POIR 613: Measurement Models and Statistical Computing

Pablo Barberá

School of International Relations
University of Southern California
`pablobarbera.com`

Course website:

pablobarbera.com/POIR613/

Introduction to automated text analysis

Text as data

Text as data

Kukuriku
koalicija
Plan 21

the TRUE NORTH
STRONG AND FREE
Stephen Harper's plan for Canadians
Conservative

Enhedslistens valgudspil
Et retfærdigt
Danmark

ΕΚΛΟΓΙΚΗ ΔΙΑΚΗΡΥΞΗ
ΣΥΡΙΖΑ
ισχυρός
στη Βουλή
και στους αγώνες
Είναι στο χέρι μας!
ΣΥΡΙΖΑ
ΣΥΝΑΣΠΙΣΜΟΣ ΡΙΖΟΣΠΑΣΤΙΚΗΣ ΑΡΙΣΤΕΡΑΣ
www.syriza.gr

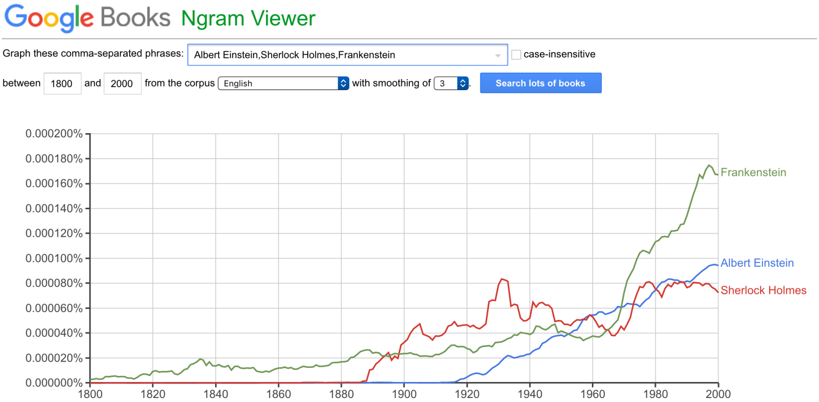
SPÖ
WAHLMANIFEST

DER
GRÜNE NEUE
GESELLSCHAFTS-
VERTRAG
KLIMA • ARBEIT • GERECHTIGKEIT • FREIHEIT

WIR HABEN DIE KRAFT
GEMEINSAM
FÜR UNSER LAND.
REGIERUNGSPROGRAMM 2009 – 2013
CDU CSU

Sozial und
Demokratisch.
Anpacken. Für Deutschland.
Das Regierungsprogramm der SPD
SPD

Text as data



Google Books Ngram Viewer

Graph these comma-separated phrases: Albert Einstein,Sherlock Holmes,Frankenstein □ case-insensitive

between 1800 and 2000 from the corpus English with smoothing of 3.

Text as data

facebook
XING
Gefällt mir
Instagram
twitter
Linked in
Pinterest
skype
flickr
You Tube

Overview of text as data methods

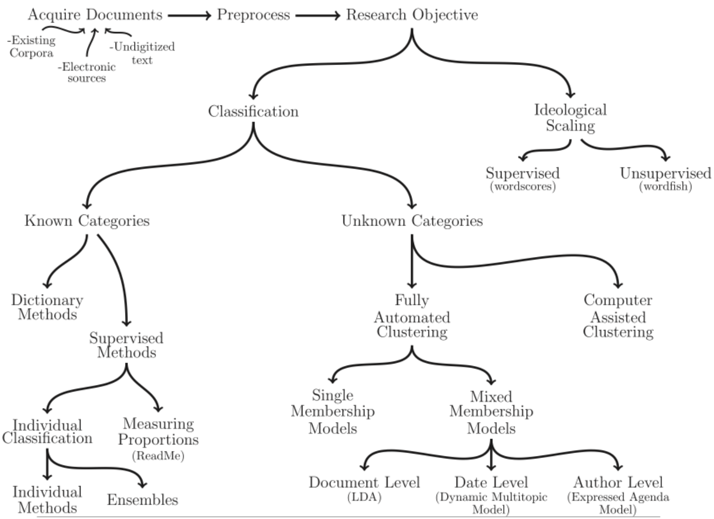


Fig. 1 in Grimmer and Stewart (2013)

From words to numbers

1. Bag-of-words assumption
2. Pre-processing text
   - Capitalization, cleaning digits/URLs, removing stopwords and sparse words, etc.
   - Stemming
   - Part-of-speech tagging
3. Document-term matrix
   - **W**: matrix of N documents by M unique words
   - W_{im}= number of times m-th words appears in i-th document.
   - Usually large matrix, but sparse (so it fits in memory)

From words to numbers

From words to numbers

1. Preprocess text:

“@MEPcandidate thank you and congratulations, you’re the best #EP2014”

“@MEPcandidate You’re an idiot, I would never vote for you”

From words to numbers

From words to numbers

1. Preprocess text: lowercase,

“@mepcandidate thank you and congratulations, you’re the best #ep2014”

“mepcandidate you’re an idiot, i would never vote for you”

From words to numbers

From words to numbers

1. Preprocess text: lowercase, remove stopwords and punctuation,

“@mepcandidate thank ~~you~~ ~~and~~ congratulations~~,~~ you’re ~~the~~ best #ep2014”

“@mepcandidate you’re ~~an~~ idiot~~,~~ ~~i~~ ~~would~~ never vote ~~for~~ ~~you~~”

From words to numbers

From words to numbers

1. Preprocess text: lowercase, remove stopwords and punctuation, stem,

   “@ thank congratul~~ations~~, you’r~~e~~ best #ep2014”

   “@ you’r~~e~~ idiot never vote”

From words to numbers

From words to numbers

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

   [@, thank, congratul, you'r, best, #ep2014, @ thank, thank congratul, congratul you'r, you'r best, best, best #ep2014]

   [@, you'r, idiot, never, vote, @ you'r, you'r idiot, idiot never, never vote]

From words to numbers

From words to numbers

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

   [@, thank, congratul, you'r, best, #ep2014, @ thank, thank congratul, congratul you'r, you'r best, best, best #ep2014]

   [@, you'r, idiot, never, vote, @ you'r, you'r idiot, idiot never, never vote]

2. Document-term 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.

	@	thank	congratul	you'r	#ep2014	@ thank	. . .	*M* words
Document 1	1	1	1	1	1	1	. . .	
Document 2	1	0	0	1	0	0	. . .	
. . .								
Document *n*	0	1	1	0	0	0	. . .	

Dictionary methods

Classifying documents when categories are known using dictionaries:

- Lists of words that correspond to each category:
  - Positive or negative, for sentiment
  - Sad, happy, angry, anxious... for emotions
  - Insight, causation, discrepancy, tentative... for cognitive processes
  - Sexism, homophobia, xenophobia, racism... for hate speech

    many others: see LIWC, VADER, SentiStrength, LexiCoder...
- Count number of times they appear in each document
- Normalize by document length (optional)
- Validate, validate, validate.
  - Check sensitivity of results to exclusion of specific words
  - Code a few documents manually and see if dictionary prediction aligns with human coding of document