Stylometry with R

10 Computational 01
01 Stylistics 0101000
11 Group 011010110

Distant Reading

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About us

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Notes from our tutorial:
https://github.com/JoannaBy/DHSI2019-Stylometry

Computational Stylistics Group:
https://computationalstylistics.github.io/

Tell us about yourselves.

What's your name (and pronouns)?

Where are you from?

Why are you interested in stylometry?

What's your project?

What is stylometry?

Stylometry =

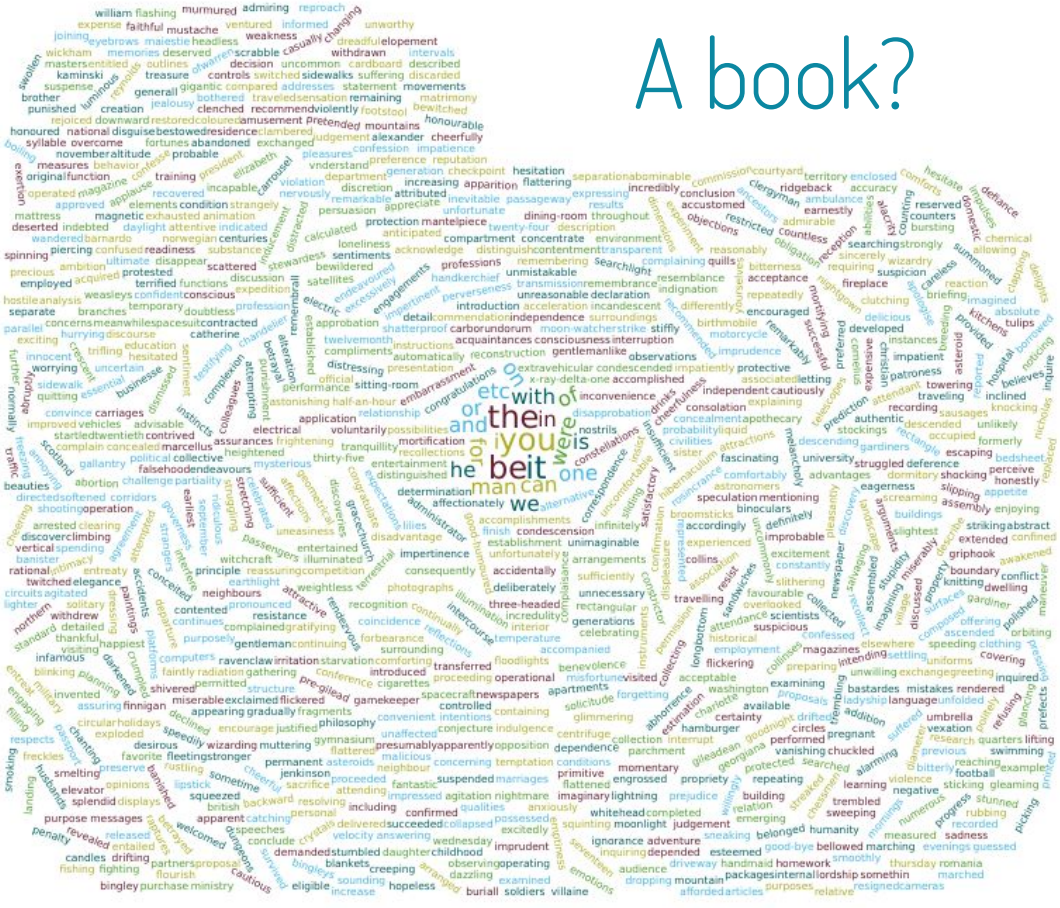
use of **quantitative methods**
to examine **similarities** and
differences within **a group of texts**

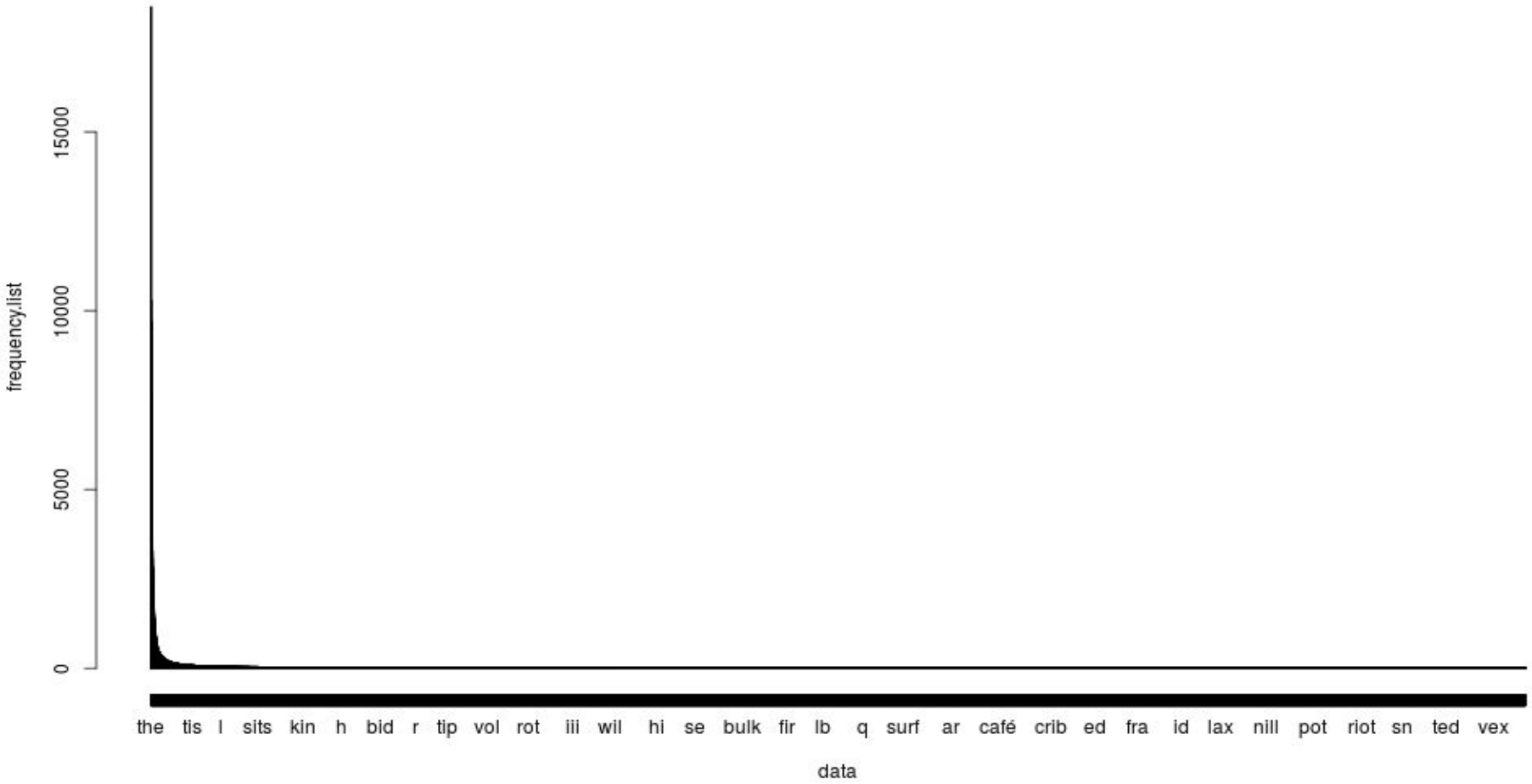
What do we need stylometry for?

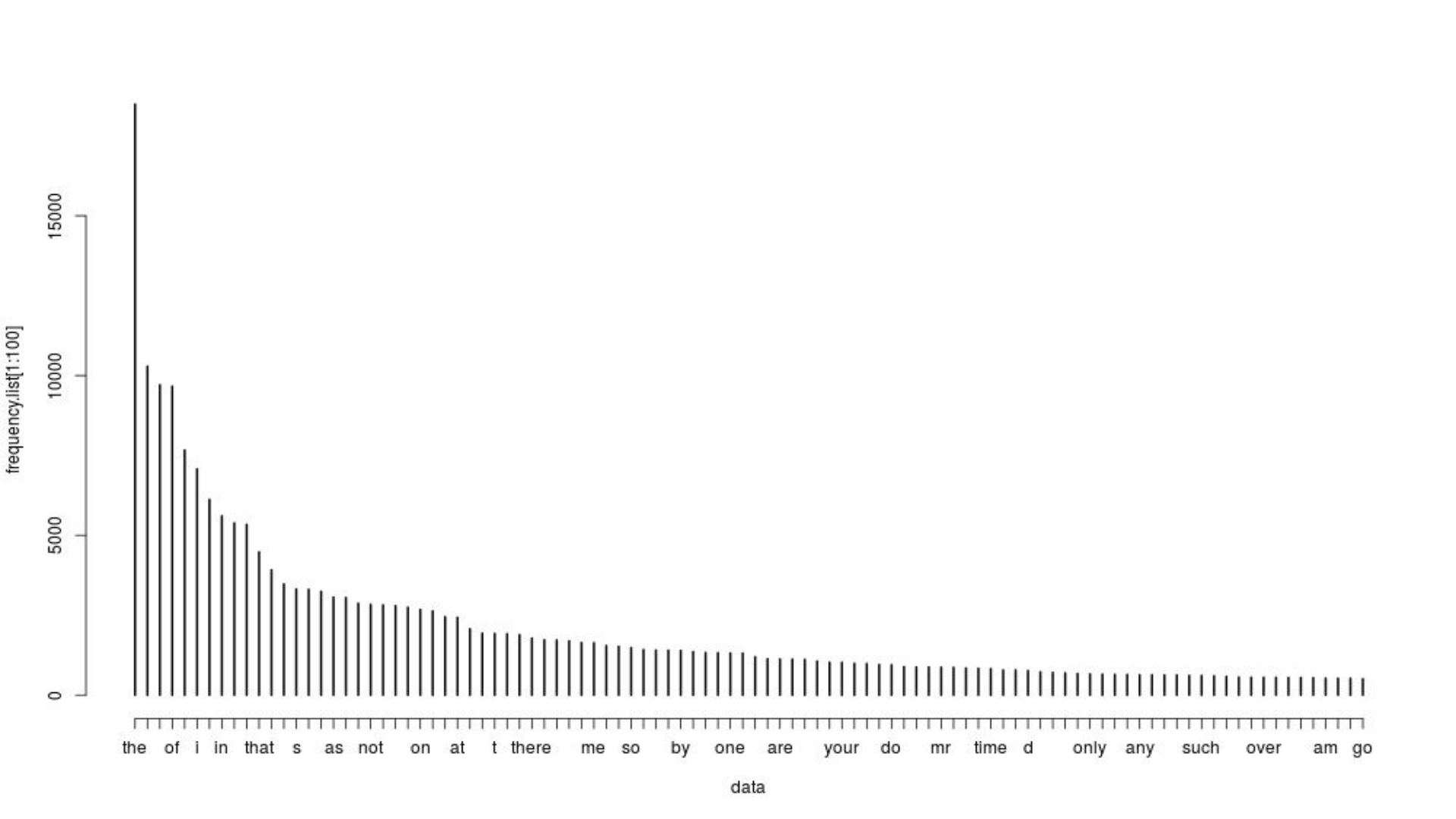
It is a truth NOT generally acknowledged that, in most discussions of works of English fiction, we proceed as if a third, two-fifths, or half of our material were not really there... That third, two-fifths, or half comprises the twenty, thirty or fifty most common words of [the] literary vocabulary. The identity of these words scarcely changes from novel to novel over the twenty years of her mature career. Eight personal pronouns, six auxiliary verb forms, five prepositions, three conjunctions, two adverbs, the definite and indefinite articles, and four other words ('to', 'that', 'for', and 'all'), each of which serves more than a single main grammatical function, almost always find their place - and usually about the same place - among the thirty most common words of each novel.

John Burrows, Computation into Criticism: A study of Jane Austen's Novels and an Experiment in Method, 1987

A book?




frequency.list
0
5000
10000
15000
the tis l sits kin h bid r tip vol rot iii wil hi se bulk fir lb q surf ar café crib ed fra id lax nill pot riot sn ted vex
data


frequency.list[1:100]
0
5000
10000
15000
the of i in that s as not on at t there me so by one are your do mr time d only any such over am go
data

The possibility of using frequency patterns of very common words rests upon the fact that words do not function as discrete entities. Since they gain their full meaning through the different sorts of relationship they form with each other, they can be seen as markers of those relationships and, accordingly, of everything that those relationships entail.

in: Wayne McKenna, John Burrows, Alexis Antonia (1999) Beckett's "Molloy": Computational Stylistics and the Meaning of Translation. Variété: Perspectives in French Literature, Society and Culture. Studies in Honour of Kenneth Raymond Dutton. Ed. Marie Ramsland. Peter Lang, Frankfurt, 79-92.

How does it work?

What do we need?

A corpus of texts

+

distance measure

+

classification algorithm

+

(visualisation)

	Agnes	Tenant	Emma	Pride	Sense	Jane
the	2511	5929	5204	4330	4105	7835
and	2733	6705	4878	3577	3489	6618
to	2366	5594	5186	4136	4103	5152
of	1602	3734	4292	3609	3571	4359
i	2204	6075	3191	2064	1998	7165
a	1296	2792	3126	1948	2067	4467
in	911	2021	2174	1866	1948	2762
that	776	1909	1800	1577	1383	1655
he	659	2259	1811	1338	1112	1902
was	1000	1835	2400	1847	1861	2525
it	795	2280	2529	1532	1755	2403
you	760	2844	1999	1356	1191	2971
her	750	1760	2483	2224	2543	1714

	Agnes	Tenant	Emma	Pride	Sense	Jane
the	3.67471	3.54285	3.24344	3.55705	3.43227	4.18704
and	3.99959	4.00655	3.04026	2.93847	2.91722	3.53667
to	3.46251	3.34267	3.23222	3.39768	3.43060	2.75324
of	2.34444	2.23124	2.67503	2.96476	2.98579	2.32946
i	3.22543	3.63009	1.98882	1.69556	1.67057	3.82899
a	1.89662	1.66835	1.94831	1.60026	1.72826	2.38717
in	1.33320	1.20764	1.35496	1.53290	1.62876	1.47602
that	1.13563	1.14072	1.12187	1.29549	1.15635	0.88444
he	0.96441	1.34986	1.12872	1.09915	0.92977	1.01643
was	1.46344	1.09650	1.49582	1.51729	1.55602	1.34937
it	1.16344	1.36241	1.57622	1.25852	1.46739	1.28417
you	1.11222	1.69942	1.24589	1.11394	0.99582	1.58771
her	1.09758	1.05168	1.54755	1.82699	2.12625	0.91597

For two texts *T* and *T1*, and for a set of *n* words,

$$\Delta(T,T_1) = \frac{1}{n}\sum_{i=1}^{n}\left|z(f_i(T)) - z(f_i(T_1))\right|$$

Where $z(f_x(T)) = \frac{f_x(T) - \mu_x}{\sigma_x}$;

$f_x(T)$ = raw frequency of word *x* in text T;

μ_x = mean frequency of word *x* in a collection of texts;

σ_x = standard deviation of frequency of word *x*.

= what's the difference in how two texts use a given feature, compared to its average use

E.g. …

	Agnes	Tenant	Emma	Pride	Sense	Jane
the	3.67471	3.54285	3.24344	3.55705	3.43227	4.18704
and	3.99959	4.00655	3.04026	2.93847	2.91722	3.53667
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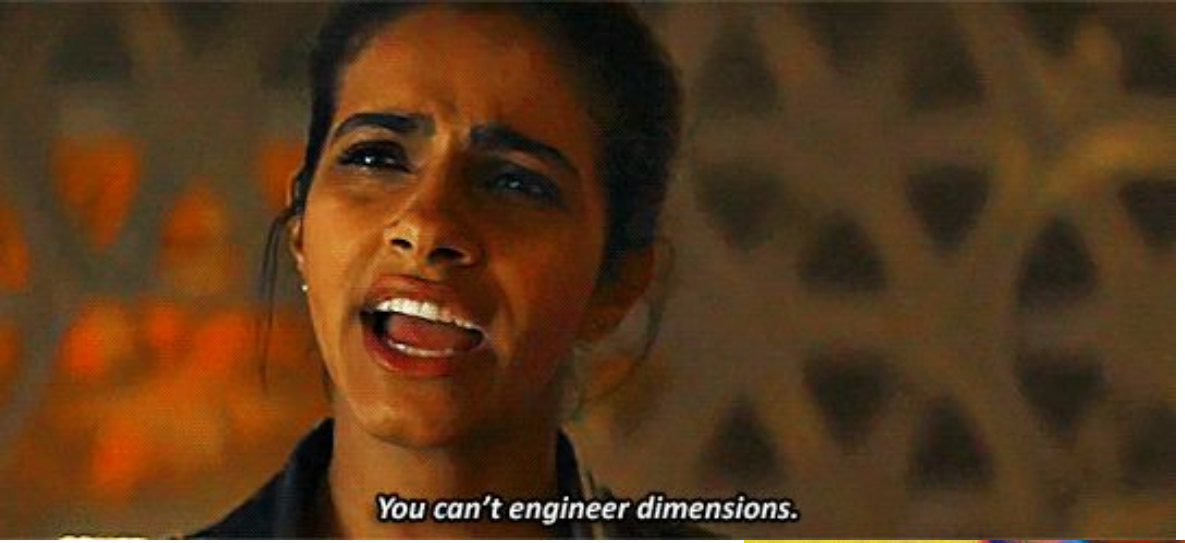
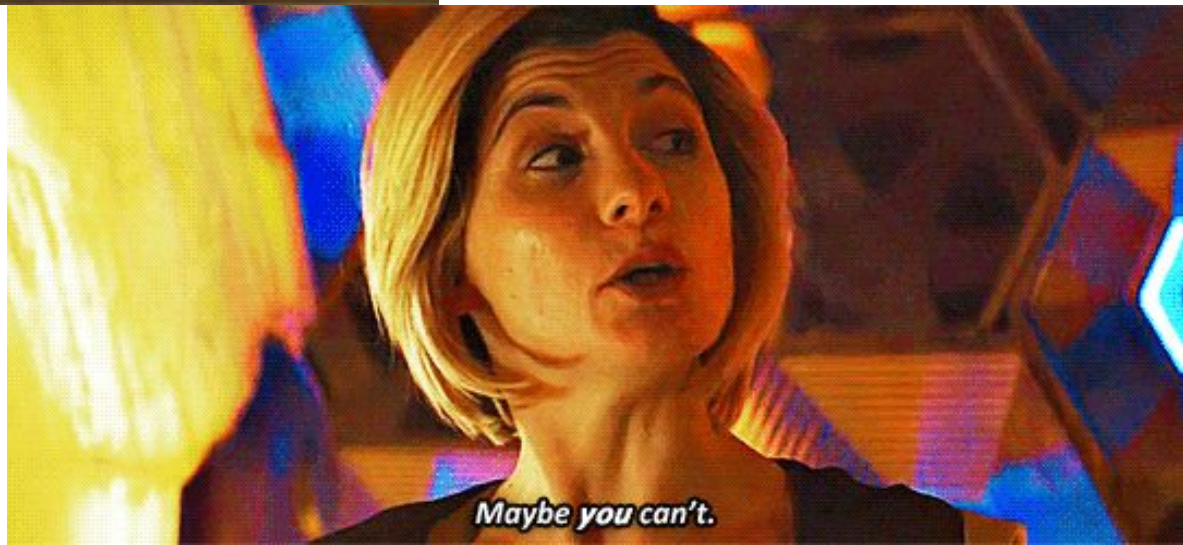
	Agnes	Pride	Jane	David	Mill	Tom	Clarissa
Tenant	0.81	1.07	0.88	0.92	0.98	1.16	1.1
Emma	1.12	0.78	1.28	1.15	1.2	1.25	1.24
Sense	1.14	0.69	1.24	1.16	1.25	1.13	1.21
Professor	1.06	1.21	0.69	0.94	1	1.27	1.3
Villette	1.07	1.26	0.65	0.91	0.96	1.28	1.3
Bleak	1.09	1.18	0.92	0.55	0.87	1.21	1.17
Hard	1.16	1.25	0.96	0.65	0.91	1.26	1.25
Wuthering	1.06	1.31	0.81	0.94	1.01	1.32	1.27
Adam	1.13	1.37	0.95	0.9	0.66	1.42	1.32
Middlemarch	1.01	1.1	0.99	0.87	0.65	1.17	1.12
Joseph	1.2	1.19	1.24	1.18	1.29	0.64	1.11
Pamela	1.15	1.24	1.27	1.19	1.26	1.11	0.67
Sentimental	1.38	1.53	1.23	1.22	1.29	1.42	1.38

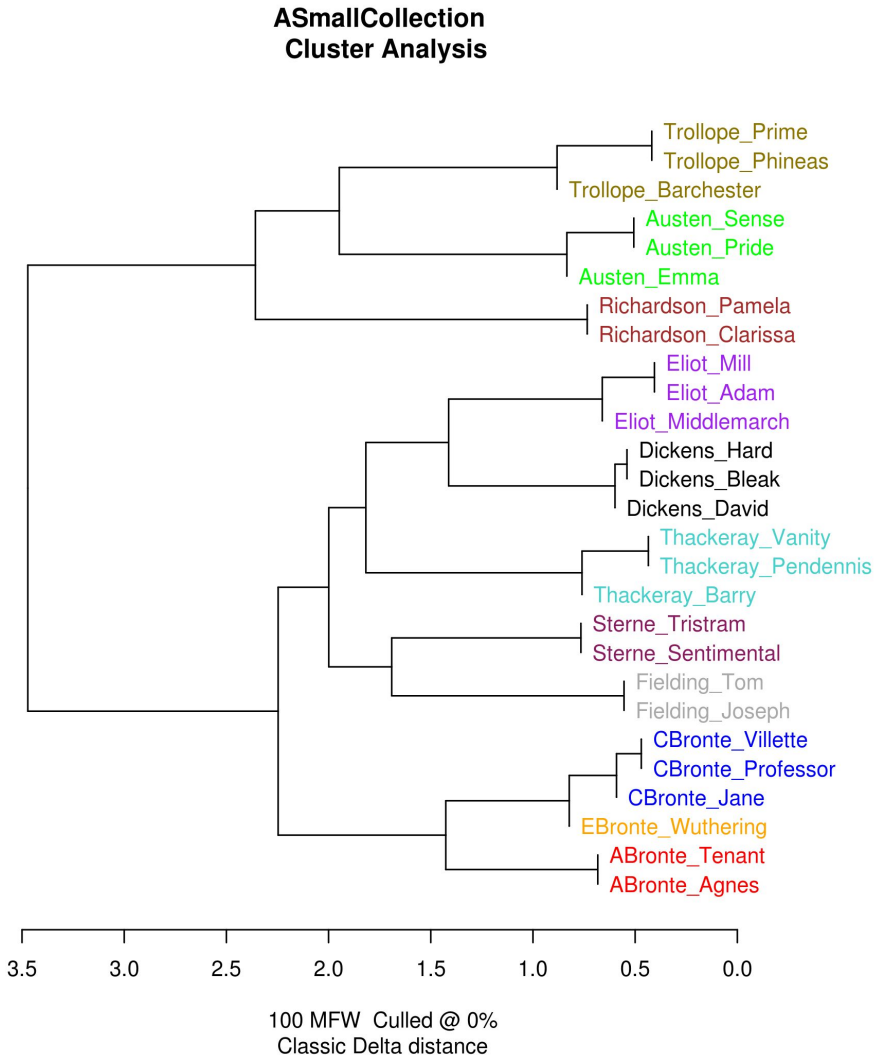
Cool, but how to actually analyse this?

Answer: dimension reduction


You can’t engineer dimensions.

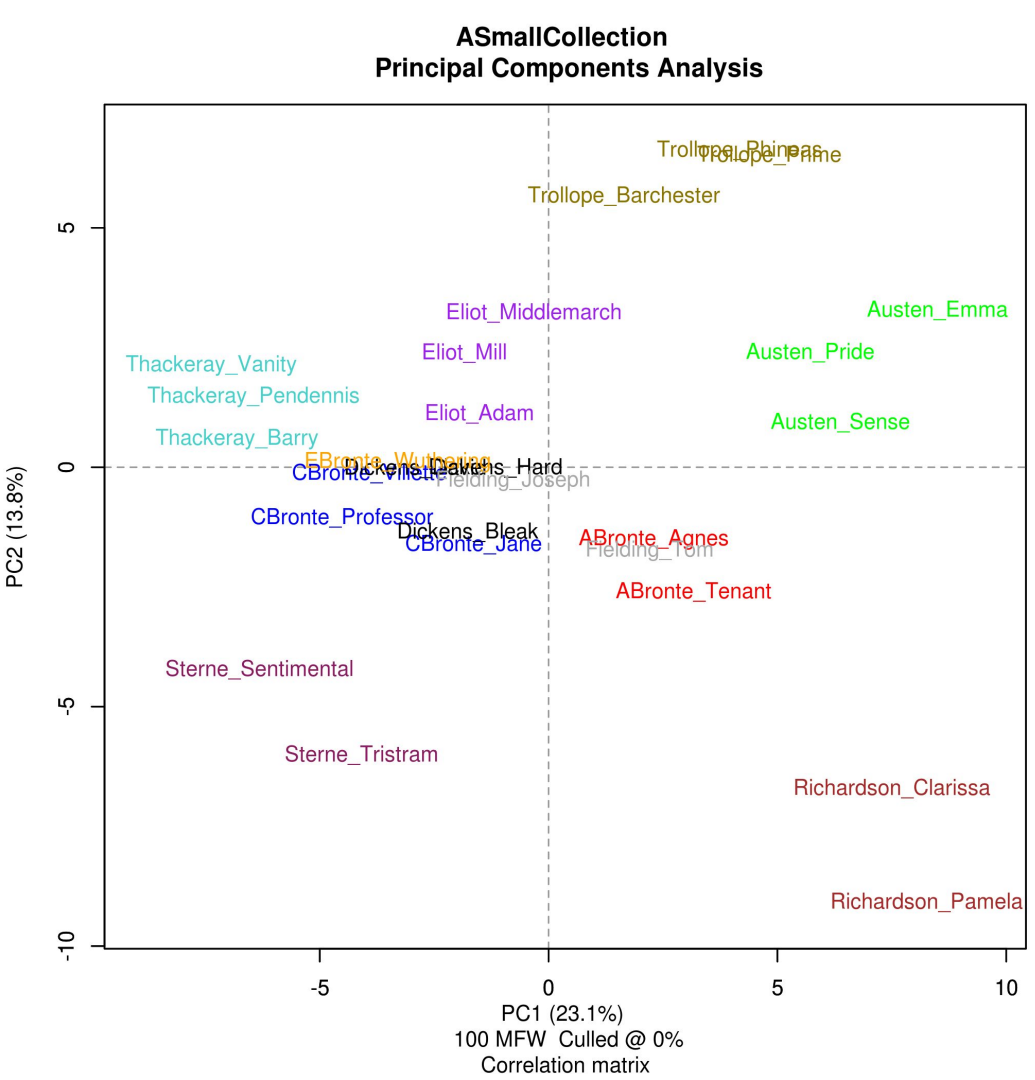

Maybe you can’t.

#1 Cluster analysis


ASmallCollection
Cluster Analysis
Trollope_Prime
Trollope_Phineas
Trollope_Barchester
Austen_Sense
Austen_Pride
Austen_Emma
Richardson_Pamela
Richardson_Clarissa
Eliot_Mill
Eliot_Adam
Eliot_Middlemarch
Dickens_Hard
Dickens_Bleak
Dickens_David
Thackeray_Vanity
Thackeray_Pendennis
Thackeray_Barry
Sterne_Tristram
Sterne_Sentimental
Fielding_Tom
Fielding_Joseph
CBronte_Villette
CBronte_Professor
CBronte_Jane
EBronte_Wuthering
ABronte_Tenant
ABronte_Agnes
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
100 MFW Culled @ 0%
Classic Delta distance

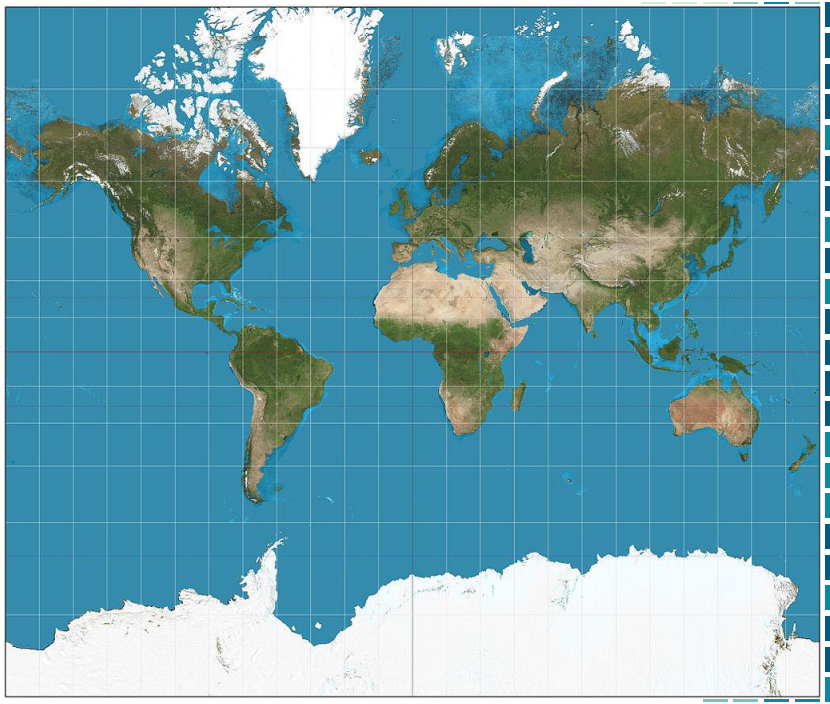
#2 PCA

PCA – Principal Component Analysis



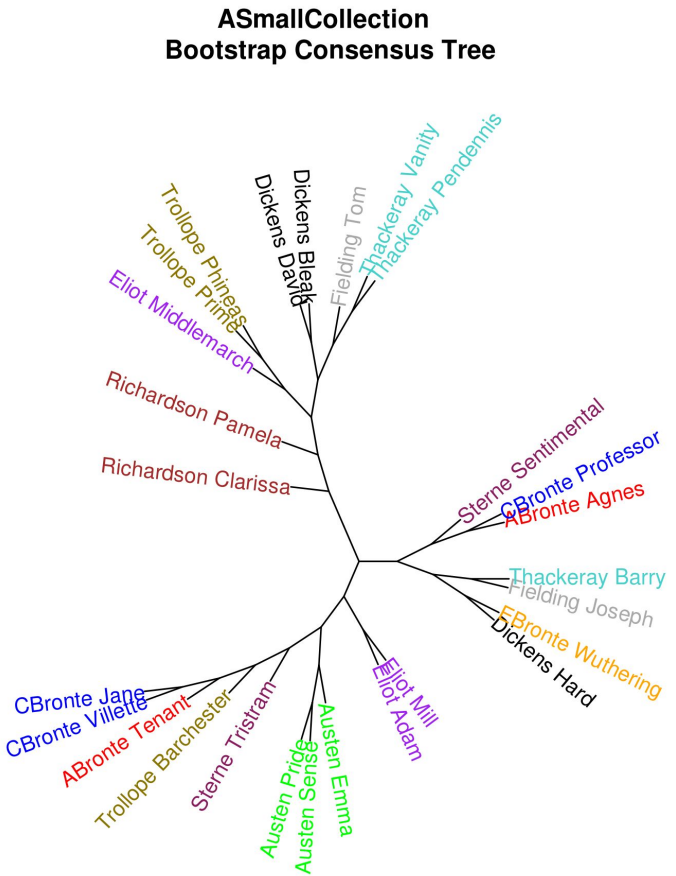
Problems with dimension reduction

Information loss

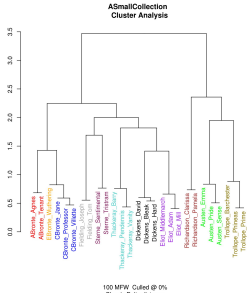


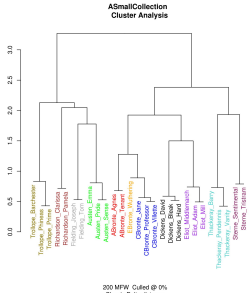
Gold standard

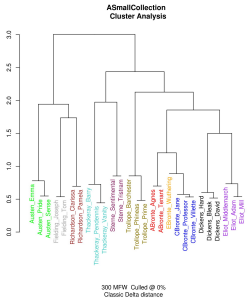
Bootstrap consensus tree

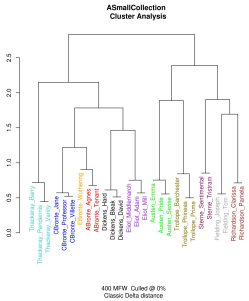


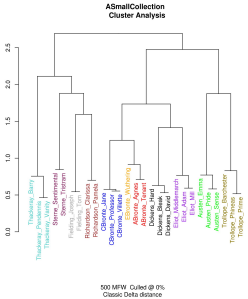
Bootstrap consensus tree – how?

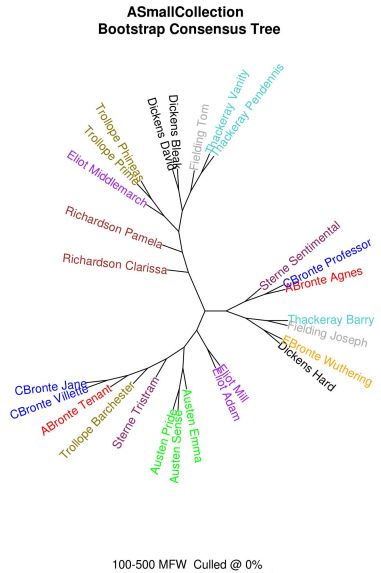












Let's try to do that!

https://computationalstylistics.github.io/stylo_nutshell/#main-functions-stylo

Getting started

Set working directory:

Command line:

```
setwd("the/path/to/my/favourite/folder")
```

RStudio users: find your directory in the Files panel, then use *Menu > More > Set as Working Directory*

Windows users: use *Menu > File > Change directory*

NEXT:

Type: library(stylo)

And then:

stylo()