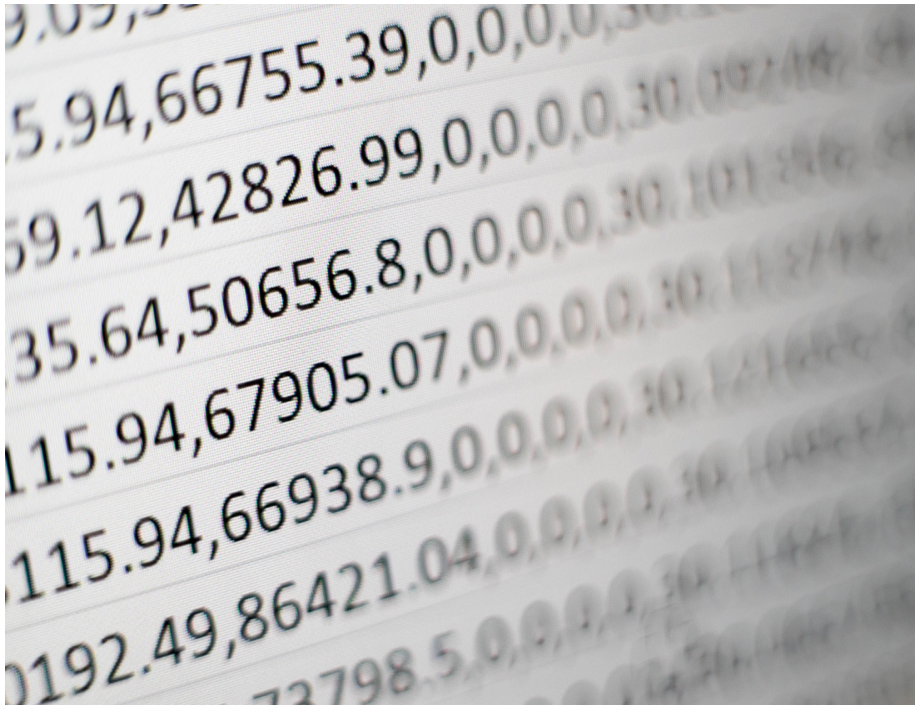


Distant reading to analyse trends across texts (Moretti 2000)

A micro and macro perspective II

Scale leads to abstraction

Too big to analyse by manual means



What do these abstract numbers represent? What is being abstracted away?

From micro to macro 
…and back again 

Two research paradigms

data exploration vs. hypothesis testing (Grimmer, Roberts, and Stewart 2021)

- add nuance
- develop new narratives
- verify hypothesis

Numbers do not talk

Thus, quantification and qualitative analysis go well together.

Text as Data

Text is challenging for computers due to

- synonymy

  `house` vs `building`

- ambiguities

  `bank`: river vs credit institute

- compositonality of meaning

  big mice, small elephants

- comparing discrete symbols
- unstructured, messy data

(see also Grimmer and Stewart 2013)

Unstructured texts? 🤔

Collection > Documents > Paragraphs > Sentences > Words

Challenging structure of texts does not imply no structure at all.

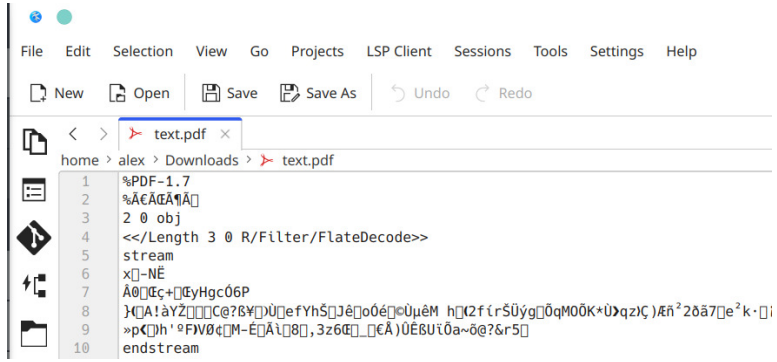
Data formats

In-class Task: File types

- What file formats do you know?
- Open files of different types in a text editor. Which ones look good?

File types

- any filename consists of name + suffix
  - suffix defines the file type
  - e.g. `task.txt`
- machine-readability
  - raw: `.txt` `.csv` `.tsv` …
  - formatted: `.docx` `.pdf` `.html` `.xml` …
- open vs proprietary
- digital sustainability



PDFs prevent immediate machine-readability

File management 🙏

Use meaningful names

- no spaces/umlauts

  only: alphanumeric, underscore, hyphen, dot

- versioning using date

  e.g. `task_20240229.pdf` instead of `task_new_final.pdf`

Let’s dive into it! 💦

Counting ngrams

Google Ngram Viewer (Michel et al. 2011)

- historical perspective on word usage
- >5.2 million books
- rise and fall of cultural ideas and phenomena

In-Class Task: Investigate the environmental discourse

- What other terms have been used to describe nature?

  e.g. environment

- What environmental issues are debated the strongest? When?

  e.g. nuclear power plant

- Are there any differences between languages?

  i.e. similar words with non-equivalent curves over time

🎯 **What do you conclude from your observations?**

Refine your queries

Check out case-sensitiveness, wildcards (*) and arithmetics 🤓

Part-of-speech tags
cook_VERB, _DET_ President _PROPN_

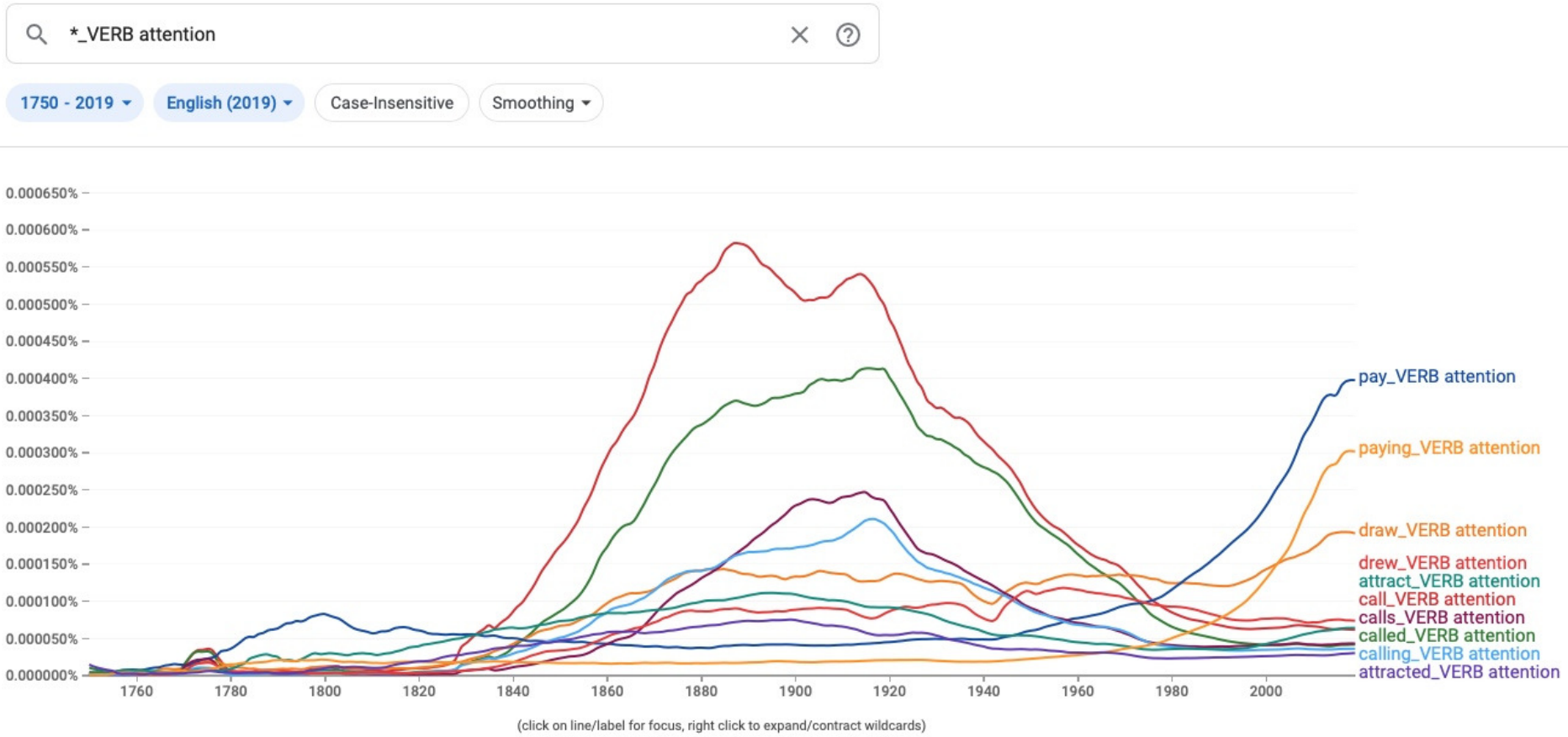
Wildcards
King of *, best *_NOUN

Inflections
shook_INF drive_VERB_INF

Arithmetic compositions
(color /(color + colour))

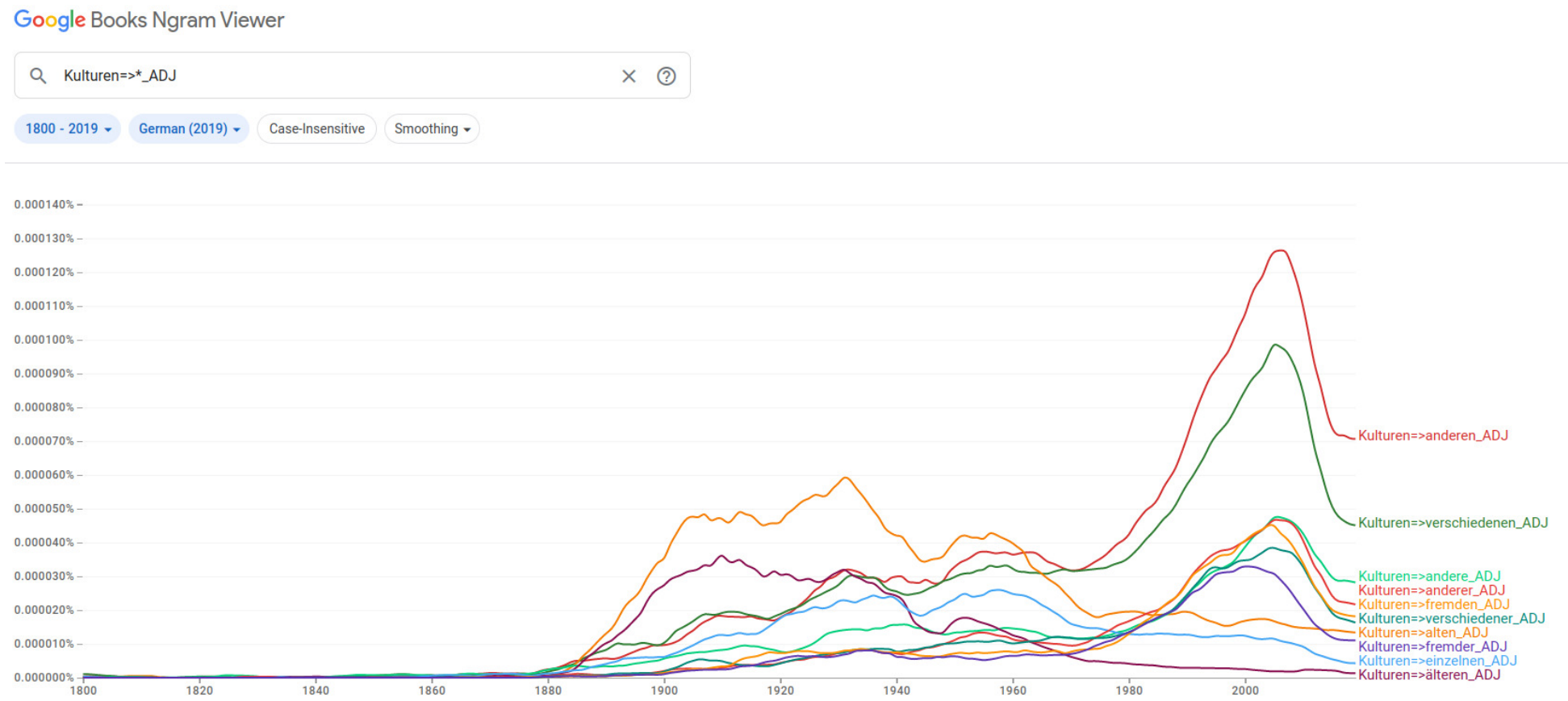
Corpus selection
I want:eng_2019, I want:eng_2009

The raise of the ngram pay attention



Google Ngram Viewer: Evolution of the phrase 'attention'

The raise of the ngram different cultures



Google Ngram Viewer: Evolution of phrases occuring with 'culture'

Has the language evolved over time or the social perception? 🤔

Likely both.

Similarly, language may vary across regions and communities.

No Culturomics but meaning-making

Phenomena in collective memory

- lexical shifts (frequency)
- semantic drifts (meaning)

Read, read, read to complement **stats** with context!

Interpretation

Potential reasons of decreasing frequency

- loosing interest
- becoming an established fact
- new reference

  `The Great War` → `World War I`
- news values and media cycles
- selection of data sources

A word of caution

The unknowns of Google Ngram Viewer

- index of books

  genre, authors, quantity

- artifacts of digitalization

🤓 use better alternative: bookworm HathiTrust


Research in practice
means organizing

The Zen of organizing

How a computational approach helps

- inspectable

  code as documentation allowing for criticism
- efficient automation ♻️

  “don’t repeat yourself”
- less error-prone 🤦‍♀️🤦‍♂️
- reproducible 💯
- extendable and shareable

Prepare your system

1. backup files + update system 🚧
2. start installation with this guide 👷

Reading

Required

Lazer, David, Alex Pentland, Lada Adamic, Sinan Aral, Albert-László Barabási, Devon Brewer, Nicholas Christakis, Noshir Contractor, James Fowler, Myron Gutmann, Tony Jebara, Gary King, Michael Macy, Deb Roy, and Marshall Van Alstyne. 2009. “Computational Social Science.” *Science* 323(5915):721–23.

(via OLAT)

Optional

Graham, Shawn, Ian Milligan, and Scott Weingart. 2015. *Exploring Big Historical Data: The Historian’s Macroscope*. Open Draft Version. Under contract with Imperial College Press.

online


Questions?

References

Grimmer, Justin, Margaret E. Roberts, and Brandon M. Stewart. 2021. “Machine Learning for Social Science: An Agnostic Approach.” *Annual Review of Political Science* 24 (1): 395–419. https://doi.org/10.1146/annurev-polisci-053119-015921.

Grimmer, Justin, and Brandon M. Stewart. 2013. “Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts.” *Political Analysis* 21 (3): 267–97. https://doi.org/10.1093/pan/mps028.

Michel, J.-B., Y. K. Shen, A. P. Aiden, A. Veres, M. K. Gray, The Google Books Team, J. P. Pickett, et al. 2011. “Quantitative Analysis of Culture Using Millions of Digitized Books.” *Science* 331 (6014): 176–82. https://doi.org/10.1126/science.1199644.

Moretti, Franco. 2000. “Conjectures on World Literature.” *New Left Review* 1: 54–68. http://newleftreview.org/II/1/franco-moretti-conjectures-on-world-literature.

Ogden, Charles Kay, and Ivor Armstrong Richards. 1923. *The Meaning of Meaning: A Study of the Influence of Language Upon Thought and of the Science of Symbolism. Supplementary Essays by B. Malinowski and F.G. Crookshank*. New York: Harcourt. https://books.google.com?id=i3MIAQAAIAAJ.