

MY360/459 Quantitative Text Analysis: Overview and fundamentals

Patrick Gildersleve

Slide content courtesy of Dr Blake Miller

January 15, 2024

Course website: lse-my459.github.io

Text as data



Text as data



Source: The Comparative Manifesto Project, <https://manifesto-project.wzb.eu>

AGAPETI PAPÆ I EPISTOLÆ.

EPISTOLA JUSTINIANI

AD AGAPETUM.

More majorum suorum apud pontificem Romanum recens electum fidei suæ professionem edit, eandem quum supra ad Joannem papam II miserat.

In nomine Domini nostri Jesu Christi Dei imperator Cæsar Flavius Justinianus, Alemanicus, Gothicus, Francicus, Germanicus, Anticus, Alanicus, Vandalicus, Africanus, Pius, Felix, Inclytus, Victor, ac Triumphator semper Augustus, Agapeto sanctissimo archiepiscopo alinæ urbis Romæ et patriarchæ.

Ante tempus in hac regia urbe nostra quorundam de causa fidei exstitit morhosa contentio; quam nos congrue respuentes interposito edicto repressimus. Et quia studii nostri est emergentes hujus-

Reidentes honorem apostolicæ sedi et vestræ sanctitati, quod semper nobis in voto fuit, et est, ut decet patrem, honorantes vestram beatitudinem, omnia, quæ ad Ecclesiarum statum pertinent, festinamus ad notitiam deferre vestræ sanctitatis: quoniam semper magnum nobis fuit studium unitatem vestræ apostolicæ sedis, et statum sanctarum Dei Ecclesiarum custodire, quæ hactenus obtinet, et incommote permanet, nulla intercedente contrarietate. Petimus ergo vestrum paternum affectum, ut vestris ad nos destinatis litteris, et ad sanctissimum episcopum hujus alinæ urbis et patriarcham vestrum fratrem, quoniam et ipse per eosdem scripsit ad vestram sanctitatem, festinans in omnibus consequi sedem apostolicam beatitudinis vestræ, manifestum nobis faciatis, quod omnes qui prædictam fidem recte

Text as data



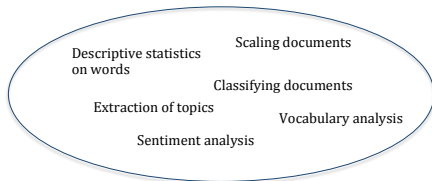
Basic QTA Process: Texts \rightarrow Feature matrix \rightarrow Analysis

When I presented the supplementary budget to this House last April, I said we could work our way through this period of severe economic distress. Today, I can report that notwithstanding the difficulties of the past eight months, we are now on the road to economic recovery.

In this next phase of the Government's plan we must stabilise the deficit in a fair way, safeguard those worst hit by the recession, and stimulate crucial sectors of our economy to sustain and create jobs. The worst is over.

This Government has the moral authority and the well-grounded optimism rather than the cynicism of the Opposition. It has the imagination to create the new jobs in energy, agriculture, transport and construction that this green budget will

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Outline

- ▶ Motivation for this course
- ▶ Logistics
- ▶ Foundations
- ▶ Examples
- ▶ Key terms in quantitative text analysis
- ▶ Justifying a term/feature frequency approach
- ▶ Selecting texts / defining documents
- ▶ Selecting features

Targets

- ▶ Learning objectives
 - ▶ fundamentals of text analysis
 - ▶ availability and consequences of *choices*
 - ▶ practical ability to work with texts in R
 - ▶ issues of text for social science
- ▶ Prerequisites
 - ▶ linear algebra and quantitative methods (MY452 or equivalent regression analysis course)
 - ▶ familiarity with R and RStudio
 - ▶ (optional) ability to process text files in a programming language such as Python

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Teaching team

▶ Dr Friedrich Geiecke

- ▶ Course convenor
- ▶ Leads lectures weeks 9-11, classes week 11
- ▶ Book office hours through Student Hub
- ▶ Please address all administrative questions to Friedrich
- ▶ `f.c.geiecke@lse.ac.uk`

▶ Dr Patrick Gildersleve

- ▶ Lecturer and seminar teacher
- ▶ Book office hours through Student Hub (typically Tuesdays 11:00-13:00)
- ▶ `p.gildersleve@lse.ac.uk`

▶ Ross Barker

- ▶ Graduate teaching assistant
- ▶ PhD student in the Department of Methodology

About me

- ▶ LSE Fellow in Computational Social Science at the Methodology Department
- ▶ PhD from the Oxford Internet Institute, University of Oxford
- ▶ **My research:**
 - ▶ News and collective attention
 - ▶ Wikipedia and collaborative communities
 - ▶ AI and the digital commons

Course resources

- ▶ **Course website:** lse-my459.github.io
 - ▶ Class description
 - ▶ Course schedule
 - ▶ Slides from class
 - ▶ Readings list
 - ▶ Links to exercises and datasets
 - ▶ Submission links for homeworks
- ▶ **Moodle page**
 - ▶ Supporting materials
- ▶ **Readings**
 - ▶ Mainly articles
 - ▶ Complement content covered in lectures and seminars

Course schedule

- ▶ **Lectures:** Monday 10:00-12:00, CKK LG.09
- ▶ **Classes** weeks 2, 4, 7, 9, 11:
 1. MY459 Mondays 13:00-15:00, 15:00-17:00
 2. MY360 Wednesdays 09:00-11:00 (week 11 Tuesday 16:00-18:00)
- ▶ No lectures or classes during Reading Week (week 6)

Evaluation: MY360

- ▶ **Formative coursework:**

- ▶ One problem set, building on content of first lab session
- ▶ 0% of course grade (but good practice!), due week 3

- ▶ **Summative coursework:**

- ▶ One midterm problem set, building on content of lab sessions
- ▶ 40% of course grade, due week 7

- ▶ **Project:**

- ▶ Original analysis of texts using methods covered in class
- ▶ 30% of course grade, due at the beginning of ST

- ▶ **Group Project:**

- ▶ Original analysis of texts using methods covered in class
- ▶ Groups randomly assigned
- ▶ 30% of course grade, due at the beginning of ST

Evaluation: MY459

- ▶ **Formative coursework:**

- ▶ One problem set, building on content of first lab session
- ▶ 0% of course grade (but good practice!), due week 3

- ▶ **Summative coursework:**

- ▶ One introductory and one midterm problem set
- ▶ 10% and 40% of course grade respectively, due weeks 5 and 7

- ▶ **Project:**

- ▶ Original analysis of texts using methods covered in class
- ▶ 50% of course grade, due at the beginning of ST

Assessment criteria

- ▶ **70–100:** Very Good to Excellent (Distinction).
 - ▶ Perceptive, focused use of a good depth of material with a critical edge. Original ideas or structure of argument.
- ▶ **60–69:** Good (Merit)
 - ▶ Perceptive understanding of the issues plus a coherent well-read and stylish treatment though lacking originality
- ▶ **50–59:** Satisfactory (Pass)
 - ▶ A “correct” answer based largely on lecture material. Little detail or originality but presented in adequate framework. Small factual errors allowed.
- ▶ **30–49:** Unsatisfactory (Fail)
- ▶ **0–29:** Unsatisfactory (Bad fail)
 - ▶ Based entirely on lecture material but unstructured and with increasing error component. Concepts are disordered or flawed. Poor presentation. Errors of concept and scope or poor in knowledge, structure and expression.

Generative AI

We will **allow** GitHub Copilot / ChatGPT / other generative AI assistants to be used for assignments

- ▶ Ignoring the presence/possibilities of Generative AI is unwise
- ▶ An opportunity to *learn* how to integrate these tools into your workflow

But beware:

- ▶ We are assessing your ability to deploy these tools in research contexts, not your ability to use them in isolation
- ▶ You need proficiency to recognise “good”, and fix broken, code
- ▶ These tools routinely produces incorrect / broken code (and information). Be very careful
- ▶ You are sharing your thoughts, ideas, and work with models that are proprietary

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Why quantitative text analysis?

Justin Grimmer's haystack metaphor: QTA improves reading

- ▶ Analyzing a straw of hay: understanding the meaning of a sentence
 - ▶ Humans are great! But computer struggle
- ▶ Organizing the haystack: describing, classifying, scaling texts
 - ▶ Humans struggle. But computers are great!
 - ▶ (What this course is about)

Principles of quantitative text analysis (Grimmer & Stewart, 2013)

1. All quantitative models are wrong – but some are useful
2. Quantitative methods for text amplify resources and augment humans
3. There is no globally best method for automated text analysis
4. Validate, validate, validate

Quantitative text analysis requires assumptions

1. Texts represent an observable implication of some underlying characteristic of interest
 - ▶ An attribute of the author
 - ▶ A sentiment or emotion
 - ▶ Salience of a political issue
2. Texts can be represented through extracting their *features*
 - ▶ most common is the **bag of words** assumption
 - ▶ many other possible definitions of “features” (e.g. word embeddings)
3. A **document-feature matrix** can be analyzed using quantitative methods to produce meaningful and valid estimates of the underlying characteristic of interest

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Descriptive statistics
on words

Scaling documents

Classifying documents

Extraction of topics

Vocabulary analysis

Sentiment analysis

Key feature of quantitative text analysis

1. **Selecting texts:** Defining the *corpus*
2. **Conversion** of texts into a common electronic format
3. **Defining documents:** deciding what will be the documentary unit of analysis

Key feature of quantitative text analysis (cont.)

4. **Defining features.** These can take a variety of forms, including tokens, equivalence classes of tokens (dictionaries), selected phrases, human-coded segments (of possibly variable length), linguistic features, and more.
5. **Conversion of textual features into a quantitative matrix**
6. **A quantitative or statistical procedure** to extract information from the quantitative matrix
7. **Summary** and interpretation of the quantitative results

Overview of text as data methods

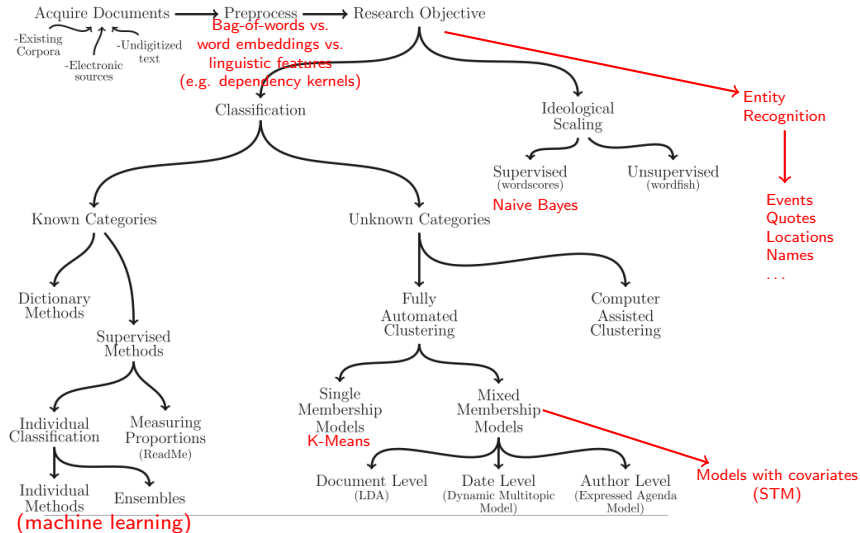


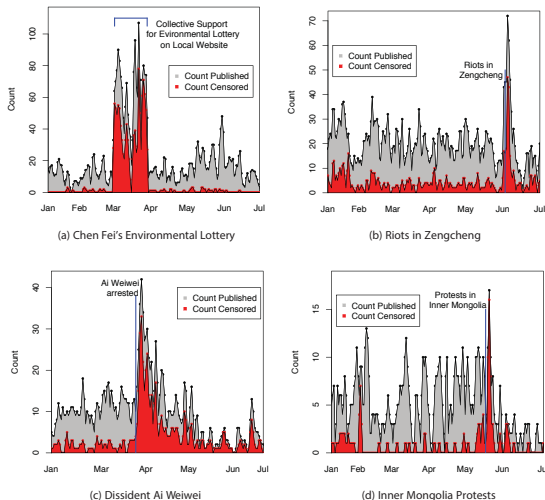
Fig. 1 in Grimmer and Stewart (2013)

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Descriptive text analysis

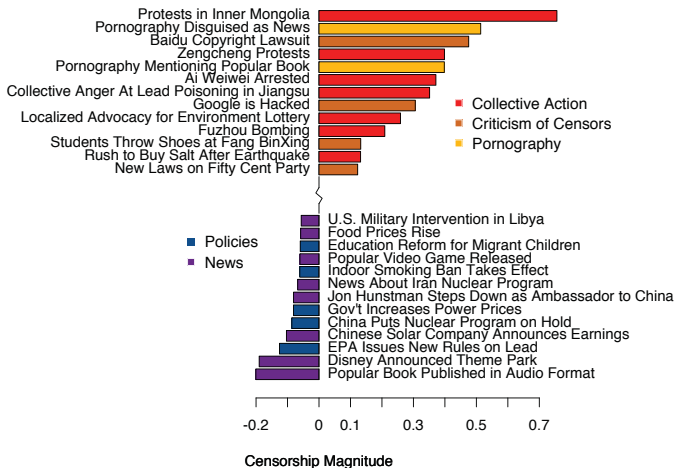
Figure 5. High Censorship During Collective Action Events (in 2011)



King, Pan, & Roberts (2013)

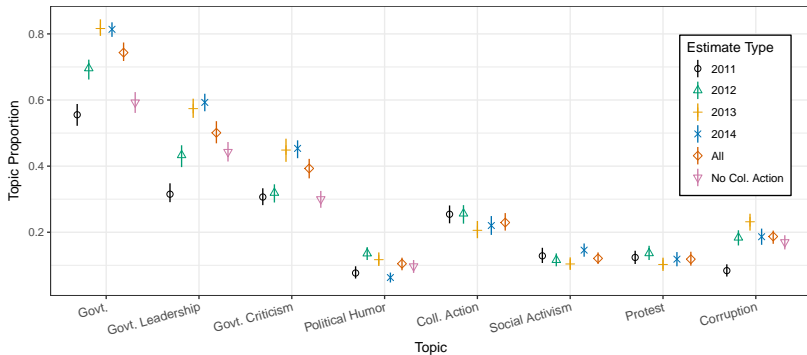
Descriptive text analysis

Figure 4. Events with Highest and Lowest Censorship Magnitude



King, Pan, & Roberts (2013)

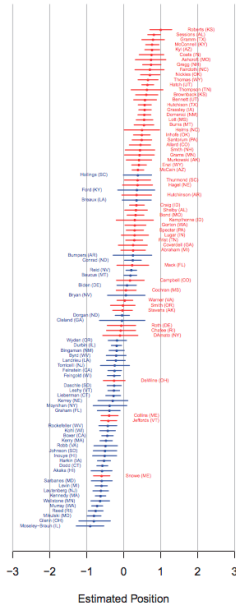
Document classification into known categories



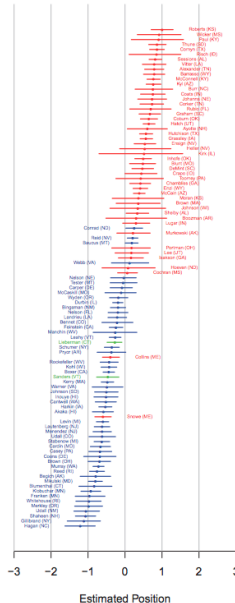
Miller, *working paper*, 2020.

Ideological scaling (Lauderdale & Herzog, PA 2016)

Senate 105



Senate 112

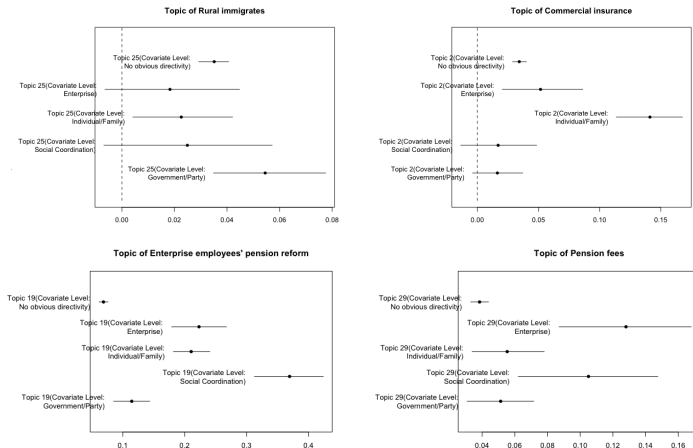


Document classification into unknown categories

Wang, Yan, *Governmentality and Counter-conduct in Authoritarian Regimes, Dissertation*, 2020.

- ▶ Data: State media reports about pension reform in China.
- ▶ Hand coded covariates: *Who should be responsible for this reform/policy?*
- ▶ Automated text analysis to discover unknown categories; hand-coded covariates to analyze state discourse on reforms.
- ▶ Paired with qualitative discourse analysis of how the state explained its reforms to the public using propaganda.

Document classification into unknown categories



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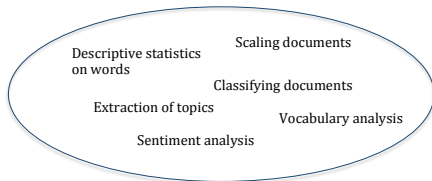
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Some key basic concepts

(text) corpus a large and structured set of texts for analysis

document each of the units of the corpus

types for our purposes, a unique word

tokens any word – so token count is total words

e.g. A corpus is a set of documents.

This is the second document in the corpus.

Above is a corpus with 2 documents, where each document is a sentence. The first document has 6 types and 7 tokens. The second has 7 types and 8 tokens. (We ignore punctuation for now.)

Some more key basic concepts

stems words with suffixes removed (using set of rules)

lemmas canonical word form (the base form of a word that has the same meaning even when different suffixes or prefixes are attached)

word	win	winning	wins	won	winner
stem	win	win	win	won	winner
lemma	win	win	win	win	win

keys such as dictionary entries, where the user defines a set of equivalence classes that group different word types

“key” words Words selected because of special attributes, meanings, or rates of occurrence

stop words Words that are designated for exclusion from any analysis of a text

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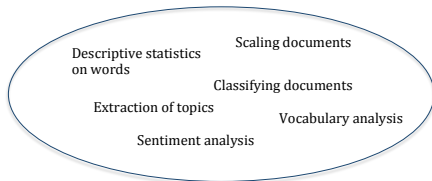
Basic QTA adopts a bag-of-words approach

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Bag-of-words approach

From words to numbers:

1. **Preprocess text:** lowercase, remove stopwords and punctuation, stem, tokenize into unigrams and bigrams (bag-of-words assumption)

“A corpus is a set of documents.”

“This is the second document in the corpus.” “a corpus is a set of documents.”

“this is the second document in the corpus.” “a corpus is a set of documents.”

“this is the second document in the corpus.” “corpus set documents”

“second document corpus” [corpus, set, document, corpus set, set document]

[second, document, corpus, second document, document corpus]

Bag-of-words approach

6 Document-feature matrix:

- ▶ **\mathbf{W}** : matrix of N documents by M unique n-grams
- ▶ w_{im} = number of times m -th n-gram appears in i -th document.

	corpus	set	document	corpus set	...	M n-grams
Document 1	1	1	1	1	...	
Document 2	1	0	1	0	...	
...						
Document n	0	1	1	0	...	

Word frequencies and their properties

Bag-of-words approach disregards grammar and word order and uses word frequencies as features. Why?

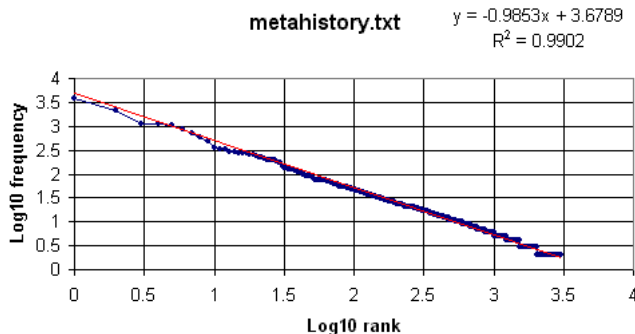
- ▶ *Context is often uninformative*, conditional on presence of words:
 - ▶ Individual word usage tends to be associated with a particular degree of affect, position, etc. without regard to context of word usage
- ▶ Single words tend to be the most informative, as co-occurrences of multiple words (n -grams) are rare
- ▶ Some approaches focus on occurrence of a word as a binary variable, irrespective of frequency: a binary outcome
- ▶ Other approaches use frequencies: Poisson, multinomial, and related distributions

Word frequency: Zipf's Law

- ▶ Basic idea: word frequency follows a power distribution; “of” and “the” make up 10% of occurrences; “aardvark” hardly ever occurs.
- ▶ **Zipf's law**: Given some corpus of natural language (in any language), the frequency of any word is inversely proportional to its rank in the frequency table.
- ▶ The simplest case of Zipf's law is a “ $1/f$ function”. Given a set of Zipfian distributed frequencies, sorted from most common to least common, the second most common frequency will occur $1/2$ as often as the first. The third most common frequency will occur $1/3$ as often as the first. The n th most common frequency will occur $1/n$ as often as the first.
- ▶ In other words, the 10th most frequent word is 10 times more common than the 100th most frequent word, etc.
- ▶ See visualization [here](#)
- ▶ Fun fact: this law also holds for measures such as the population of global cities.

Word frequency: Zipf's Law

- ▶ Formulaically: if a word occurs f times and has a rank r in a list of frequencies, then for all words $f = \frac{a}{r^b}$ where a and b are constants and b is close to 1
- ▶ So if we log both sides, $\log(f) = \log(a) - b \log(r)$
- ▶ If we plot $\log(f)$ against $\log(r)$ then we should see a straight line with a slope of approximately -1.



Discussion: Why is Zipf's Law Important/Useful?

- ▶ Reducing complexity: Language is complex, identifying patterns helps us develop simplified models.
- ▶ Identifying the distribution: Knowing the distribution of word counts helps us develop better statistical models of text.
- ▶ Selecting features: characterizing the distribution helps us intuit which terms are most important.

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Strategies for selecting units of textual analysis

What can the **document** be?

- ▶ Words
- ▶ n -word sequences
- ▶ Sentences
- ▶ Pages
- ▶ Paragraphs
- ▶ Natural units (a speech, a poem, a manifesto)
- ▶ Aggregation of units (e.g. all speeches by party and year)
- ▶ Key: **depends on the research design**
- ▶ Frequent trade-off between cost and accuracy

Sampling strategies for selecting texts

- ▶ Difference between a **sample** and a **population**
- ▶ *May not be feasible* to perform any sampling
- ▶ *May not be necessary* to perform any sampling
- ▶ Be wary of sampling that is a feature of the social system: “social bookkeeping”
- ▶ Different types of sampling vary from random to purposive
 - ▶ random sampling
 - ▶ non-random sampling
- ▶ Key is to make sure that what is being analyzed is a valid representation of the phenomenon as a whole – a question of **research design**

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- ▶ Examples
- ▶ Key terms in quantitative text analysis
- ▶ Justifying a term/feature frequency approach
- ▶ Selecting texts / defining documents
- ▶ **Selecting features**

Defining Features

- ▶ characters
- ▶ words
- ▶ word stems or lemmas: this is a form of defining *equivalence classes* for word features
- ▶ word segments, especially for languages using compound words, such as German, e.g.
Rindfleischetikettierungsüberwachungsaufgabenübertragungsgesetz
drops-its-longest-word-Rindfleischeti....html
(the law concerning the delegation of duties for the supervision of cattle marking and the labelling of beef)
Saunauntensitzer

Defining Features (cont.)

- ▶ “word” sequences, especially when inter-word delimiters (usually white space) are not commonly used, e.g., in Chinese
- ▶ linguistic features, such as parts of speech
- ▶ (if qualitative coding is used) coded or annotated text segments
- ▶ word embeddings (more on this later in the course)

Parts of speech

► the Penn

“Treebank” <https://www.ling.upenn.edu/courses/Fall2003/ling001/p>

Number	Tag	Description
1.	CC	Coordinating conjunction
2.	CD	Cardinal number
3.	DT	Determiner
4.	EX	Existential <i>there</i>
5.	FW	Foreign word
6.	IN	Preposition or subordinating conjunction
7.	JJ	Adjective
8.	JJR	Adjective, comparative
9.	JJS	Adjective, superlative
10.	LS	List item marker
11.	MD	Modal
12.	NN	Noun, singular or mass
13.	NNS	Noun, plural
14.	NNP	Proper noun, singular
15.	NNPS	Proper noun, plural
16.	PDT	Predeterminer
17.	POS	Possessive ending
18.	PRP	Personal pronoun
19.	PRP\$	Possessive pronoun
20.	RB	Adverb
21.	RBR	Adverb, comparative
22.	RBS	Adverb, superlative
23.	RP	Particle

Parts of speech (cont.)

- ▶ several open-source projects make it possible to tag POS in text, such as Apache's OpenNLP (and R package openNLP wrapper) or TreeTagger

```
> s
```

```
Pierre Vinken, 61 years old, will join the board as a nonexecutive director  
Nov. 29. Mr. Vinken is chairman of Elsevier N.V., the Dutch publishing  
group.
```

```
> sprintf("%s/%s", s[a3w], tags)
```

[1]	"Pierre/NNP"	"Vinken/NNP"	",/,,"	"61/CD"
[5]	"years/NNS"	"old/JJ"	",/,,"	"will/MD"
[9]	"join/VB"	"the/DT"	"board/NN"	"as/IN"
[13]	"a/DT"	"nonexecutive/JJ"	"director/NN"	"Nov./NNP"
[17]	"29/CD"	"../."	"Mr./NNP"	"Vinken/NNP"
[21]	"is/VBZ"	"chairman/NN"	"of/IN"	"Elsevier/NNP"
[25]	"N.V./NNP"	",/,,"	"the/DT"	"Dutch/JJ"
[29]	"publishing/NN"	"group/NN"	"../."	

Parts of speech (cont.)

Example: Creating an **index of editorialization** of journalists' and media outlets' political news coverage.

Proportion of tweets that: (1) mention a major party or candidate, (2) include at least one adjective.

Table 2.4 Determinants of editorialisation and popularity of news accounts on twitter (OLS regressions)

	DV = Editorialisation		DV = Popularity	
	Model 1	Model 2	Model 3	Model 4
Type: journalist	5.10*** (1.13)	4.32*** (1.26)	2.70*** (0.22)	2.49*** (0.30)
Tweets about Europe (%)	-0.03+ (0.02)	-0.03+ (0.02)	0.01*** (0.002)	0.01*** (0.002)
Editorialisation Index			0.02*** (0.004)	0.02*** (0.004)
(Intercept)	7.58** (2.59)	7.94** (2.47)	-4.03*** (0.40)	-3.92*** (0.41)
Country fixed effects	YES	YES	YES	YES
Outlet fixed effects	YES	YES	YES	YES
R ²	0.12	0.12	0.71	0.71
Adj. R ²	0.08	0.08	0.70	0.70
Num. obs.	2662	2662	2662	2662
RMSE	7.63	7.63	1.08	1.08

Barberá, Vaccari, Valeriani (2016) [control variables omitted]

Strategies for feature selection

How to choose which features to include?

- ▶ **All?** Computationally inefficient, and rare words are generally uninformative

Potential criteria to select features (“trim” the DFM):

- ▶ **document frequency**: How many documents in which a term appears
- ▶ **term frequency** How many times does the term appear in the corpus
- ▶ **deliberate disregard** Use of “stop words” – words excluded because they represent linguistic connectors of no substantive content
- ▶ **purposive selection** Use of a *dictionary* of words or phrases
- ▶ **declared equivalency classes** Non-exclusive synonyms, also known as *thesaurus* (more on this later)

Common English stop words

a, able, about, across, after, all, almost, also, am, among, an, and, any, are, as, at, be, because, been, but, by, can, cannot, could, dear, did, do, does, either, else, ever, every, for, from, get, got, had, has, have, he, her, hers, him, his, how, however, I, if, in, into, is, it, its, just, least, let, like, likely, may, me, might, most, must, my, neither, no, nor, not, of, off, often, on, only, or, other, our, own, rather, said, say, says, she, should, since, so, some, than, that, the, their, them, then, there, these, they, this, tis, to, too, twas, us, wants, was, we, were, what, when, where, which, while, who, whom, why, will, with, would, yet, you, your

- But no list should be considered universal

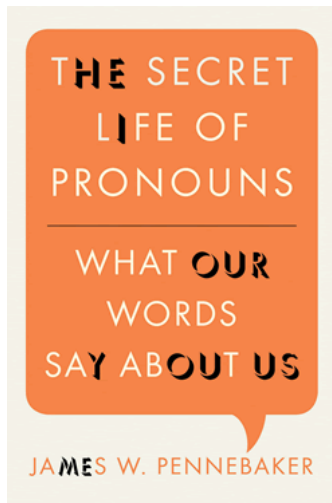
A more comprehensive list of stop words

as, able, about, above, according, accordingly, across, actually, after, afterwards, again, against, ain't, all, allow, allows, almost, alone, along, already, also, although, always, am, among, amongst, an, and, another, any, anybody, anyhow, anyone, anything, anyway, anyways, anywhere, apart, appear, appreciate, appropriate, are, aren't, around, as, aside, ask, asking, associated, at, available, away, awfully, be, became, because, become, becomes, becoming, been, before, beforehand, behind, being, believe, below, beside, besides, best, better, between, beyond, both, brief, but, by, c'mon, c's, came, can, can't, cannot, cant, cause, causes, certain, certainly, changes, clearly, co, com, come, comes, concerning, consequently, consider, considering, contain, containing, contains, corresponding, could, couldn't, course, currently, definitely, described, despite, did, didn't, different, do, does, doesn't, doing, don't, done, down, downwards, during, each, edu, eg, eight, either, else, elsewhere, enough, entirely, especially, et, etc, even, ever, every, everybody, everyone, everything, everywhere, ex, exactly, example, except, far, few, fifth, first, five, followed, following, follows, for, former, formerly, forth, four, from, further, furthermore, get, gets, getting, given, gives, go, goes, going, gone, got, gotten, greetings, had, hadn't, happens, hardly, has, hasn't, have, haven't, having, he, he's, hello, help, hence, her, here, here's, hereafter, hereby, herein, hereupon, hers, herself, hi, him, himself, his, hither, hopefully, how, howbeit, however, i'd, i'll, i'm, i've, ie, if, ignored, immediate, in, inasmuch, inc, indeed, indicate, indicated, indicates, inner, insofar, instead, into, inward, is, isn't, it, it'd, it'll, it's, its, itself, just, keep, keeps, kept, know, knows, known, last, lately, later, latter, latterly, least, less, lest, let, let's, like, liked, likely, little, look, looking, looks, ltd, mainly, many, may, maybe, me, mean, meanwhile, merely, might, more, moreover, most, mostly, much, must, my, myself, name, namely, nd, near, nearly, necessary, need, needs, neither, never, nevertheless, new, next, nine, no, nobody, non, none, noone, nor, normally, not, nothing, novel, now, nowhere, obviously, of, off, often, oh, ok, okay, old, on, once, one, ones, only, onto, or, other, others, otherwise, ought, our, ours, ourselves, out, outside, over, overall, own, particular, particularly, per, perhaps, placed, please, plus, possible, presumably, probably, provides, que, quite, qv, rather, rd, re, really, reasonably, regarding, regardless, regards, relatively, respectively, right, said, same, saw, say, saying, says, second, secondly, see, seeing, seem, seemed, seeming, seems, seen, self, selves, sensible, sent, serious, seriously, seven, several, shall, she, should, shouldn't, since, six, so, some, somebody, somehow, someone, something, sometime, sometimes, somewhat, somewhere, soon, sorry, specified, specify, specifying, still, sub, such, sup, sure, t's, take, taken, tell, tends, th, than, thank, thanks, thanx, that, that's, thats, the, their, theirs, them, themselves, then, thence, there, there's, thereafter, thereby, therefore, therein, theres, thereupon, these, they, they'd, they'll, they're, they've, think, third, this, thorough, thoroughly, those, though, three, through, throughout, thru, thus, to, together, too, took, toward, towards, tried, tries, truly, try, trying, twice, two, un, under, unfortunately, unless, unlikely, until, unto, up, upon, us, use, used, useful, uses, using, usually, value, various, very, via, viz, vs, want, wants, was, wasn't, way, we, we'd, we'll, we're, we've, welcome, well, went, were, weren't, what, what's, whatever, when, whence, whenever, where, where's, whereafter, whereas, whereby, wherein, whereupon, wherever, whether, which, while, whither, who, who's, whoever, whole, whom, whose, why, will, willing, wish, with, within, without, won't, wonder, would, would, wouldn't, yes, yet, you, you'd, you'll, you're, you've, your, yours, yourself, yourselves, zero

Stopwords

Are there cases in which we would want to keep stopwords? Or should we always exclude them from our analysis?

Stopwords sometimes can be informative!



But sometimes we want to add/remove our own new stopwords
(e.g. female pronouns, legislative terms, directional terms)

Stemming words

Lemmatization refers to the algorithmic process of converting words to their lemma forms.

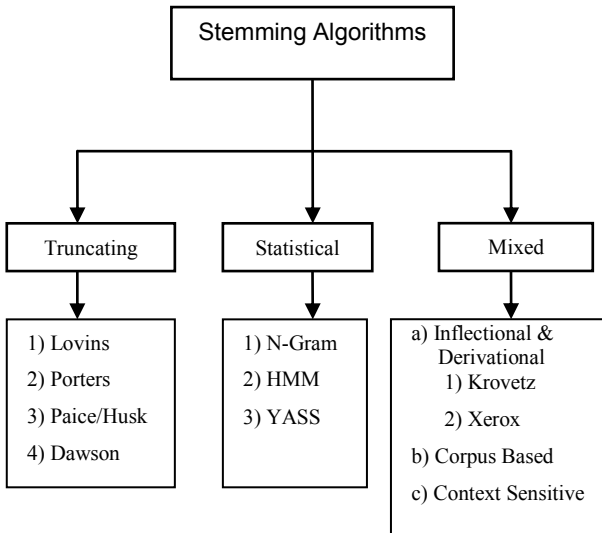
stemming the process for reducing inflected (or sometimes derived) words to their stem, base or root form. Different from *lemmatization* in that stemmers operate on single words without knowledge of the context.

both convert the morphological variants into stem or root terms

example: **produc** from
production, producer, produce, produces,
produced

Why? Reduce feature space by collapsing different words into a stem (e.g. “happier” and “happily” convey same meaning as “happy”)

Varieties of stemming algorithms



Issues with stemming approaches

- ▶ The most common is probably the Porter stemmer
- ▶ But this set of rules gets many stems wrong, e.g.
 - ▶ `policy` and `police` considered (wrongly) equivalent
 - ▶ `general` becomes `gener`, `iteration` becomes `iter`
- ▶ Other corpus-based, statistical, and mixed approaches designed to overcome these limitations
- ▶ Key for you is to be careful through inspection of morphological variants and their stemmed versions
- ▶ Sometimes not appropriate! e.g. Schofield and Minmo (2016) find that “stemmers produce no meaningful improvement in likelihood and coherence (of topic models) and in fact can degrade topic stability”

Where to obtain textual data?

Some tips...

- ▶ Existing datasets, e.g.
 - ▶ UCD's EuroParl project
 - ▶ Hansard Archive of parliamentary debates in UK
 - ▶ Media archives (newspaper articles, TV transcripts...) at LexisNexis, ProQuest, Factiva...
 - ▶ Academic articles (JSTOR Data for Research)
 - ▶ Open-ended responses to survey questions
- ▶ Collect your own data:
 - ▶ From social media (Twitter, FB) and blogs
 - ▶ Scraping other websites
- ▶ Digitize your own text data using optical character recognition (OCR) software
 - ▶ Options: Tesseract (open-source), Abbyy FineReader

Wrapping up...

Big questions we answered today:

- ▶ Quantitative Text Analysis: why?
- ▶ Key terms: document, corpus, feature, document feature matrix, type, token
- ▶ How to select the unit of analysis (i.e. documents)?
- ▶ How to select features? Bag-of-words, stemming, stopwords, part-of-speech tagging

Before next class

- ▶ Do readings for today and next class
- ▶ Create a GitHub account

Discussion Questions

1. QTA often disregards grammar and word order and uses word frequencies as features. Why? What are the main advantages and limitations of these assumptions?
2. In QTA, document features are often represented as word frequency. How might this representation be suboptimal in light of Zipf's law?
3. Why might one choose to remove stop words? Why might one choose to keep them?

Brainstorming Course Goals

1. Any particular applications of QTA that are particularly interesting to you?
2. How is QTA useful for your particular disciplinary focus?
3. Do you have any initial ideas/topics/tools you may want to explore in your final project?

Brainstorming Course Goals



<https://ideaboardz.com/for/LSEMY459/5171010>