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The taming of the data:
Using text mining in building and analyzing a corpus of historical scientific texts

Social and historical linguistic studies benefit from corpora encoding contextual metadata (e.g. time, register, genre) and relevant structural information (e.g. document structure). While small, hand-crafted corpora control over selected contextual variables (e.g. the Brown/LOB corpora encoding variety, register, and time) and are readily usable for analysis, big data (e.g. Google or Microsoft *n*-grams) are typically poorly contextualized and considered of limited value for linguistic analysis (see, however, Lieberman et al. 2007). Similarly, when we compile new corpora, sources may not contain all relevant metadata and structural data (e.g. the Old Bailey sources vs. the richly annotated corpus in Huber 2007).

For corpora with rich metadata and structural data, we can draw on well-established methods of analysis, from descriptive statistics to machine learning (see e.g. Kilgarriff 2001 for an overview). For the analysis of corpora with few/no metadata or structural information, we first need to learn more about our data. Relevant methods are found in data mining (Witten et al. 2011), which is concerned with detecting patterns in complex and potentially noisy datasets. This is what we have when building a corpus from uncharted material.

We have built a corpus from the Philosophical Transactions and Proceedings of the Royal Society of London (see e.g. Atkinson 1998; Taavitsainen et al. 2011), covering the first two centuries (1665–1869) of publication (Khamis et al. 2015). The sources (obtained from JSTOR) contain some but not all relevant metadata (year of publication and author, but not discipline) and no structural data. We apply a combination of pattern-based techniques and text-mining methods (e.g. clustering, classification, topic modeling) to explore the data. Apart from understanding our data better and (semi-)automatically enriching it with relevant contextual and structural information, we obtain positive effects regarding data quality (detection of artifacts such as OCR errors, text duplicates and running headers/footers).

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