Introduction to Text Mining with R

Introduction

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Why quantitative analysis of social media text?

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

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Principles of automated 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 text analysis
4. Validate, validate, validate

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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. n-grams)
3. A **document-feature matrix** can be analyzed using quantitative methods to produce meaningful and valid estimates of the underlying characteristic of interest

Key concepts

Some key basic concepts

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

Example:

```
A corpus is a set of documents. This is the 2nd document in the corpus.
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→ 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.)

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document	each of the units of the corpus (e.g. a Facebook post)
types	for our purposes, a unique word
tokens	any word – so token count is total words

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Some more key basic concepts

stems words with suffixes removed (using set of rules)

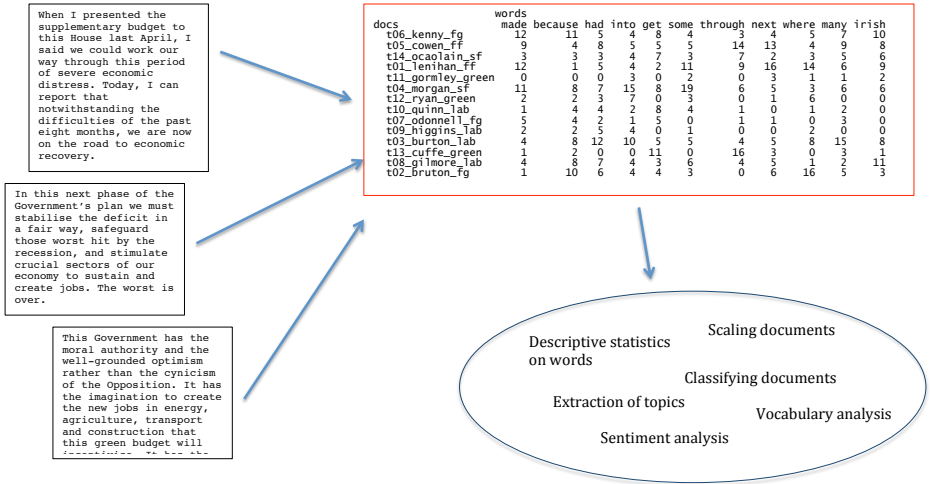
lemmas canonical word form (the base form of a word that has the same meaning even when different suffixes or prefixes are attached)

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

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

From words to numbers

Bag-of-words approach: workflow



Bag-of-words approach: from words to numbers

1. **Preprocess text:**

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Bag-of-words approach: from words to numbers

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Bag-of-words approach: from words to numbers

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   "corpus set documents"
   "second document corpus"

Bag-of-words approach: from words to numbers

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

   [corpus, set, document, corpus set, set document]

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2. **Document-feature matrix**:
   - **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?**

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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