



DIACOLLO: ON THE TRAIL OF DIACHRONIC COLLOCATIONS



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ABSTRACT

DiaCollo is a new software tool for the efficient extraction, comparison, and interactive visualization of **collocations** from a **diachronic text corpus**. Unlike other conventional collocation extractors, DiaCollo is suitable for extraction and analysis of diachronic collocation data: collocate pairs whose association strength depends on the date of their occurrence. By tracking changes in a word's typical collocates over time, DiaCollo can help to provide a clearer picture of diachronic changes in the word's usage, especially those related to semantic shift or discourse environment.

THE SITUATION

Diachronic Text Corpora

- heterogeneous text collections
 - especially with respect to **date of origin**
- increasing number available, e.g.
 - Deutsches Textarchiv* (DTA) [4]
 - Historical American English (COHA) [2]
- even putatively "synchronic" corpora have a nontrivial temporal extension [8]

Collocation Profiling

- "You shall know a word by the company it keeps" – J. R. Firth
- find "significant" collocates of a **target term**
 - rank candidates by **association score**
 - filter out "chance" co-occurrences
 - statistical methods require large sample
 - existing methods [1, 3, 7] implicitly assume **corpus homogeneity**

DIACHRONIC PROFILING

Idea

- represent terms as **attribute n-tuples**
 - including **document date!**
- partition term vocabulary **on-the-fly**
 - user-specified epochs**
- collect epoch profiles into final result-set

Advantages

- full support for diachronic axis
- variable query-level granularity
- flexible attribute selection

Drawbacks

- sparse data requires larger corpora
- computationally expensive
- large index size

IMPLEMENTATION

Interfaces

- Perl API & command-line utilities
- RESTful **web-service plugin** + GUI

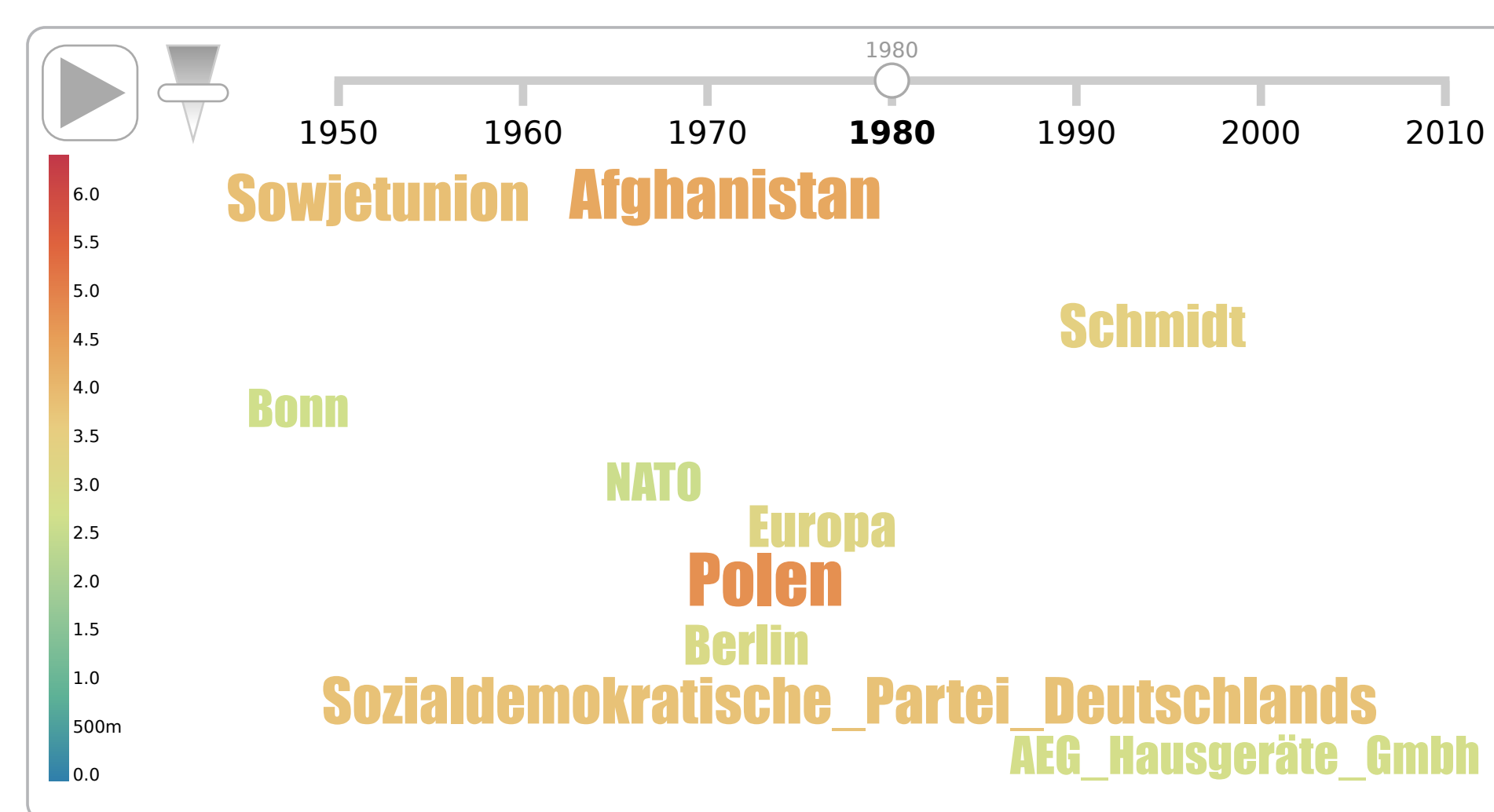
Features

- scalable even in a high-load environment
 - no persistent server process required
 - index access via file I/O or `mmap()` syscall
- supports both unary and "diff" profiles
- full DDC query support via ddc back-end

Output & Visualization

- TSV, JSON, HTML, Highcharts, d3-cloud, ...

EXAMPLE 1: *Krise* ("CRISIS") IN THE WEEKLY *DIE ZEIT* (1946–2014)

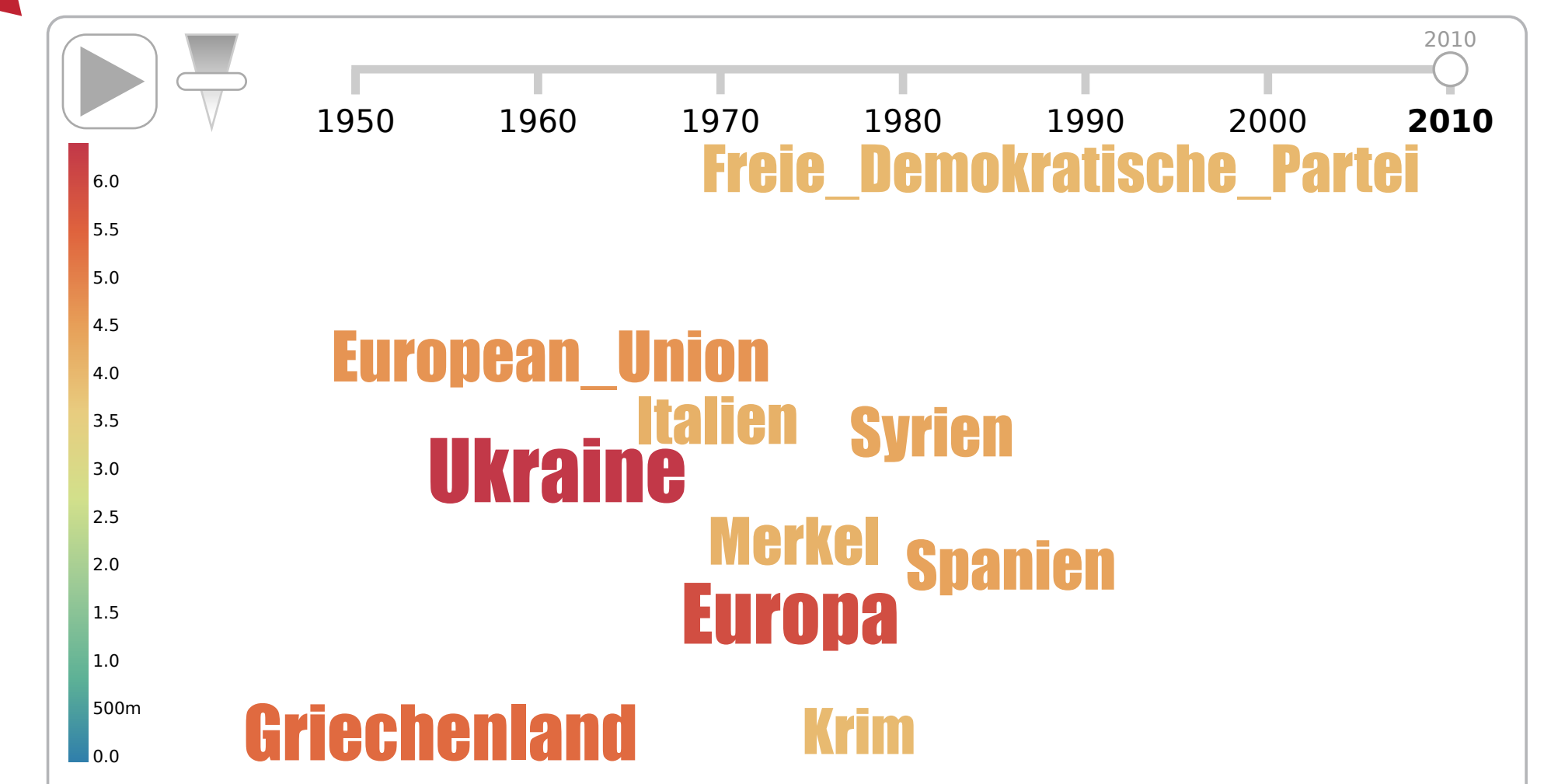


1980–1989

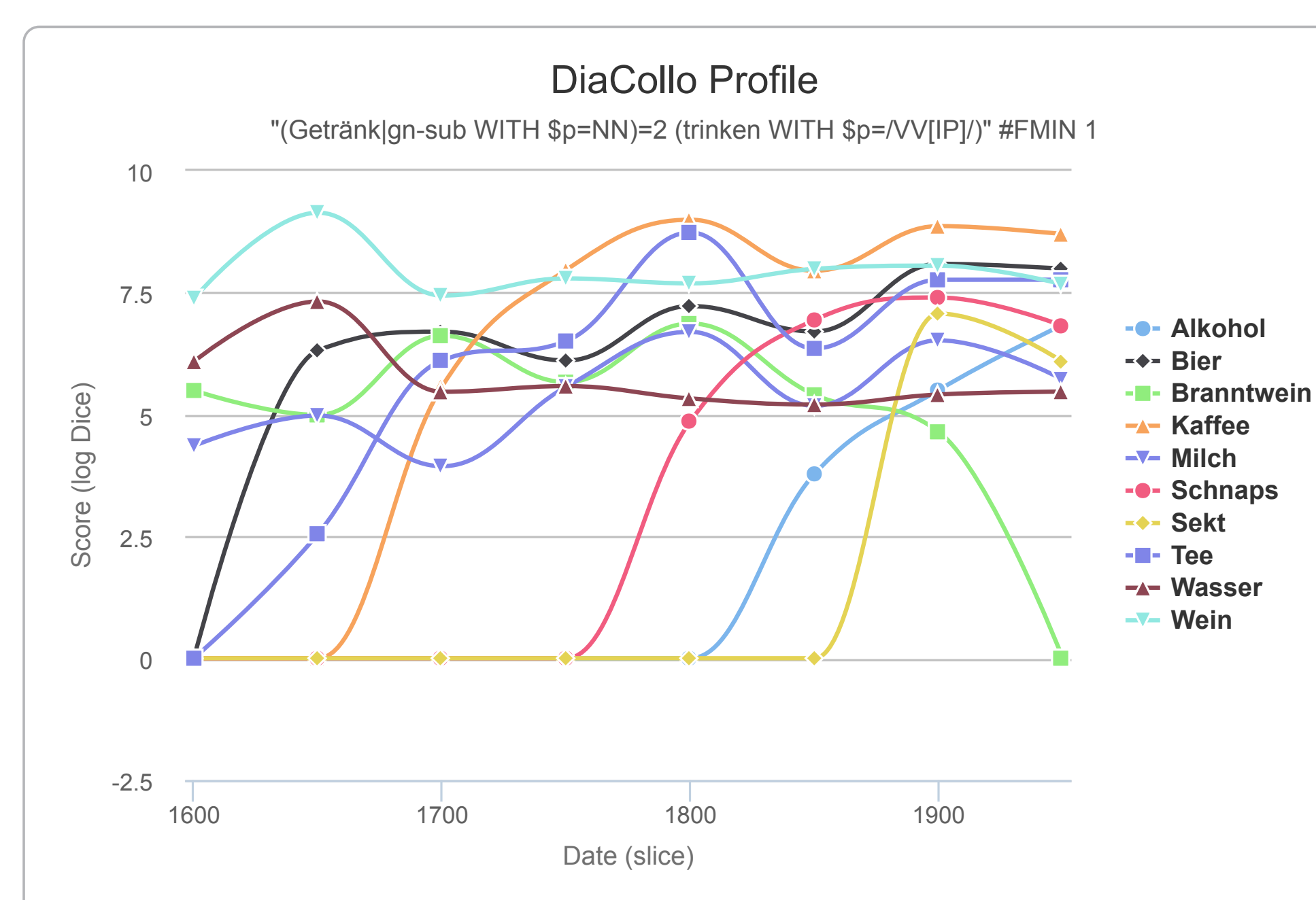
- Soviet war in Afghanistan
- Solidarność* & martial law in Poland
- collapse of Helmut Schmidt (SPD) coalition
- AEG sells consumer electronics division
 - subsequent takeover by Daimler-Benz AG
- NATO Pershing-II missiles in western Europe

2010–2014

- civil wars in Ukraine & Syria
- Russian annexation of Crimea
- Greek government-debt crisis
 - speculation regarding Italy & Spain
 - bailout terms re-negotiated with EU Troika
- German FDP loses *Bundestag* presence



EXAMPLE 2: 400 YEARS OF POTABLES (1600–1999)



Remarks

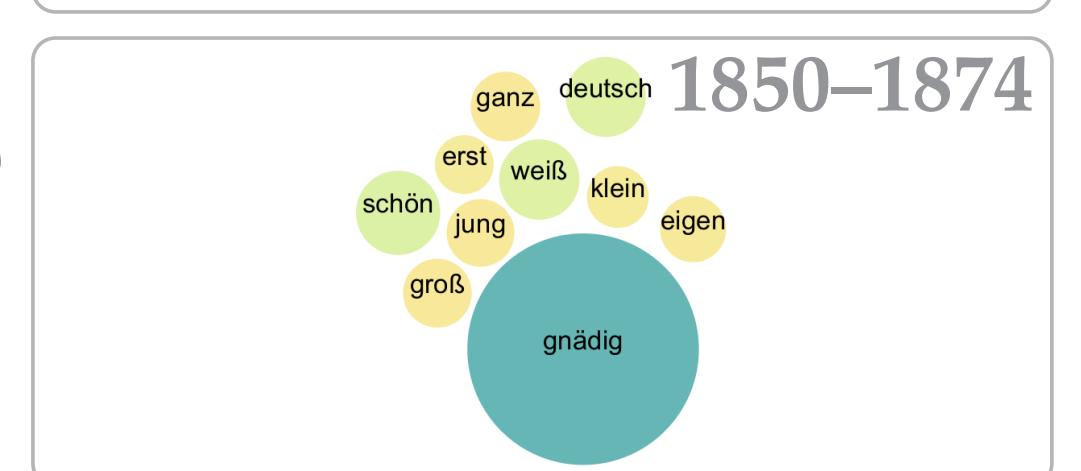
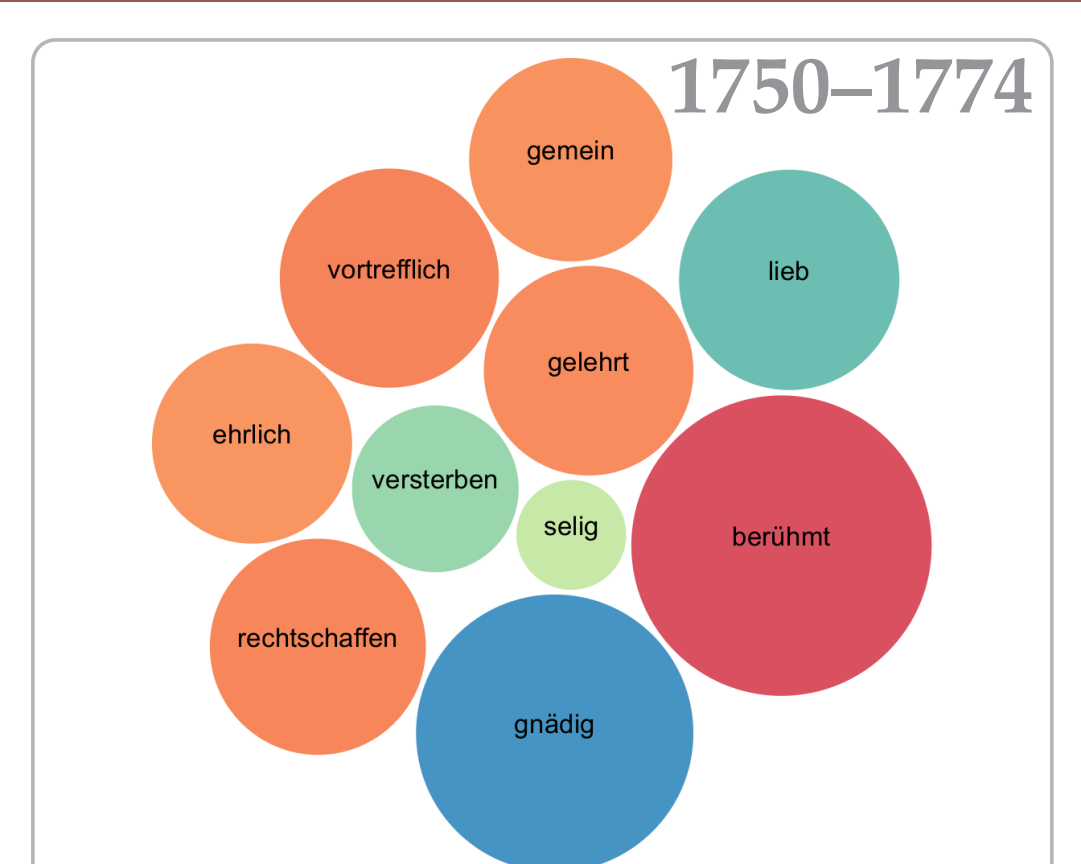
- DDC back-end + GermaNet [5, 6] expansion
- fine-grained search for beverages in object position of verb *trinken* ("to drink")

Observations

- staples ~ constants, e.g.
 - Bier, Milch, Wasser* ("beer, milk, water")
- 1650–1750: *Tee, Kaffee* ("tea, coffee") appear
- 1800–1900: *Schnaps* displaces *Branntwein*
- 1850–1900: *Alkohol* ("alcohol") as a beverage

EXAMPLE 3: GENDER BIAS (1600–1900)

- comparison profile: **Mann** ("man") vs. **Frau** ("woman")
 - node size indicates absolute association score difference
- fixed & formulaic expressions very prominent
 - gnädige Frau* ("milady") → masculine: *gnädiger Herr*
 - Frau X geborene Y* ("born") → birth- vs. married surname
 - der gemeine Mann* ("common") → masculine generic
- historical corpus data can reveal persistent cultural biases
 - Mann** ~ *berühmt, ehrlich, gelehrt, ...* ("famous, honest, learned, ...")
 - Frau** ~ *lieb, schön, verwitwet, ...* ("dear, beautiful, widowed, ...")
- differences grow less pronounced in late 18th & 19th centuries
 - political discourse: *deutsch, eigen, frei* ("German, own, free")



REFERENCES

- K. W. Church and P. Hanks. Word association norms, mutual information, and lexicography. *Computational Linguistics*, 16(1):22–29, 1990.
- M. Davies. Expanding horizons in historical linguistics with the 400-million word Corpus of Historical American English. *Corpora*, 7(2):121–157, 2012.
- S. Evert. *The Statistics of Word Cooccurrences: Word Pairs and Collocations*. PhD thesis, IMS Stuttgart, 2005.
- A. Geyken, S. Haaf, B. Jurish, M. Schulz, J. Steinmann, C. Thomas, and F. Wiegand. Das deutsche Textarchiv: Vom historischen Korpus zum aktiven Archiv. In S. Schomburg, C. Leggewie, H. Lobin, and C. Puschmann, editors, *Digitale Wissenschaft. Stand und Entwicklung digital vernetzter Forschung in Deutschland*, pages 157–161, 2011.
- B. Hamp and H. Feldweg. GermaNet – a lexical-semantic net for German. In *Proceedings of the ACL workshop Automatic Information Extraction and Building of Lexical Semantic Resources for NLP Applications*, 1997.
- V. Henrich and E. Hinrichs. GernEdiT – the GermaNet editing tool. In *Proceedings LREC 2010*, pages 2228–2235, 2010.
- A. Kilgarriff and D. Tugwell. Sketching words. In M.-H. Corréard, editor, *Lexicography and Natural Language Processing: A Festschrift in Honour of B. T. S. Atkins*, EU-RALEX, pages 125–137, 2002.
- J. Scharloth, D. Eugster, and N. Bubenhofer. Das Wuchern der Rhizome. linguistische Diskursanalyse und Data-driven Turn. In D. Busse and W. Teubert, editors, *Linguistische Diskursanalyse. Neue Perspektiven*, pages 345–380. VS Verlag, Wiesbaden, 2013.



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