

Text

Session 13

PMAP 8921: Data Visualization with R
Andrew Young School of Policy Studies
Fall 2023

Plan for today

Qualitative text-based data

Crash course in
computational linguistics

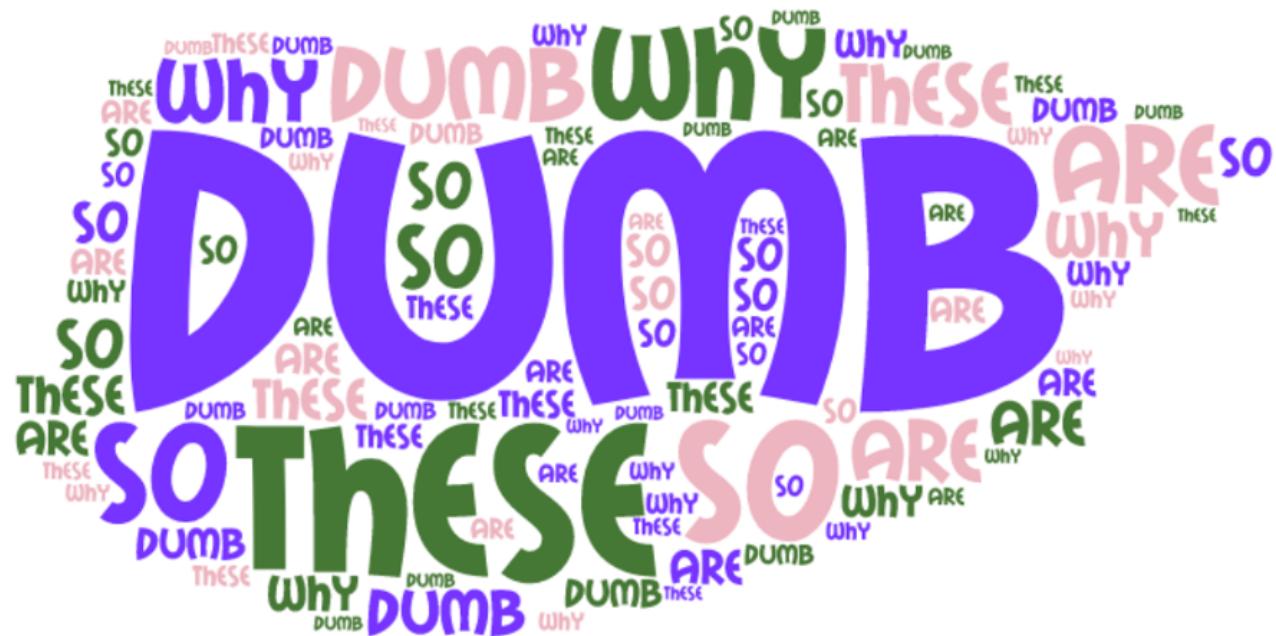
Qualitative text-based data

Free responses

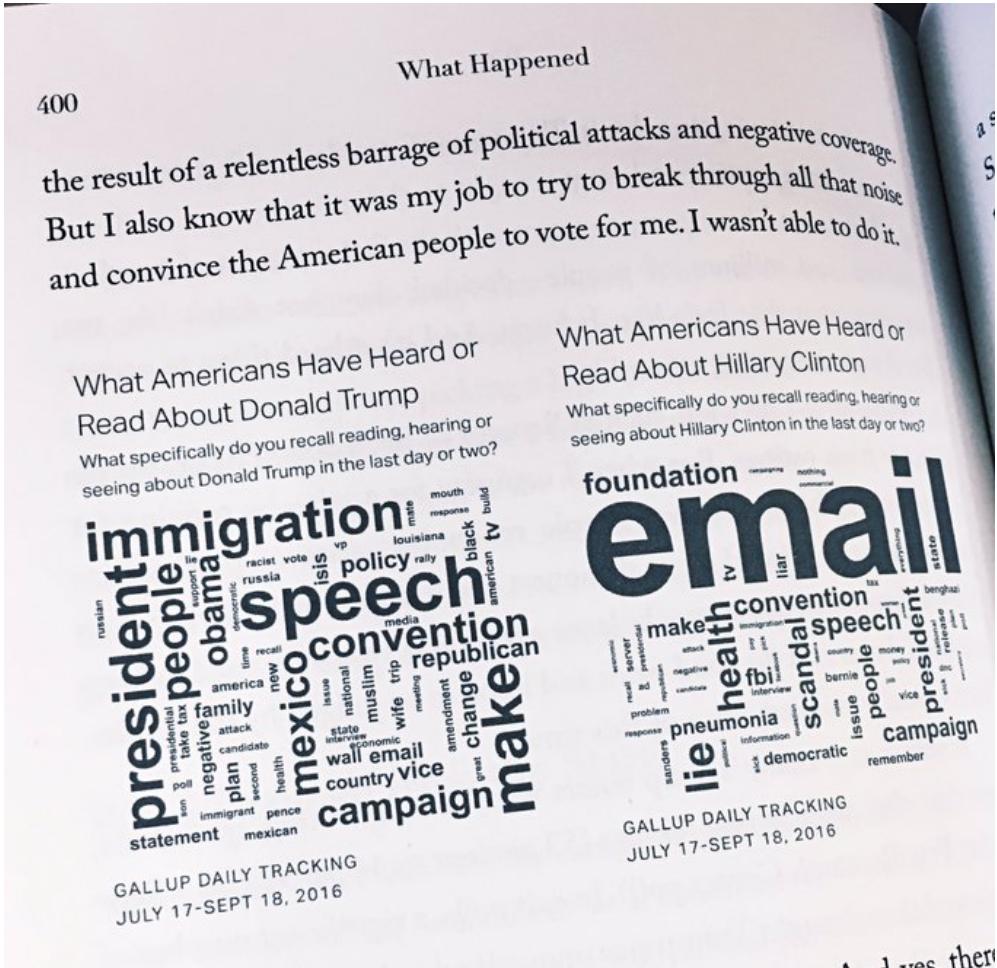
N	O	P	
donate_likely	amount_donate	amount_keep	amount_why
Somewhat unlikely	0	100	I am poor
Somewhat unlikely	0	100	I really feel like I deserve to treat myself recently. I have been working hard.
Somewhat likely	10	90	I donate the amount that I usually would
Somewhat unlikely	0	100	i'm poor
Neither likely nor unlikely	10	90	It is not a cause that is very important to me. i have other things to do.
Extremely likely	29	71	I want to contribute to the cause, but also keep some of the money.
Somewhat likely	20	80	It's a reasonable amount of money for an individual to donate to a charity.
Extremely unlikely	0	100	I don't fully agree with their mission
Somewhat likely	10	90	I am pretty poor so I need to keep some for myself, but I also want to help others.
Extremely likely	5	95	I think it would be a good amount to give from the money I have available.
Neither likely nor unlikely	69	31	to help with their cause
Somewhat unlikely	0	100	My dad always told me to give until it hurts, and right now I am hurting.
Neither likely nor unlikely	0	100	I would rather keep the money for myself and find a charity that I care about.
Extremely unlikely	0	100	I want the most for myself.
Neither likely nor unlikely	5	95	Can afford to give a little
Extremely unlikely	0	100	Because I would then have 100\$ more dollars.
Extremely unlikely	0	100	I'm a broke boi. If anyone need humanitarian aid, it's me.
Somewhat likely	10	90	I'm in a position where I would need the extra money, but I also want to help others.
Somewhat unlikely	90	10	I think it is a worthy cause and I think donating 90% of the amount is fair.
Extremely likely	50	50	I feel splitting it 50/50 would be a fair deal. I get to help make a difference.
Extremely likely	20	80	I feel that my contribution is enough. I would gladly donate again.
Somewhat likely	9	91	give a little
Somewhat likely	1	99	I like money
Somewhat unlikely	0	100	I do not really know what they will do with the money.

Typical free responses from a survey

y tho?

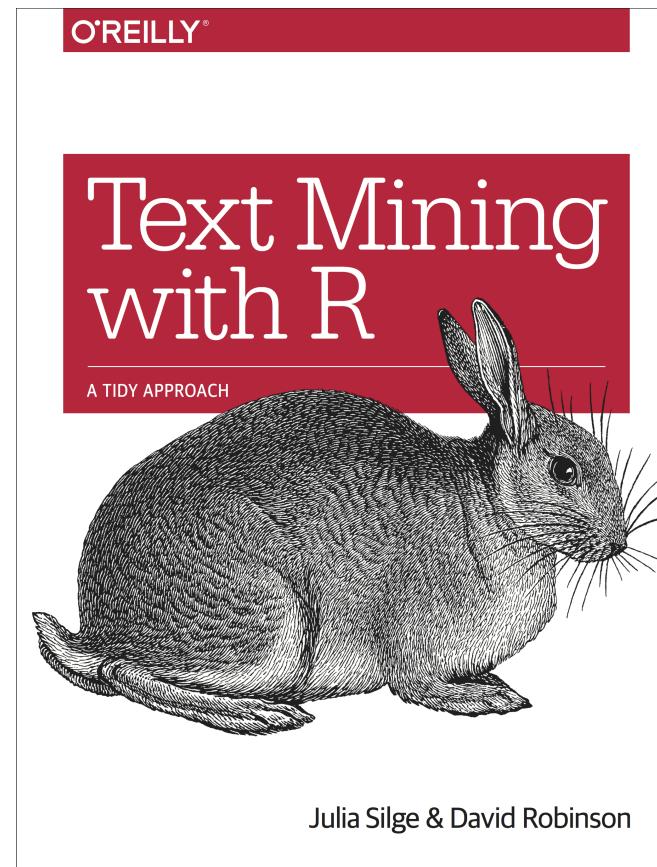


Some cases are okay



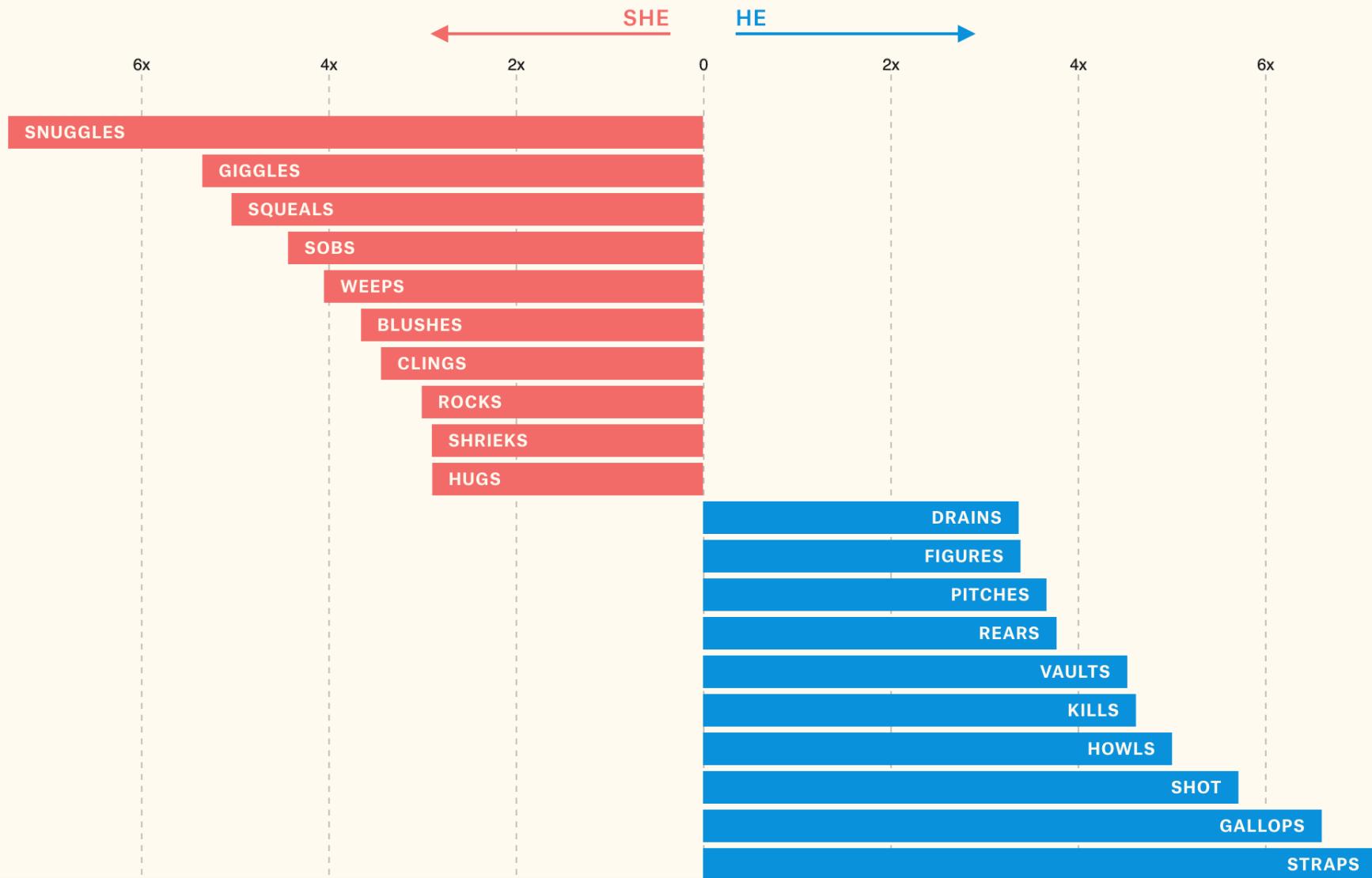
Word clouds for grownups

Count words, but in fancier ways

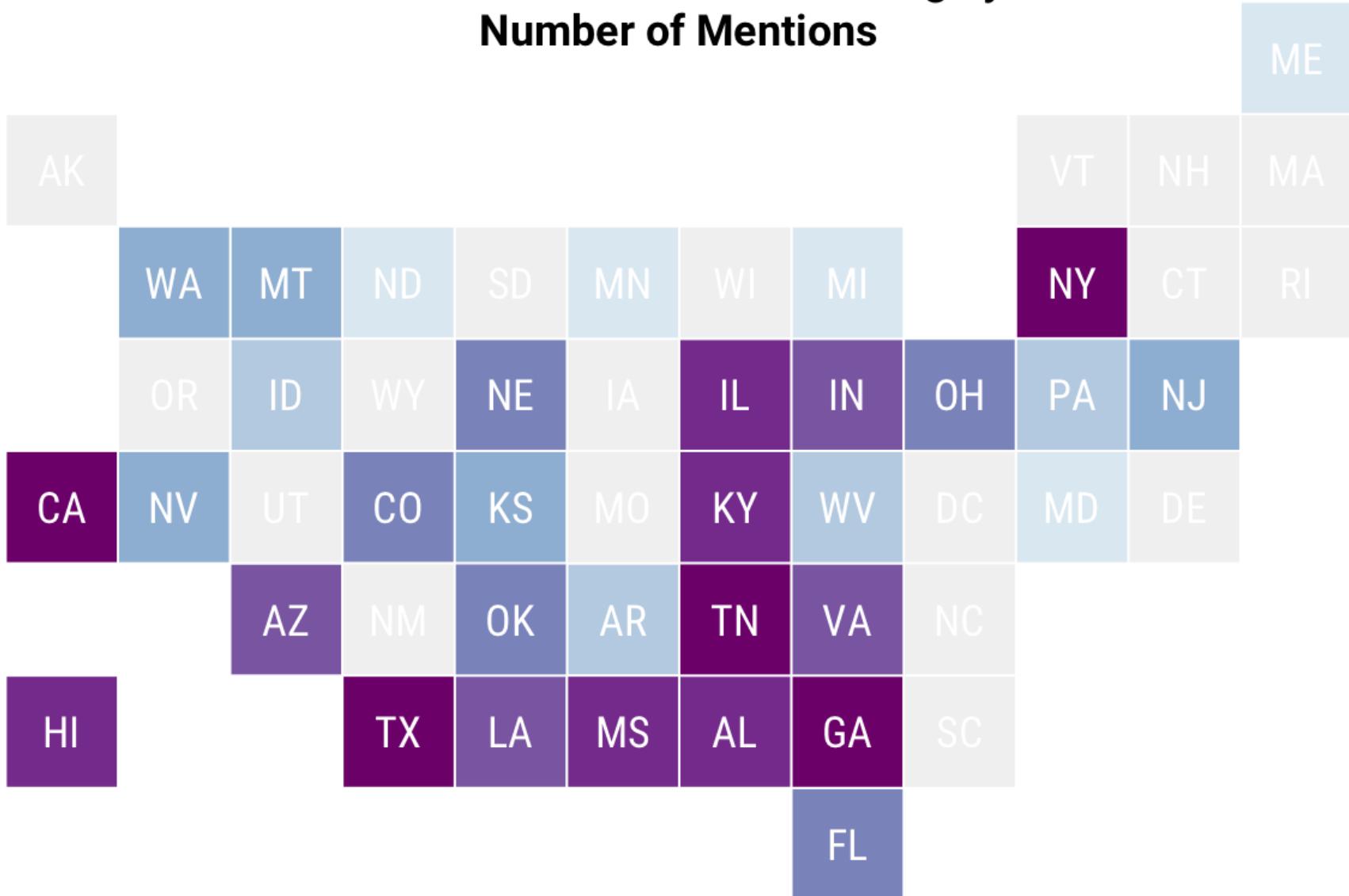


The most used words for women vs. men

Likelihood that certain words appear after “she” vs. “he” in screen direction.



What States Are Mentioned in Song Lyrics? Number of Mentions



Crash course in computational linguistics

Core concepts and techniques

Tokens, lemmas, and parts of speech

Sentiment analysis

tf-idf

Topics and LDA

Fingerprinting

Regular text

THE BOY WHO LIVED Mr. and Mrs. Dursley, of number four, Privet Drive, were proud to say that they were perfectly normal, thank you very much. They were the last people you'd expect to be involved in anything strange or mysterious, because they just didn't hold with such nonsense. Mr. Dursley was the director of a firm called Grunnings, which made drills. He was a big, beefy man with hardly any neck, although he did have a very large mustache. Mrs. Dursley was thin and blonde and had nearly twice the usual amount of neck, which came in very useful as she spent so much of her time craning over garden fences, spying on the neighbors. The Dursleys had a small son called Dudley and in their opinion there was no finer boy anywhere. The Dursleys had everything they wanted, but they also had a secret, and their greatest fear was that somebody would discover it. They didn't think they could bear it if anyone found out about the Potters. Mrs. Potter was Mrs. Dursley's sister, but they hadn't met for several years; in fact, Mrs. Dursley pretended she didn't have a sister, because her sister and her good-for-nothing husband were as unDursleyish as it was possible to be. The Dursleys shuddered to think what the neighbors would say if the Potters a...

Tidy text

One row for each text element

Can be chapter, page, verse, etc.

```
# A tibble: 6 × 3
#> #> chapter book          text
#> #> <int> <chr>        <chr>
#> 1     1 Harry Potter and the Philosopher's Stone "THE BOY WHO LIVED Mr. and Mrs. Dur...
#> 2     2 Harry Potter and the Philosopher's Stone "THE VANISHING GLASS Nearly ten yea...
#> 3     3 Harry Potter and the Philosopher's Stone "THE LETTERS FROM NO ONE The escape...
#> 4     4 Harry Potter and the Philosopher's Stone "THE KEEPER OF THE KEYS BOOM. They ...
#> 5     5 Harry Potter and the Philosopher's Stone "DIAGON ALLEY Harry woke early the ...
#> 6     6 Harry Potter and the Philosopher's Stone "THE JOURNEY FROM PLATFORM NINE AND TH...
```

Tokens

Split the text into even smaller parts

Paragraph, line, verse, sentence, n-gram, word, letter, etc.

```
# A tibble: 6 × 3
  word    chapter book
  <chr>   <int>  <chr>
1 the        1 Harry Potter...
2 boy        1 Harry Potter...
3 who       1 Harry Potter...
4 lived     1 Harry Potter...
5 mr         1 Harry Potter...
6 and       1 Harry Potter...
```

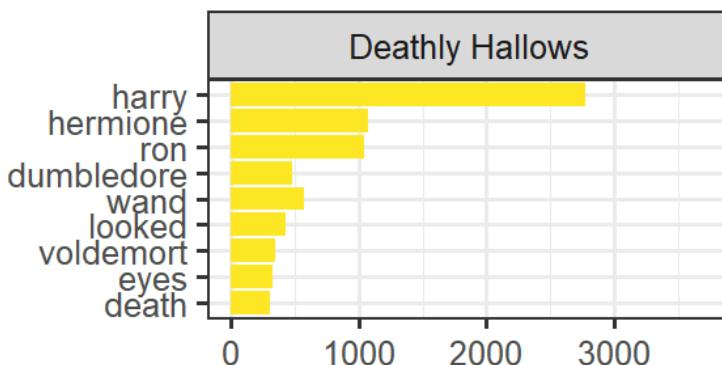
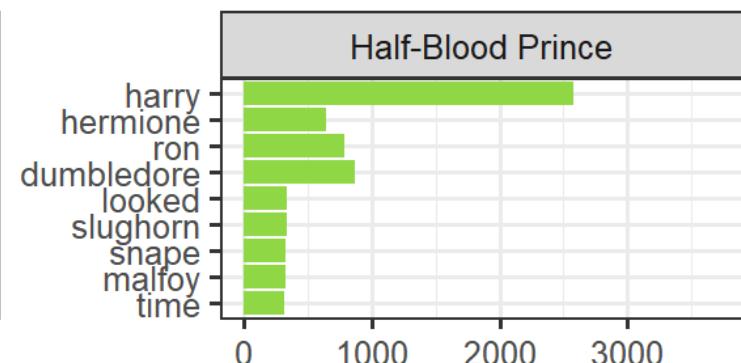
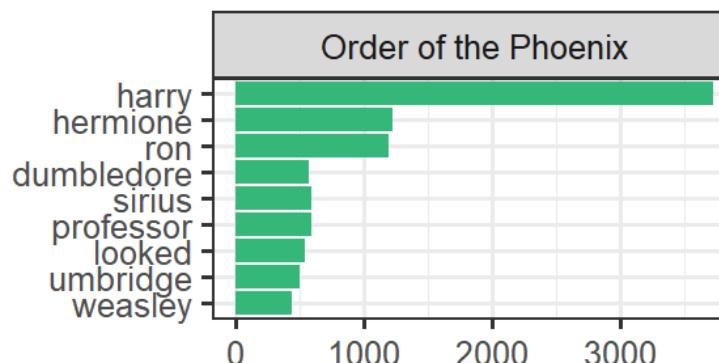
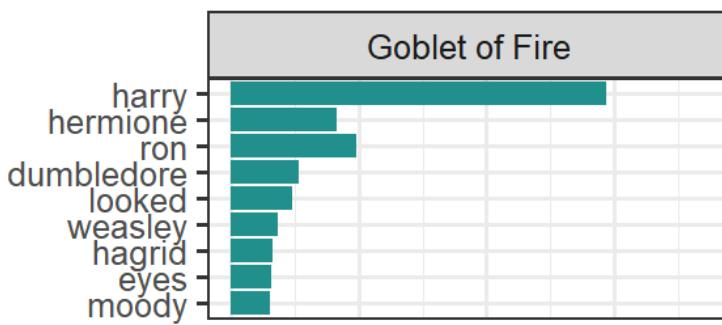
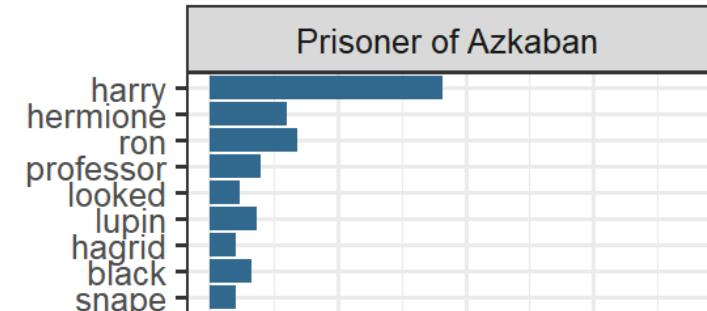
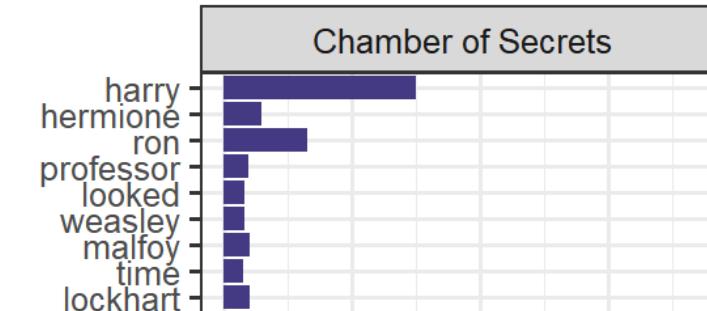
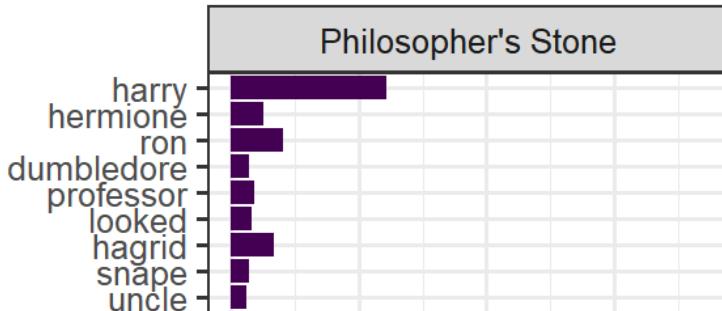
```
# A tibble: 6 × 3
  bigram    chapter book
  <chr>      <int>  <chr>
1 the boy    1 Harry Potter...
2 boy who    1 Harry Potter...
3 who lived  1 Harry Potter...
4 lived mr   1 Harry Potter...
5 mr and    1 Harry Potter...
6 and mrs   1 Harry Potter...
```

Stop words

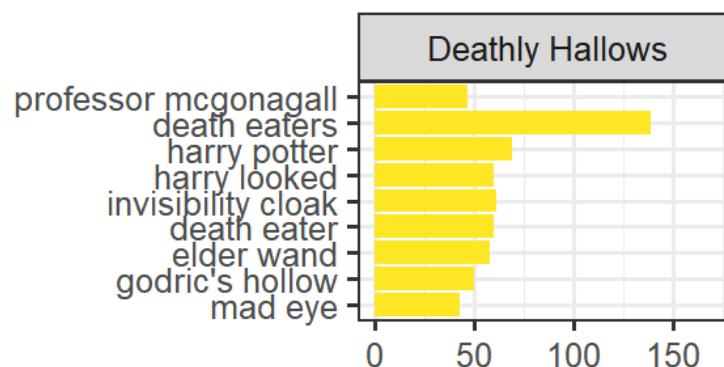
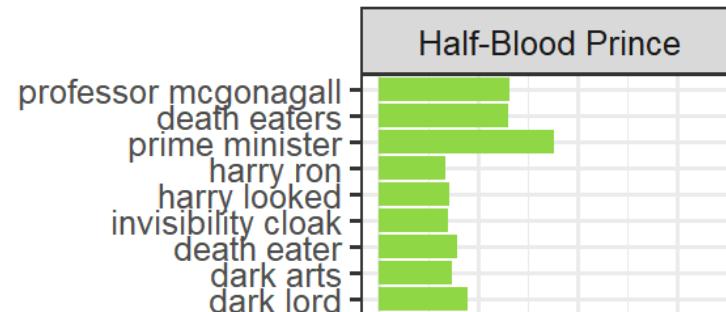
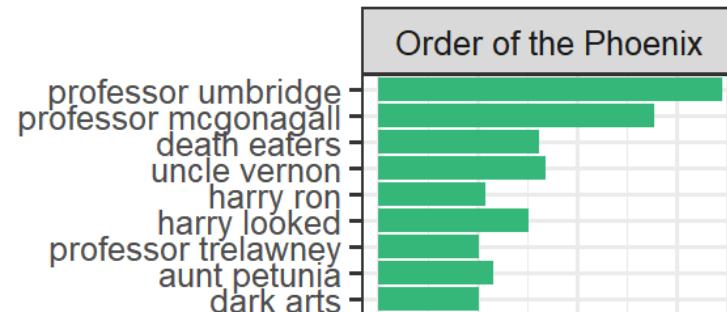
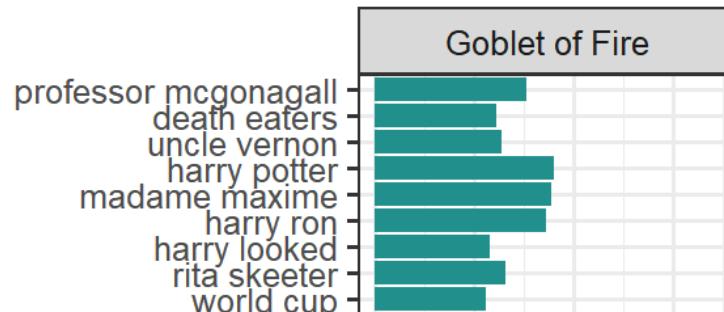
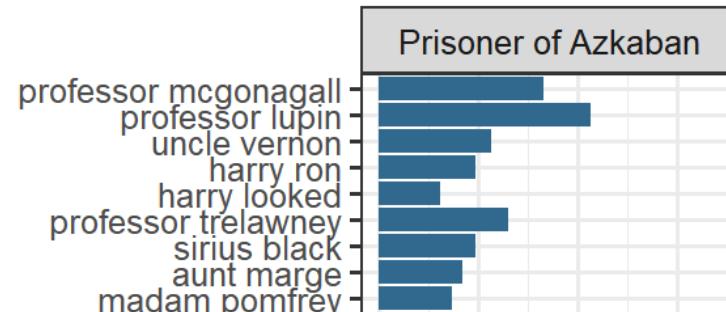
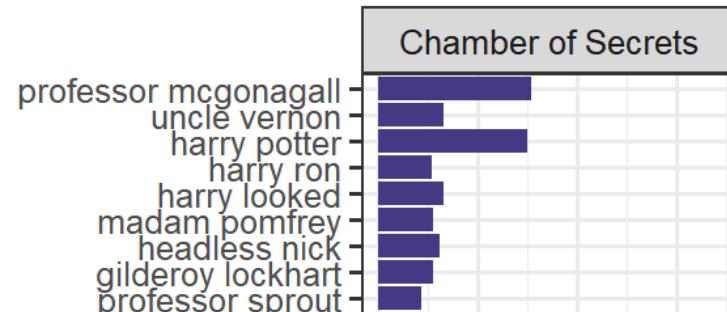
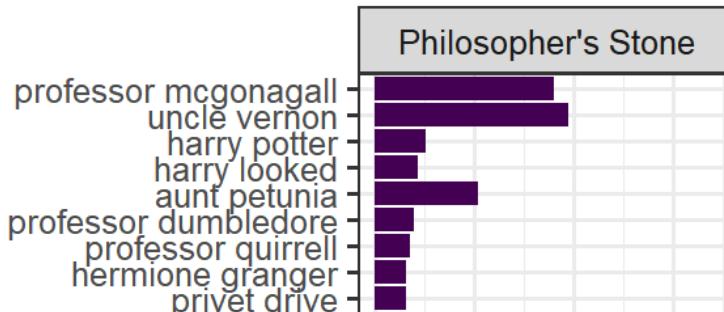
Common words that we can generally ignore

```
# A tibble: 1,149 × 2
  word      lexicon
  <chr>     <chr>
1 a         SMART
2 a's       SMART
3 able      SMART
4 about     SMART
5 above     SMART
6 according SMART
7 accordingly SMART
8 across    SMART
9 actually  SMART
10 after    SMART
# i 1,139 more rows
```

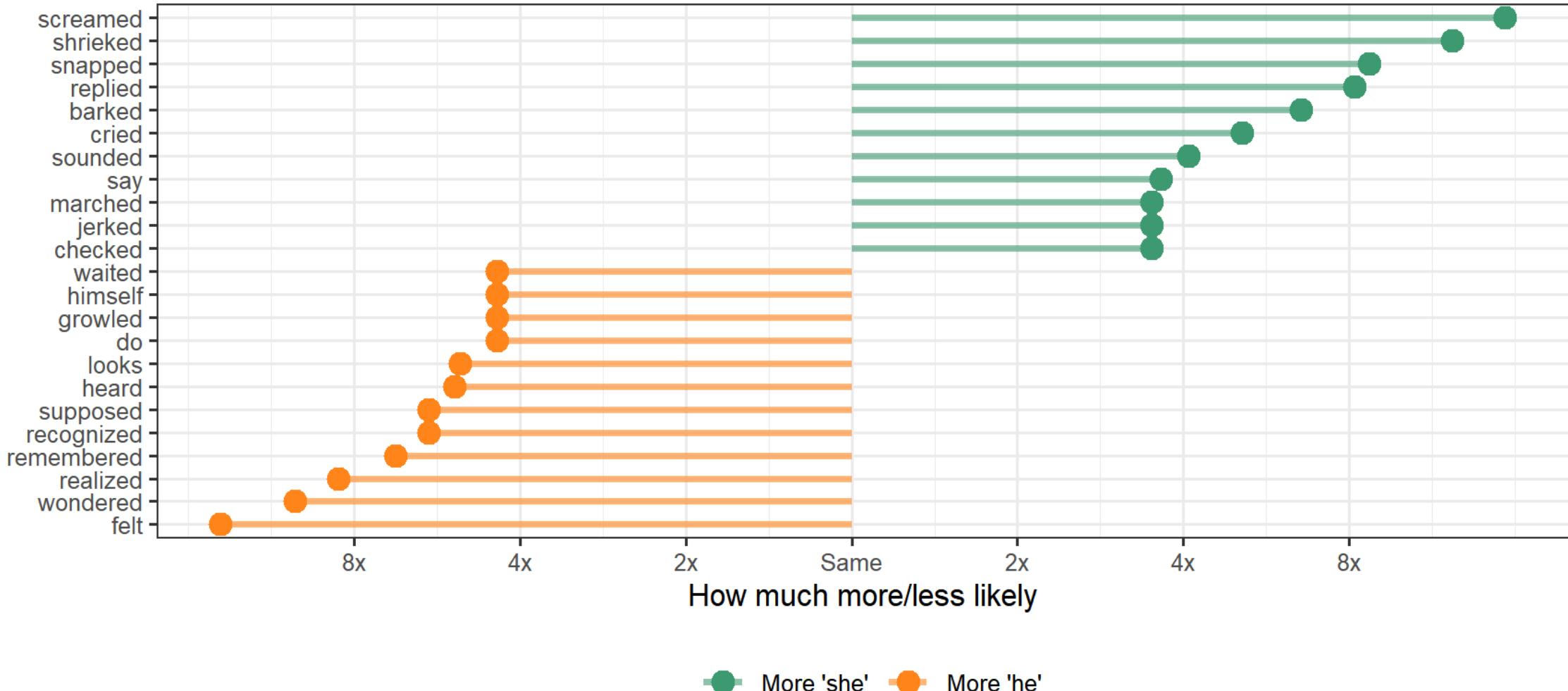
Token frequency: words



Token frequency: n-grams



Token frequency: n-gram ratios



Parts of speech

```
# A tibble: 50 × 11
  doc_id   sid    tid token token_with_ws lemma      upos     xpos   feats tid_source relation
  <dbl>   <dbl>  <dbl> <chr>  <chr>        <chr>      <chr>  <chr> <chr> <dbl> <chr>
1       1     1      1 THE    THE          the       DET     DT   Defin...
2       1     1      2 BOY    BOY          Boy      NOUN    NN   Numbe...
3       1     1      3 WHO    WHO          who      PRON    WP   PronT...
4       1     1      4 LIVED  LIVED        live     VERB    VBD  Mood=...
5       1     1      5 Mr.   Mr.          Mr.     PROPN   NNP  Numbe...
6       1     1      6 and   and          and     CCONJ   CC   <NA>
7       1     1      7 Mrs.  Mrs.          Mrs.    PROPN   NNP  Numbe...
8       1     1      8 Dursley Dursley  Dursley PROPN   NNP  Numbe...
9       1     1      9 ,     ,            ,       PUNCT   ,    <NA>
10      1     1     10 of   of          of      ADP     IN   <NA>
# i 40 more rows
```

These use the Penn part of speech tags

Parts of speech frequency

Verbs

```
# A tibble: 1,557 × 2
  lemma      n
  <chr>    <dbl>
1 say        920
2 get        440
3 have       417
4 go         384
5 look       380
6 be         310
7 know       310
8 see         303
9 think      230
10 do         227
# i 1,547 more rows
```

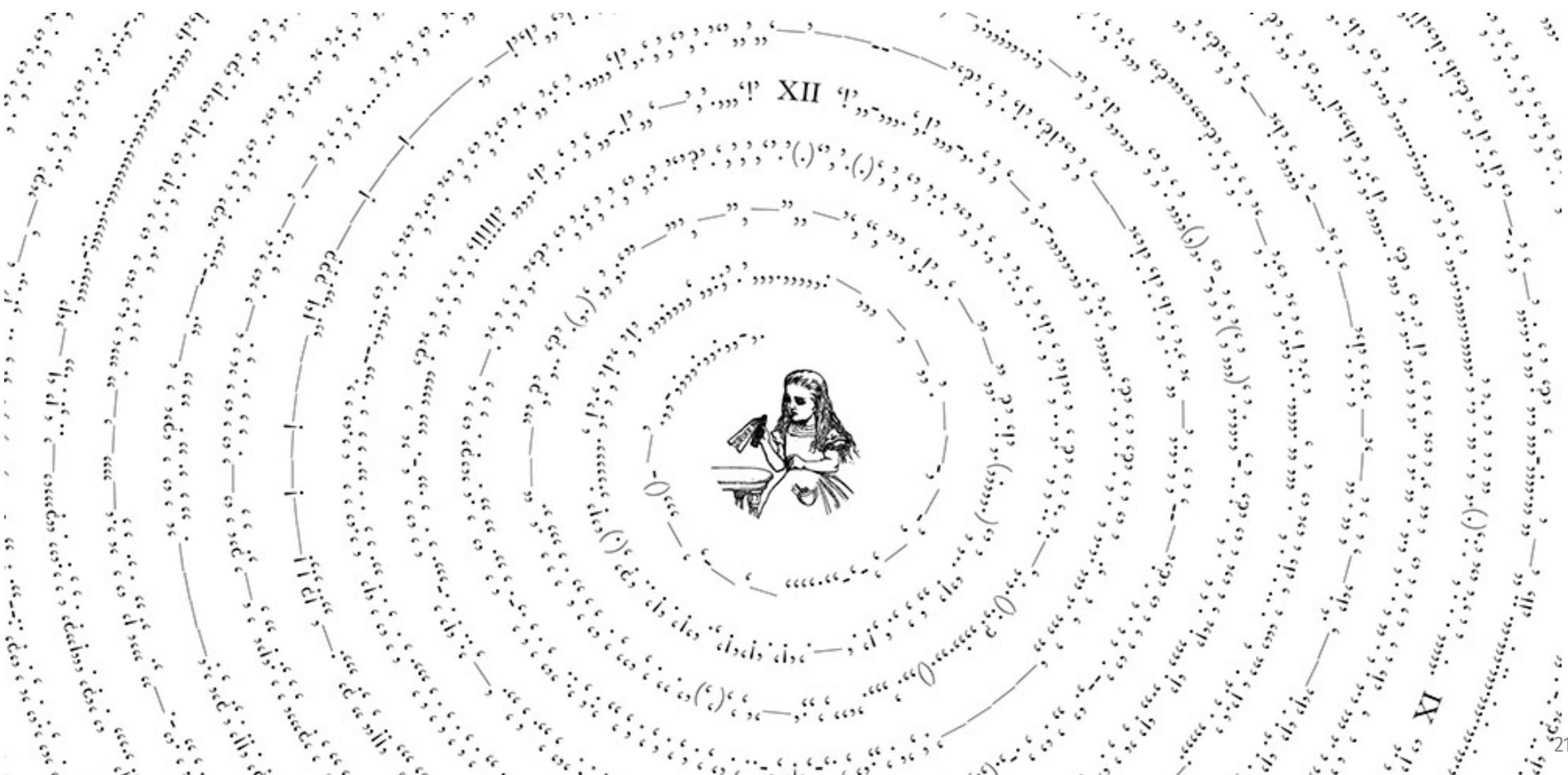
Nouns

```
# A tibble: 2,852 × 2
  lemma      n
  <chr>    <dbl>
1 Harry     1315
2 Ron        423
3 Hagrid    258
4 Professor  167
5 Snape      154
6 Hermione   153
7 Dumbledore 144
8 time        138
9 Dudley     136
10 uncle      122
# i 2,842 more rows
```

Adjectives & adverbs

```
# A tibble: 1,240 × 2
  lemma      n
  <chr>    <dbl>
1 back      223
2 so         215
3 just       180
4 when       178
5 very       171
6 now         166
7 then       165
8 all         147
9 how         136
10 there      123
# i 1,230 more rows
```

Artsy stuff



Sentiment analysis

```
get_sentiments("bing")
```

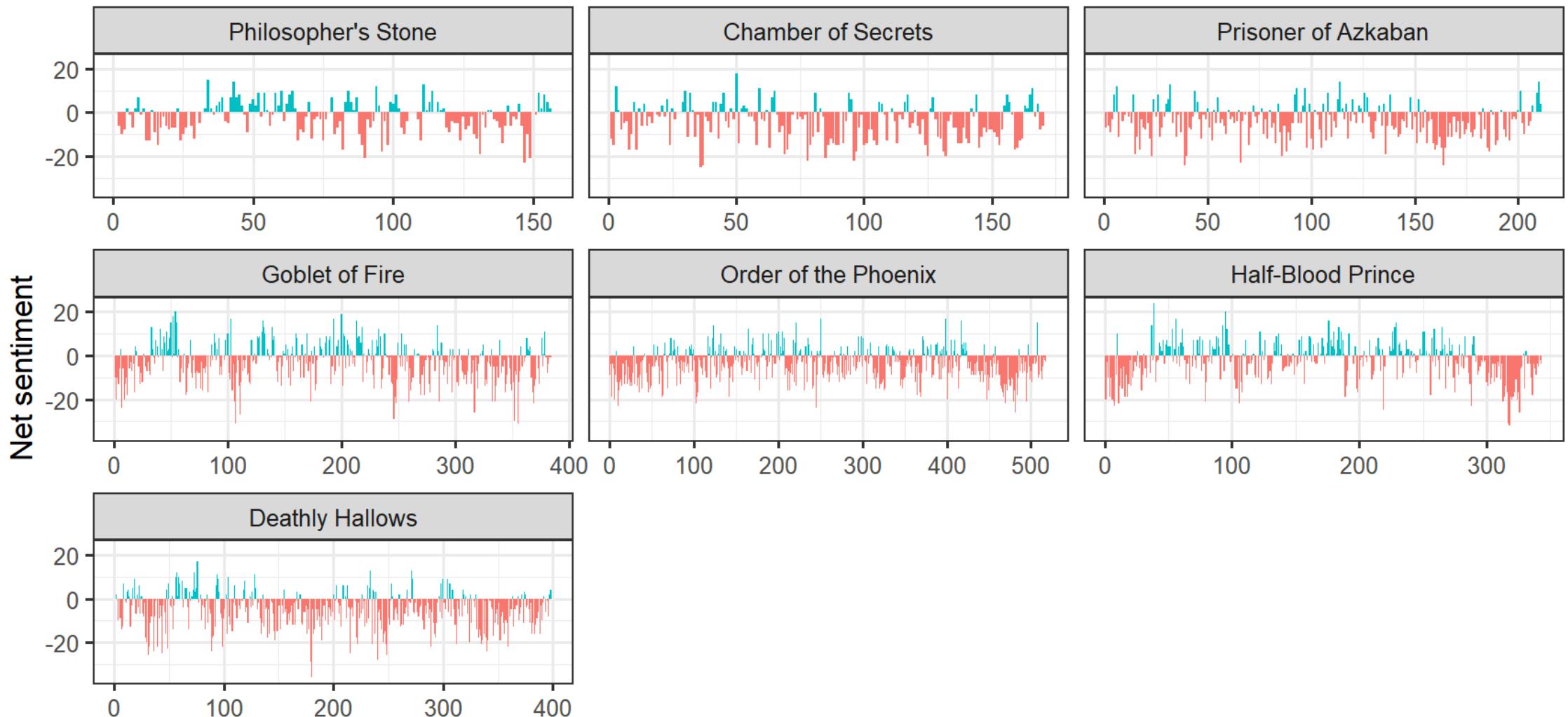
```
# A tibble: 6,786 × 2
  word      sentiment
  <chr>     <chr>
1 2-faces   negative
2 abnormal   negative
3 abolish    negative
4 abominable negative
5 abominably negative
6 abominate   negative
7 abomination negative
8 abort      negative
9 aborted     negative
10 aborts     negative
# i 6,776 more rows
```

```
get_sentiments("afinn")
```

```
# A tibble: 2,477 × 2
  word      value
  <chr>     <dbl>
1 abandon    -2
2 abandoned  -2
3 abandons   -2
4 abducted   -2
5 abduction  -2
6 abductions -2
7 abhor      -3
8 abhorred   -3
9 abhorrent  -3
10 abhors    -3
# i 2,467 more rows
```

```
get_sentiments("nrc")
```

```
# A tibble: 13,872 × 2
  word      sentiment
  <chr>     <chr>
1 abacus    trust
2 abandon   fear
3 abandon   negative
4 abandon   sadness
5 abandoned anger
6 abandoned fear
7 abandoned negative
8 abandoned sadness
9 abandonment anger
10 abandonment fear
# i 13,862 more rows
```



tf-idf

Term frequency-inverse document frequency

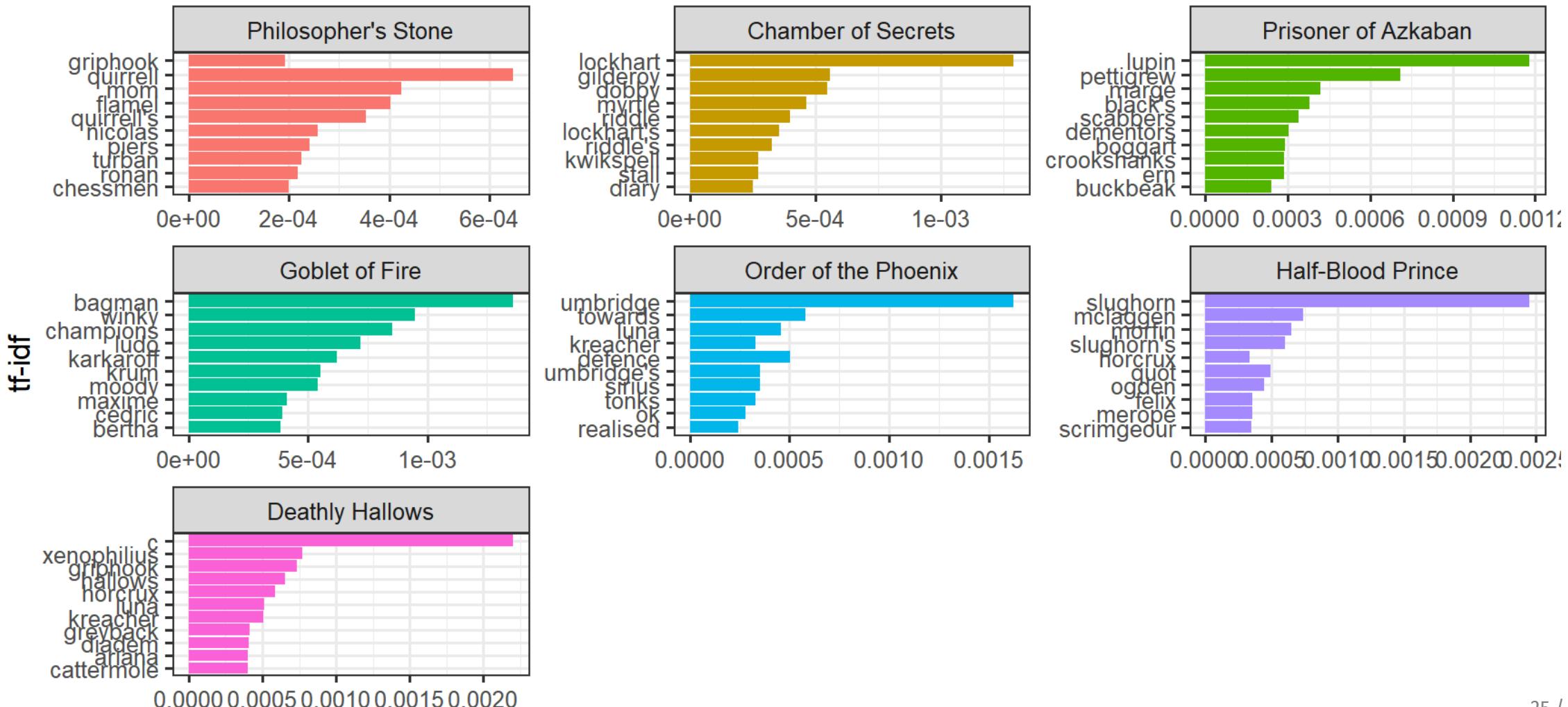
How important a term is compared to the rest of the documents

$$tf = \frac{n_{\text{term}}}{n_{\text{terms in document}}}$$

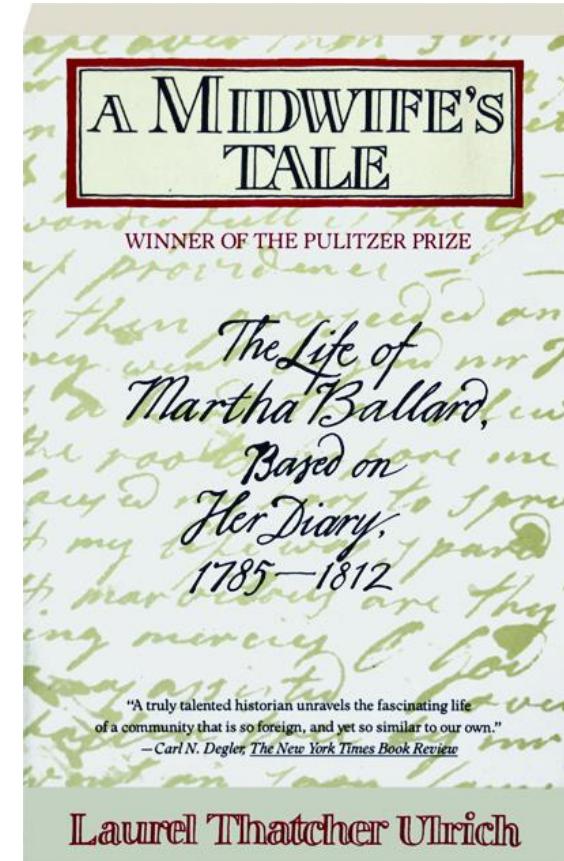
$$idf(\text{term}) = \ln \left(\frac{n_{\text{documents}}}{n_{\text{documents containing term}}} \right)$$

$$tf\text{-}idf(\text{term}) = tf(\text{term}) \times idf(\text{term})$$

tf-idf



Topic modeling



Latent Dirichlet Allocation (LDA)

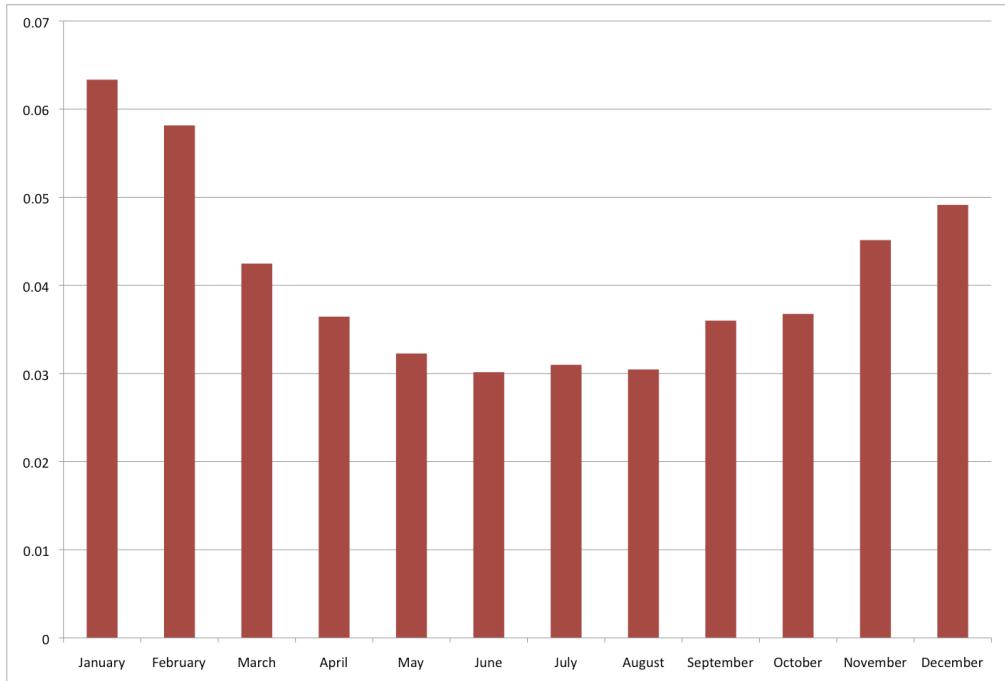


Clusters of related words

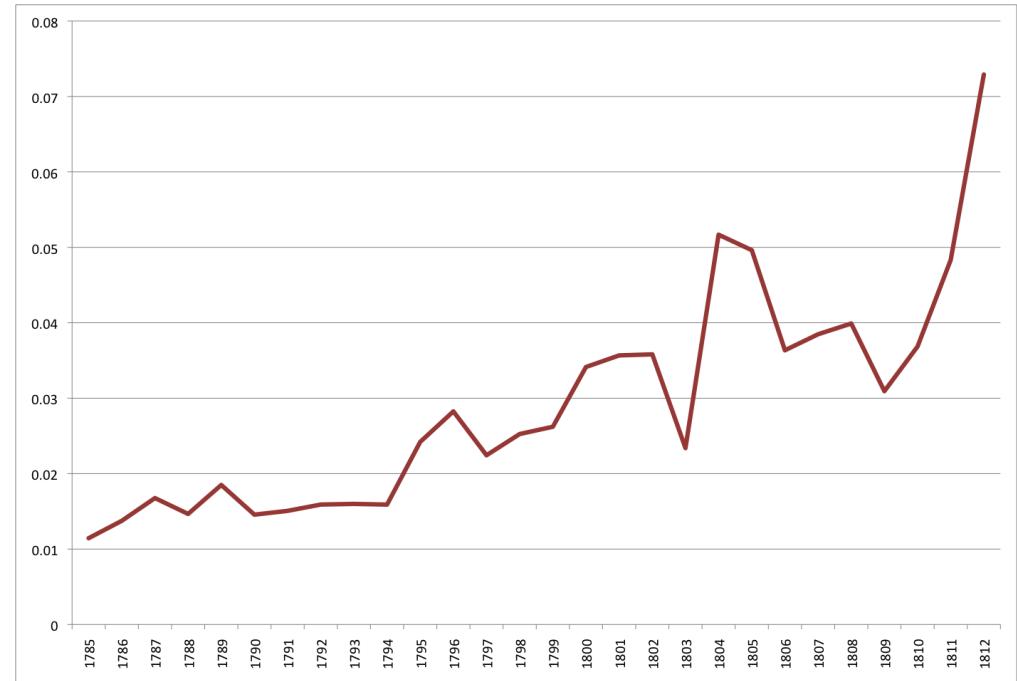
Topic label Topic words

Midwifery	birth safe morn receivd calld left cleverly pm labour ...
Church	meeting attended afternoon reverend worship ...
Death	day yesterday informd morn years death expired ...
Gardening	gardin sett worked clear beens corn warm planted ...
Shopping	lb made brot bot tea butter sugar carried ...
Illness	unwell sick gave dr rainy easier care head neighbor ...

Track topics over time

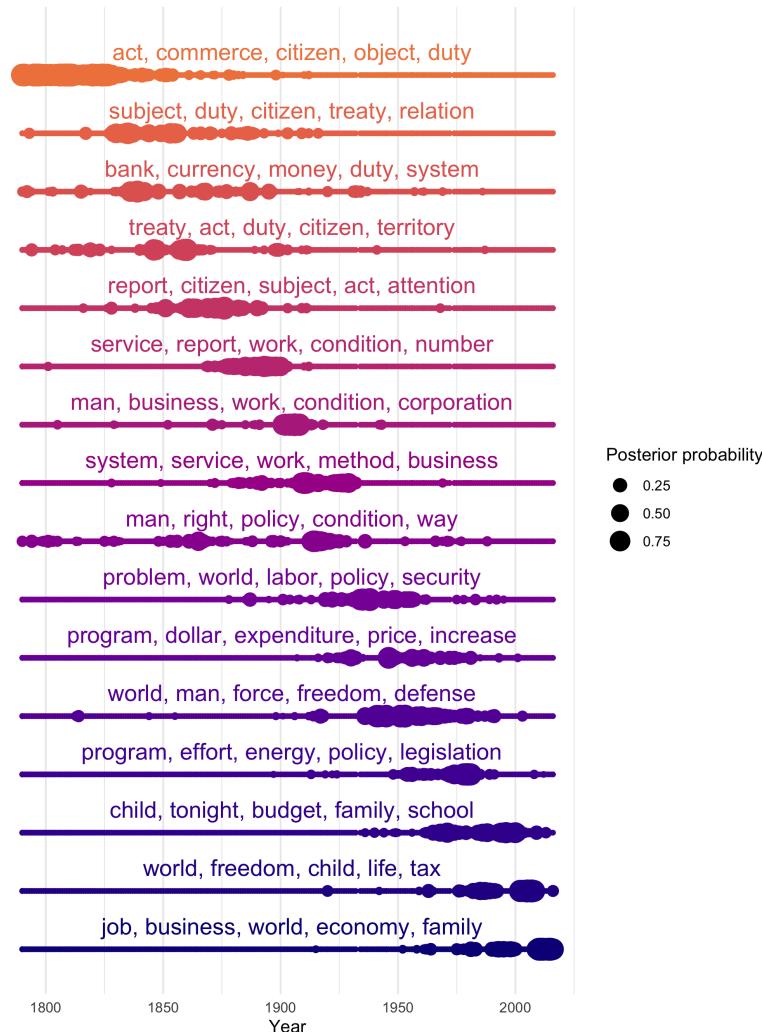


Cold weather topic by month



Emotion topic over time

State of the Union addresses



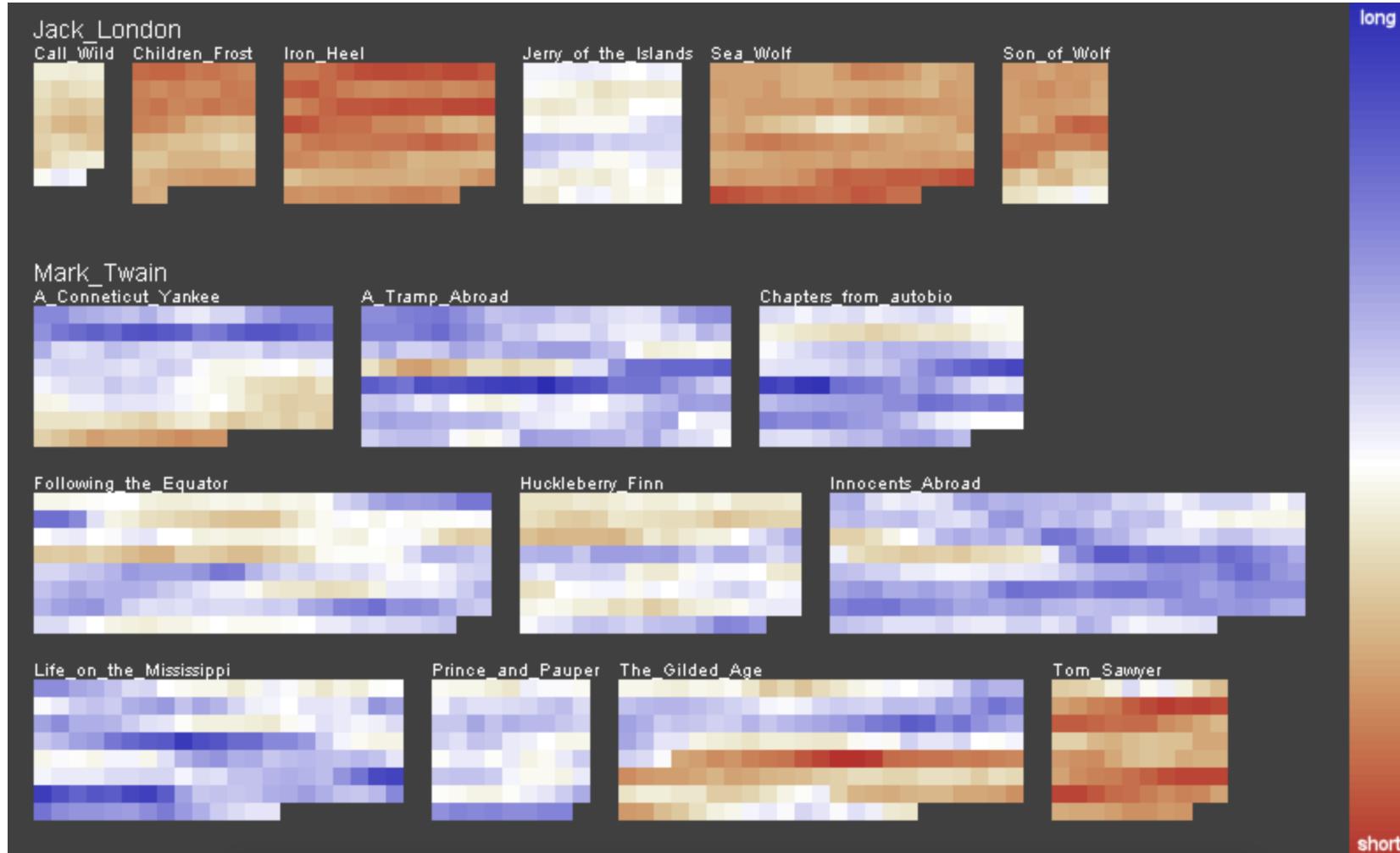
Fingerprinting

Analyze richness or uniqueness of a document

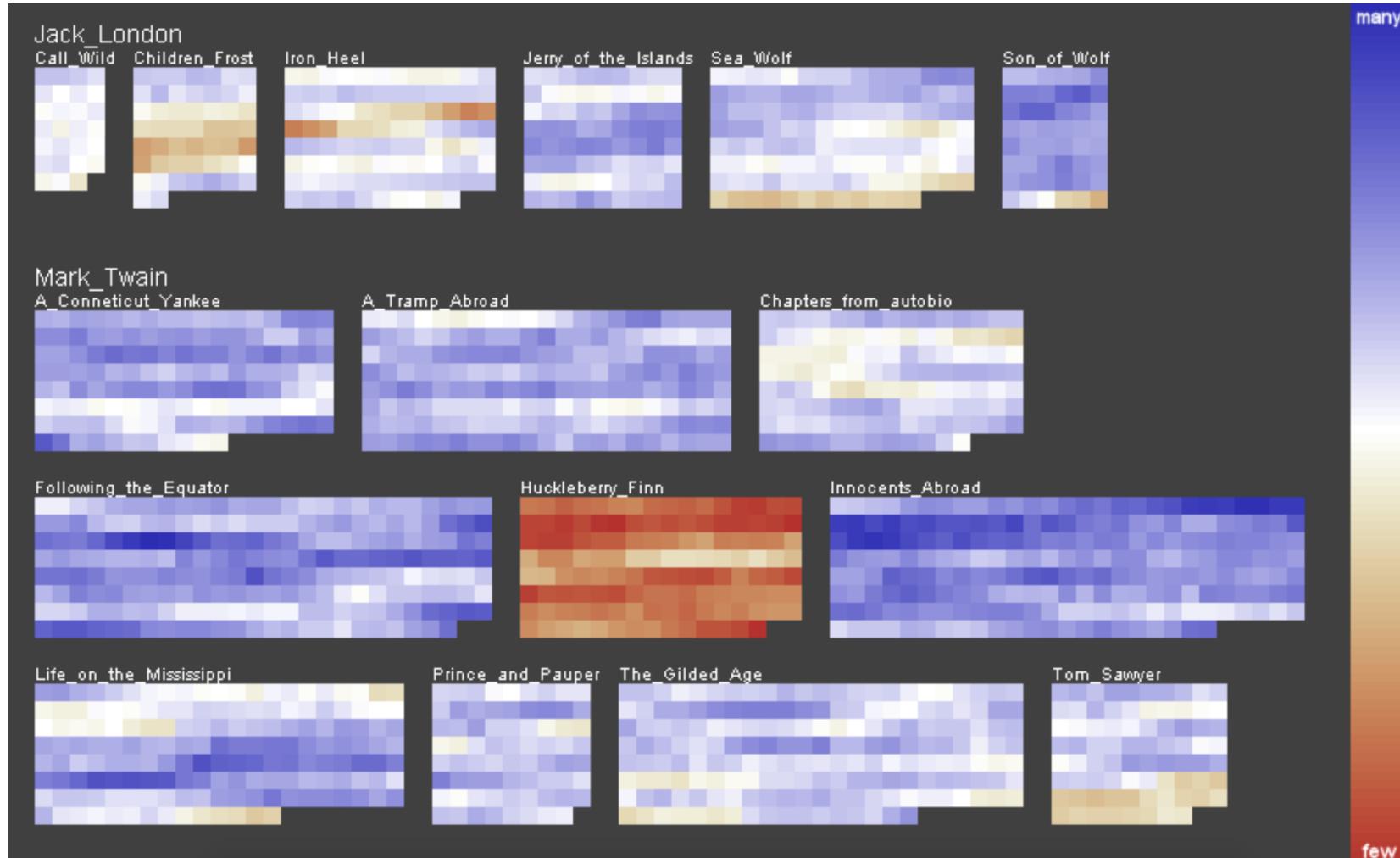
Punctuation patterns, vocabulary choices, sentence length

Hapax legomenon

Sentence length



Hapax legomena



Verse length

