Text

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2014-04-24

Why visualize text?

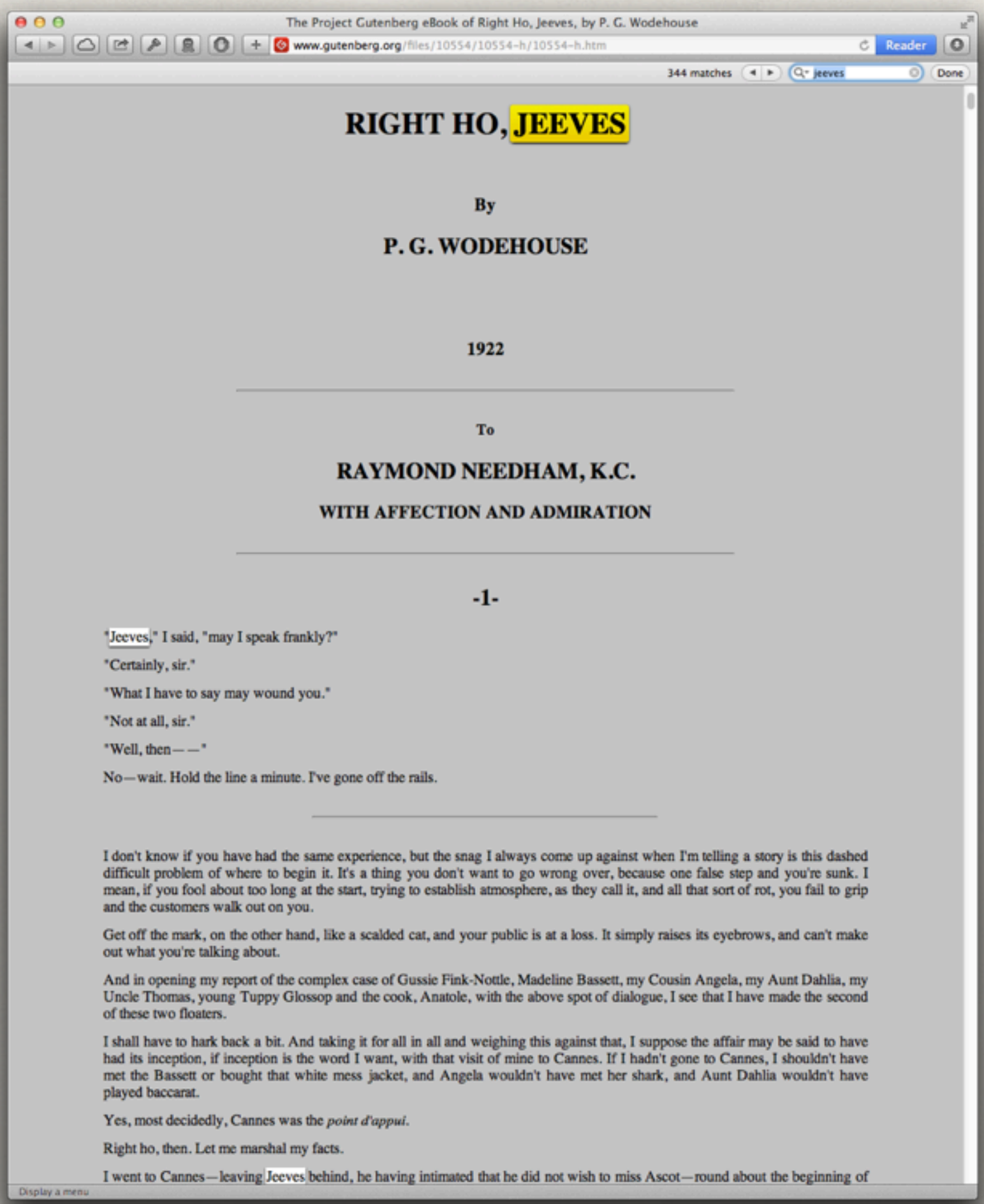
Visualization goals

Understanding - read a document
Summaries - get the "gist" of a document
Clustering - group together similar contents
Correlate - compare patterns in text to other data

High-level tasks

Find documents of interest in a collection
Find documents similar to ones I want
Identify the main themes or ideas of documents or collections
See the history of changes in a document
Find connections between documents

borrowed from J. Heer and J. Stasko



Interaction tool includes context of position and length of document

All details available through interaction

Search is built in

Tool is familiar, readily available and convenient

census1.html — UNREGISTERED

census1.html

```
32
33          function makeScatterplot(){
34              var margin = {top:20, bottom:20, left:60, right: 20};
35              var width = 500, height = 500;
36              var xValue = function(d){return d[0]};
37              var yValue = function(d){return d[1]};
38              var xScale = d3.scale.linear();
39              var yScale = d3.scale.linear();
40              var xAxis = d3.svg.axis().scale(xScale).orient("bottom");
41              var yAxis = d3.svg.axis().scale(yScale).orient("left");
42
43
44
45              function chart(selection){
46
47                  selection.each(function(data){
48
49                      xScale.range([0,width - margin.left - margin.right])
50                      .nice()
51                      .domain(d3.extent(data, xValue));
52
53
54                      yScale.range([height - margin.top - margin.bottom, 0])
55                      .nice()
56                      .domain(d3.extent(data, yValue));
57
58                      var svg = d3.select(this).append("svg")
59                      .attr({width:width, height:height});
60
61                      var canvas = svg.append("g")
62                      .attr("transform","translate("+margin.left +","+margin.top+")");
63
64                      // create the dots
65                      var dots = canvas.selectAll("circle")
66                      .data(data)
67                      .enter()
68                      .append("circle");
```

Line 1, Column 16 | Tab Size: 4 | HTML

overview + detail display

syntactic structure is mapped to a color encoding

I don't know if you have had the same experience, but the snag I always come up against when I'm telling a story is this dashed difficult problem of where to begin it. It's a thing you don't want to go wrong over, because one false step and you're sunk. I mean, if you fool about too long at the start, trying to establish atmosphere, as they call it, and all that sort of rot, you fail to grip and the customers walk out on you.

Get off the mark, on the other hand, like a scalded cat, and your public is at a loss. It simply raises its eyebrows, and can't make out what you're talking about.

And in opening my report of the complex case of Gussie Fink-Nottle, Madeline Bassett, my Cousin Angela, my Aunt Dahlia, my Uncle Thomas, young Tuppy Glossop and the cook, Anatole, with the above spot of dialogue, I see that I have made the second of these two floaters.

I shall have to hark back a bit. And taking it for all in all and weighing this against that, I suppose the affair may be said to have had its inception, if inception is the word I want, with that visit of mine to Cannes. If I hadn't gone to Cannes, I shouldn't have met the Bassett or bought that white mess jacket, and Angela wouldn't have met her shark, and Aunt Dahlia wouldn't have played baccarat.

Yes, most decidedly, Cannes was the *point d'appui*.

Right ho, then. Let me marshal my facts.

LO, praise of the prowess of people-kings
of spear-armed Danes, in days long sped,
we have heard, and what honor the athelings won!
Oft Scyld the Scefing from squadroned foes,
from many a tribe, the mead-bench tore,
awing the earls. Since erst he lay
friendless, a foundling, fate repaid him:
for he waxed under welkin, in wealth he throve,
till before him the folk, both far and near,
who house by the whale-path, heard his mandate,
gave him gifts: a good king he!
To him an heir was afterward born,
a son in his halls, whom heaven sent
to favor the folk, feeling their woe
that erst they had lacked an earl for leader
so long a while; the Lord endowed him,
the Wielder of Wonder, with world's renown.
Famed was this Beowulf: far flew the boast of him,
son of Scyld, in the Scandian lands.
So becomes it a youth to quit him well
with his father's friends, by fee and gift,
that to aid him, aged, in after days,
come warriors willing, should war draw nigh,
liegemen loyal: by lauded deeds
shall an earl have honor in every clan.

YOU don't know about me without you have read a book by the name of The Adventures of Tom Sawyer; but that ain't no matter. That book was made by Mr. Mark Twain, and he told the truth, mainly. There was things which he stretched, but mainly he told the truth. That is nothing. I never seen anybody but lied one time or another, without it was Aunt Polly, or the widow, or maybe Mary. Aunt Polly—Tom's Aunt Polly, she is—and Mary, and the Widow Douglas is all told about in that book, which is mostly a true book, with some stretchers, as I said before.

1. US GOVERNMENT INTELLIGENCE REPORT: 7 OCTOBER 2008 from MI-5

MI-5 states that 100,000 bullets, six guns and military ware were among items police say they recovered after raiding a house in Narok, Kenya, belonging to Mr Thabiti Otieno. The MI5 officers are investigating how sleeping bags, Nato-approved 7.62mm calibre ammunition, military desert boots, combat rain jackets, military fuel tanks, British Army inscribed Land Rover spare parts, military machetes and knives, landed in the hands of an unauthorised person.

3. US GOVERNMENT TELEPHONE INTERCEPT: [October 10 2008]

Call placed from a pre-paid cell phone (Caller 1) in an apartment complex in Barcelona, Venezuela to a pre-paid cell phone (Caller 2) in a business district Carabobo, Venezuela. Conversation took place in Spanish at about 1217, Barcelona local time.

Caller 1: Jorge's place was raided last night. I think they [probably the police] were watching the place. They found the guns-
Caller 2: (interrupted) Shut up! Shut up! Just shut up! You can't say that.
Caller 1: Sorry, and we need a new source for the, uh, car parts.
Caller 2: I think I have a source. My friend has a connection to a guy who is selling parts. I'm going to contact him today or tomorrow.
Caller 1: When do you think we can get them?
Caller 2: I don't know. Just don't talk to anybody. I'll call you on this phone when we have anything. Don't call me and don't do anything.
[END]

1. News Article: Bangkok Post, March 2, 2008

Thai authorities seized an Ilyushin IL-76 aircraft carrying tons of weapons from North Korea during a refueling stop in Bangkok, a government official said. The pilot told Thai authorities the aircraft was headed to Sri Lanka, but its final destination was unknown, according to a spokesman for the Thai prime minister. It contained about 35 tons of weapons, including rocket-propelled grenades, shoulder-launched rockets and tubes that may be missile components, the spokesman said. The plane, which was detained Saturday, had five people onboard -- four from Ukraine and one from Belarus. They will appear in court Monday on charges related to illegal weapons smuggling, the spokesman said.

1. REPORT DATE: 9 October 2008 [provided to CIA by Pakistani Criminal Investigation Unit, Karachi Division]

NOTE: Surveillance report on the activities of Maulana Haq Bukhari, suspected to be a top leader within the Karachi faction of Lashkar-e-Jhangvi. Bukhari is frequently accompanied by Akram Basra, who acts as a driver and bodyguard. Additional information provided by police informants.

23 July 2008 – A delivery was made to a house in Lyari Town (a constituent town of Karachi) in a house believed to be used by Bukhari. The delivery was made by a two men in street clothing (as opposed to a uniform) who arrived in a white van, license LHR 6354, with single blue stripe on each side. The delivery consisted of three medium boxes (requiring two hands to move) and a small box (handsized). The boxes appeared to be heavy. One large box was square, the other rectangular. The small box was rectangular. It is unknown if Bukhari was home at the time of the delivery.

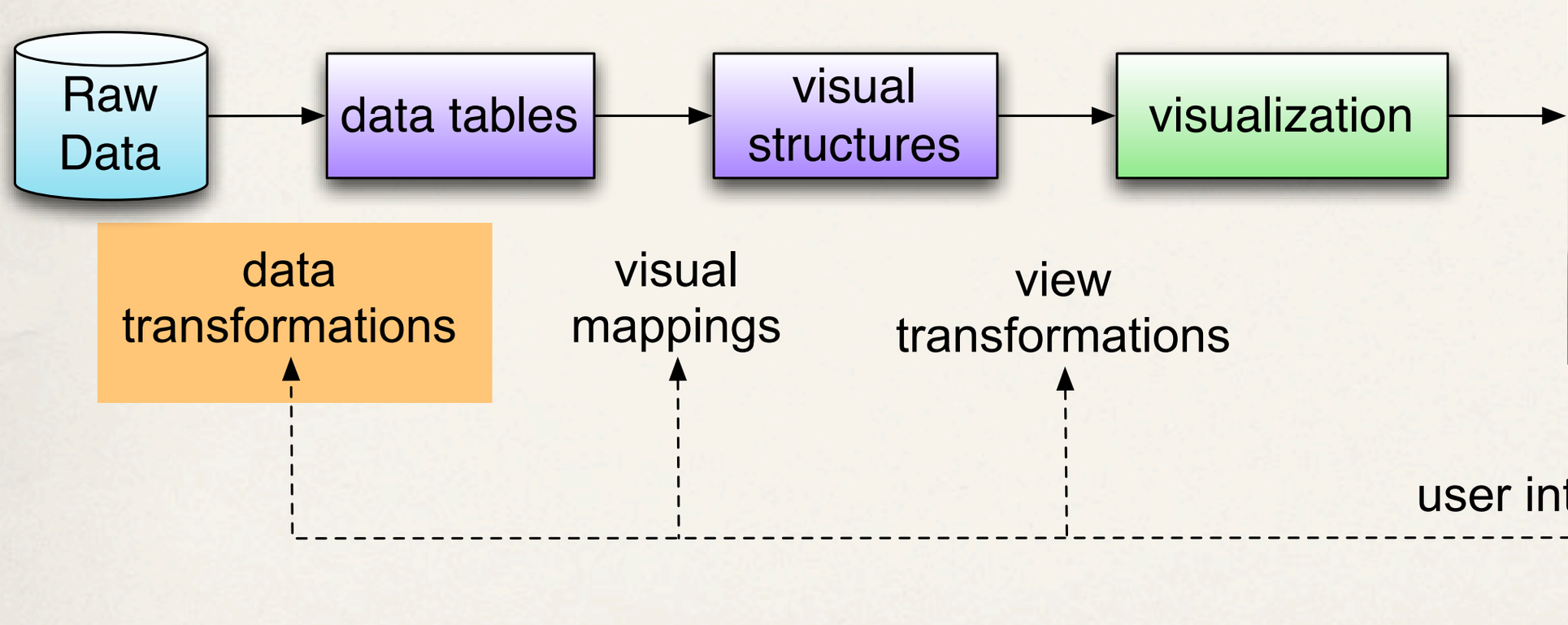
8 August 2008 – An unknown man visited the Lyari Town house where Bukhari is believed to stay. He arrived at 1615, and was let into the house immediately. Loud voices could be heard for a few moments, then they subsided. About fifteen minutes later a silver Mercedes left the rear of the house with what appeared to be three occupants. Due to the tinted glass it was impossible to identify the occupants of the vehicle. The house was surveilled for the next five hours; however no one came or went.

16 September 2008 – Bukhari was followed from his Lyari Town house to an apartment about 1.5 kilometers southeast. He entered the building and stayed there for about two hours. When he left he returned to his Lyari Town house at which time the observer believed he'd been discovered and left the area.

23 September 2008 – Bukhari and probably Basra are reported to have visited a house in the Katchi Abadis Old Settlement, on 835T Longhi Street. The informant, a vendor with business in the area, was passing by and noticed Bukhari and one other person enter the building at about 1430. The informant knew Bukhari by sight, but had never met him.

Visualization Pipeline

Insight!



Why is text visualization hard?

Text is high dimensional

(10,000+ unique words in a document)

Some words have ordering

January, February, March...

one, two, three...

Words have meaning, relationships and context

On St. Patrick's Day, the local bar serves green beer.

The pub downtown has been known to make their pints chartreuse on Saint Paddy's .

Patrick walked around the corner of Green St. and Day St., right into this bar sticking out of the wall and knocked himself senseless.

Extracting structure

metadata - data about the data

who wrote it, when, what collection is it from, how long is it, format, keywords

lexical level - break the document into *tokens*

characters, words, n-grams

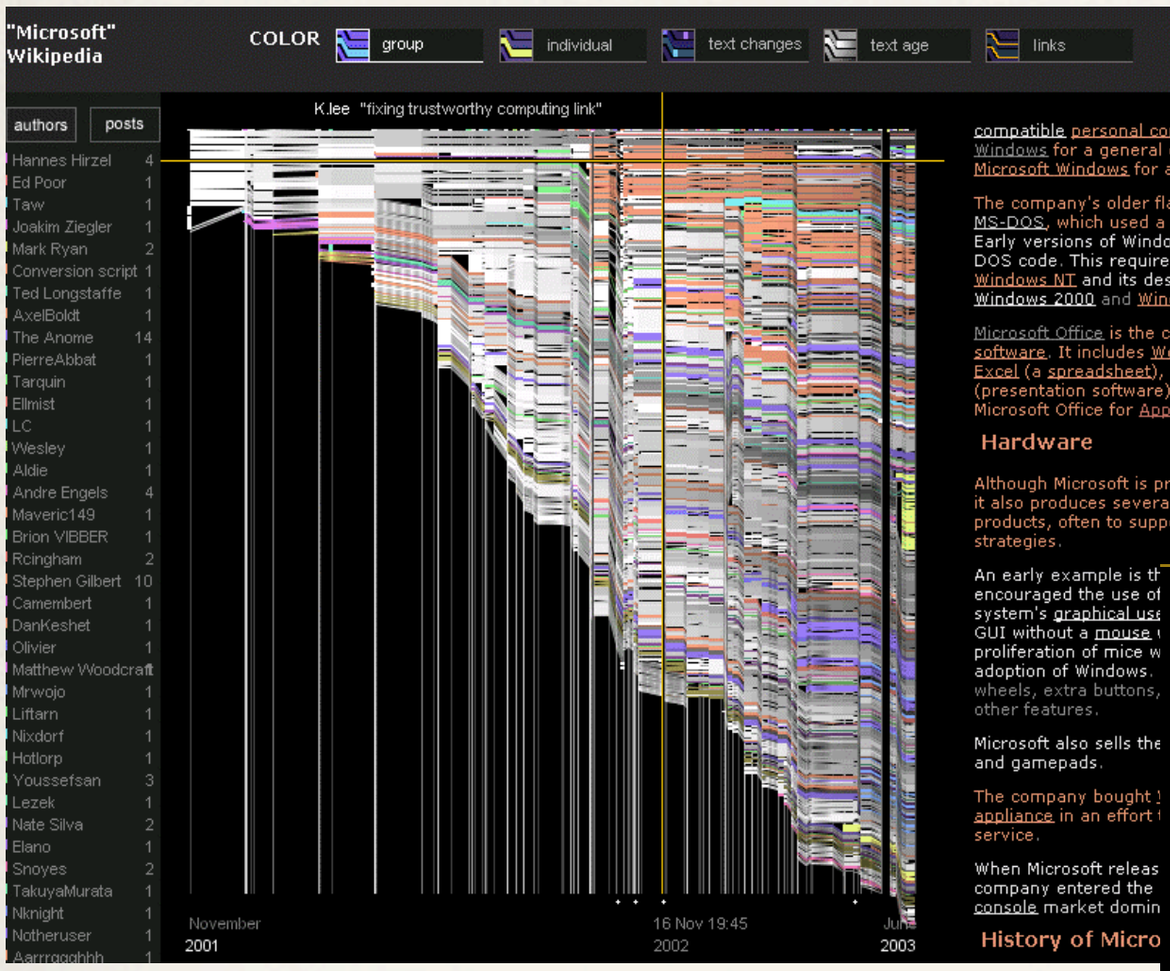
syntactic level - identify the function of tokens

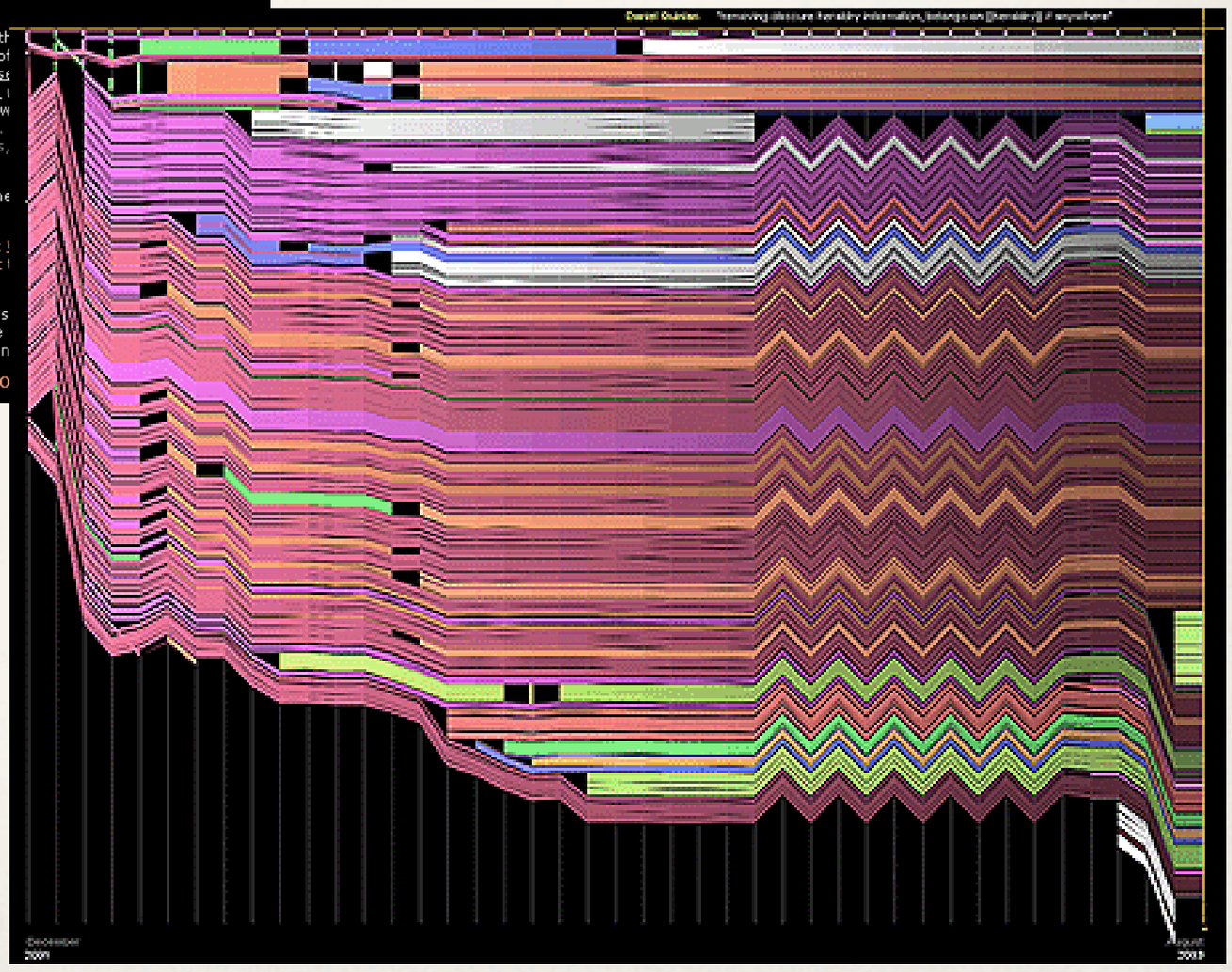
identify the part of speech or named entities (people, places, money, dates)

semantic level - extract meaning from the text

identify relationships between entities, themes, sentiment, etc..

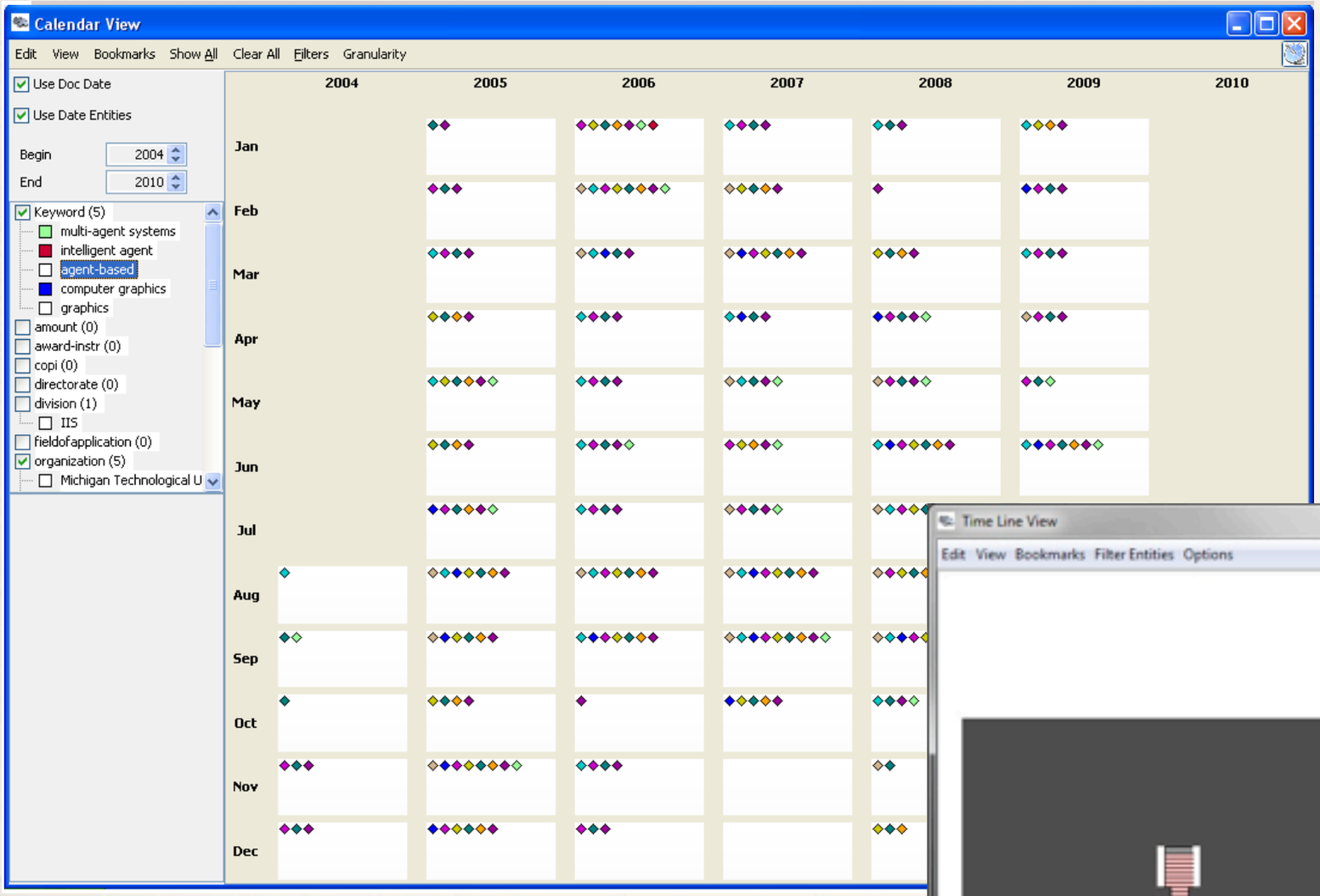
History flow

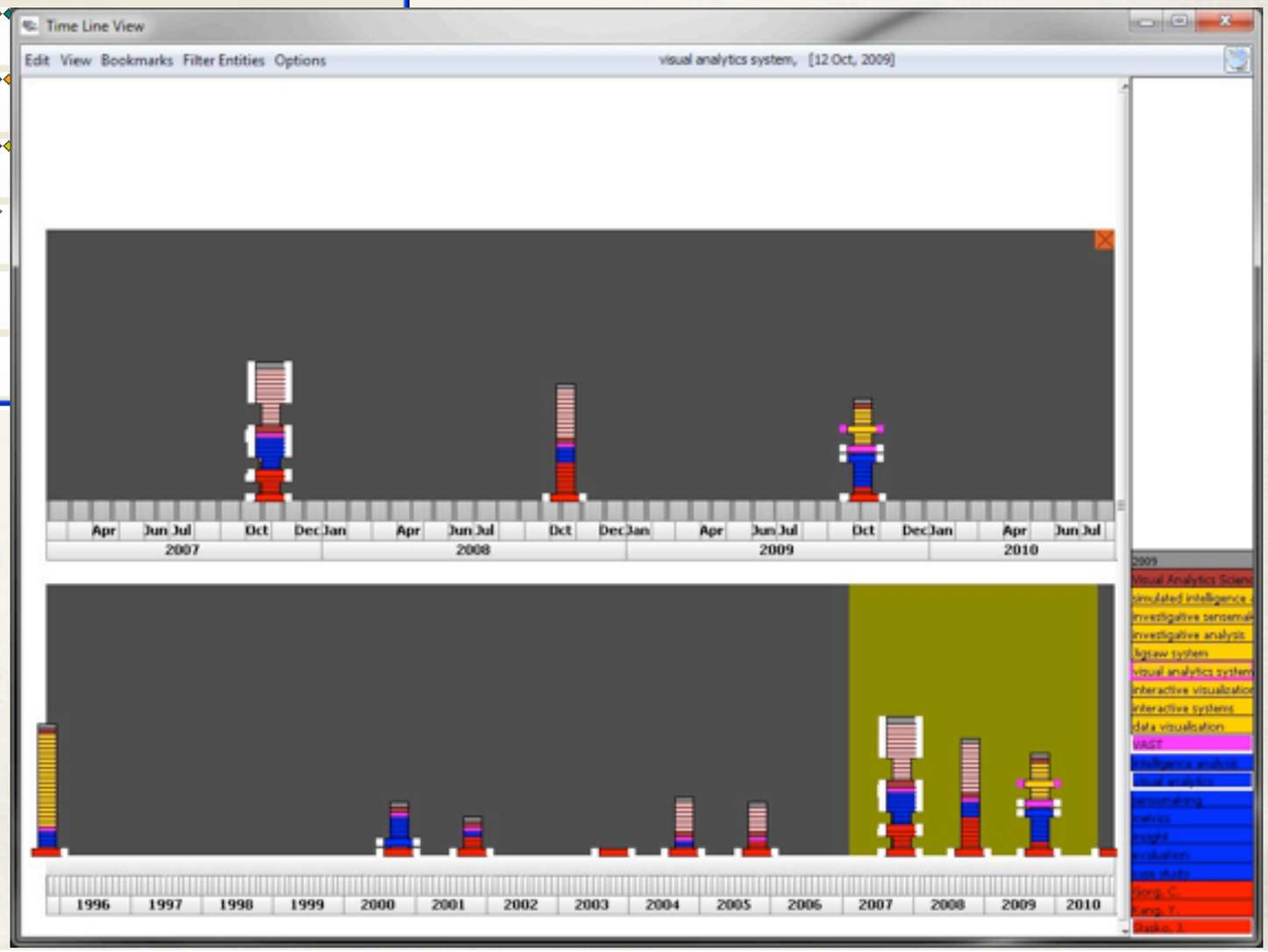




Viégas et al. ,"Studying Cooperation and Conflict between Authors with *history flow* Visualizations"

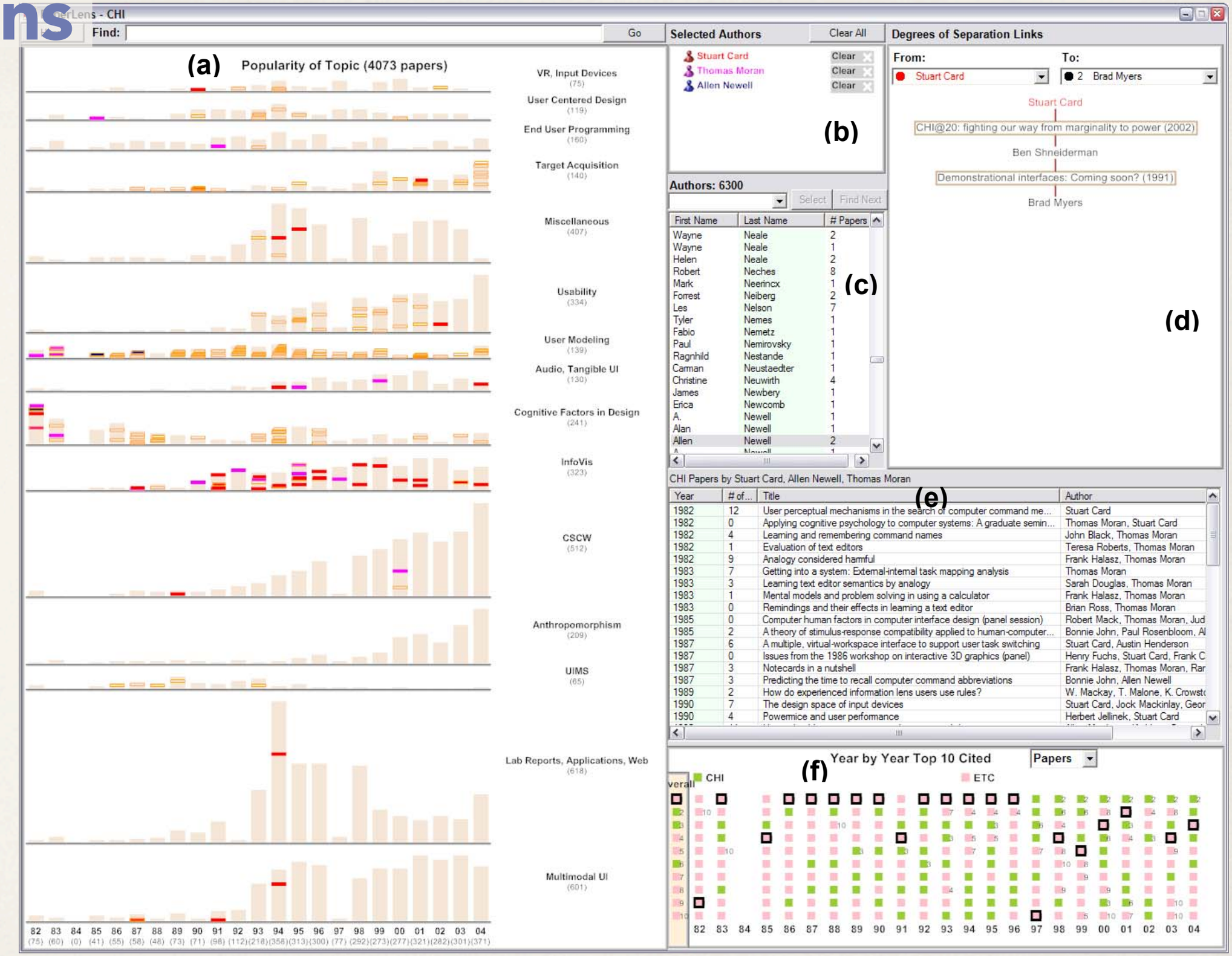
Jigsaw: Calendar and timeline views





Jigsaw

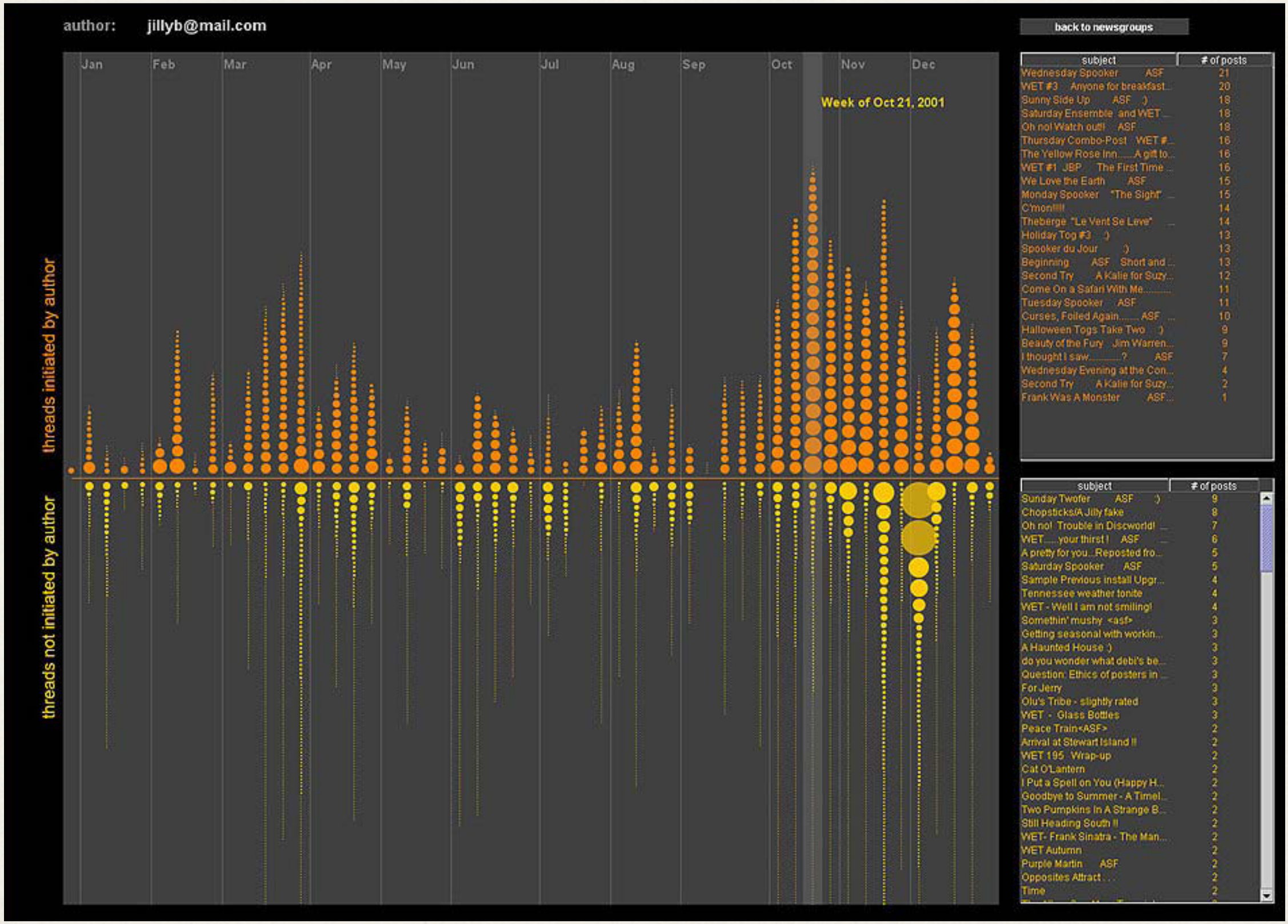
PaperLens



Lee et al., "Understanding Research Trends in Conferences using PaperLens"

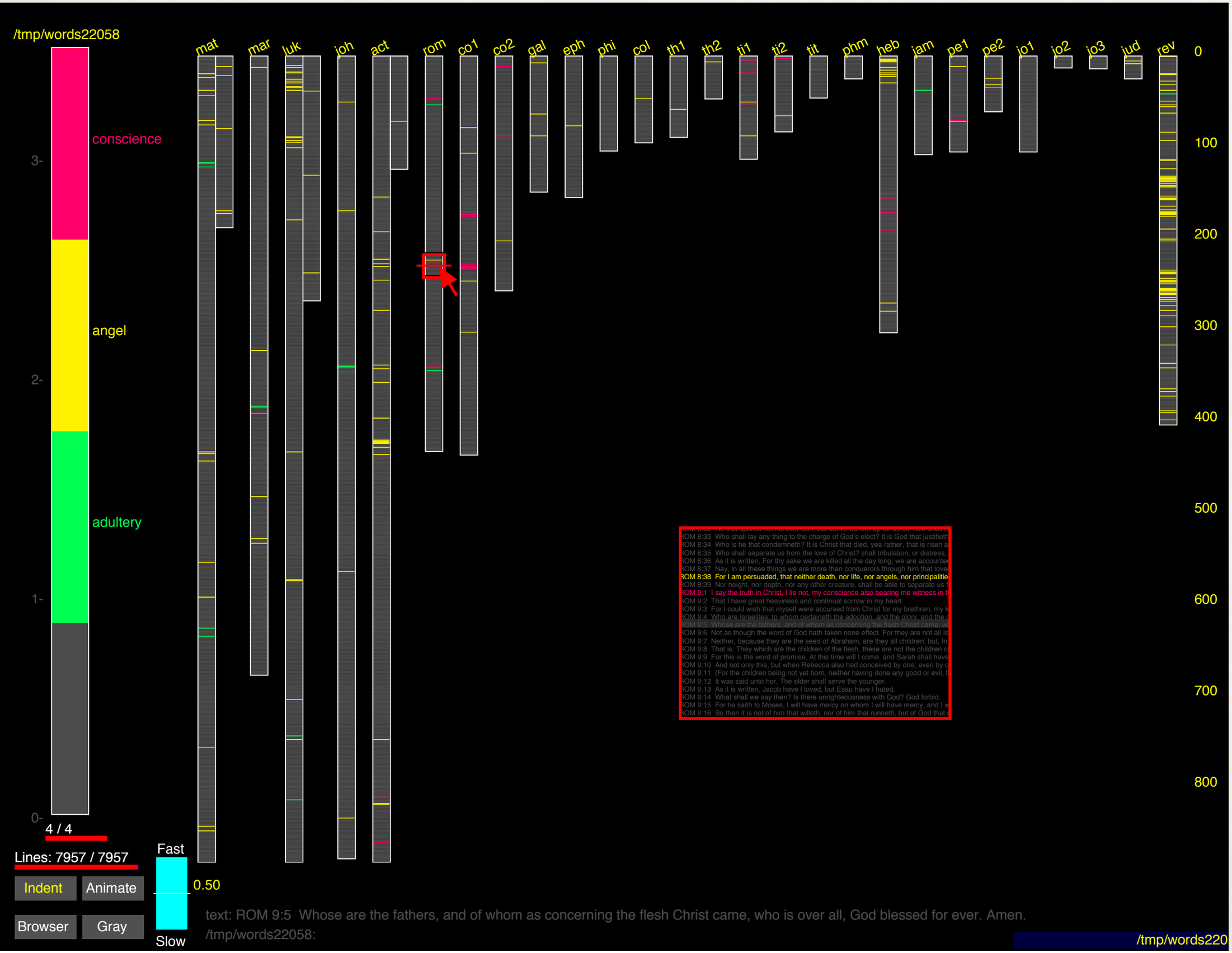
Figure 1. PaperLens tightly couples views across papers, authors, and references and consists of 6 main parts: (a) Popularity of Topic (b) Selected Authors (c) Author List (d) Degrees of Separation Links (e) Paper List (f) Year by Year Top 10 Cited Papers/Authors.

Authorlines



Viégas and Smith, "Newsgroup Crowds and Authorlines: Visualizing the Activity of Individuals in Conversational Cyberspace"

SeeSoft



Eick, "Graphically Displaying Text"

Vector Space Model / Bag of Words

	Book 1	Book 2	Book 3	Book 4
sir	481	79	118	12
about	316	175	192	61
jeeves	313	0	0	0
like	255	96	139	80
holmes	2	459	0	0
your	210	406	282	92
man	126	288	50	80
could	166	286	185	105
doctor	4	34	554	0
romana	0	0	419	0
k9	0	0	347	0
page	3	9	327	0
wizard	1	0	1	255
dorothy	0	0	0	238
jim	0	0	0	152
little	86	269	50	146
…	…	…	…	…

Weighting the vector-space

Term Frequency

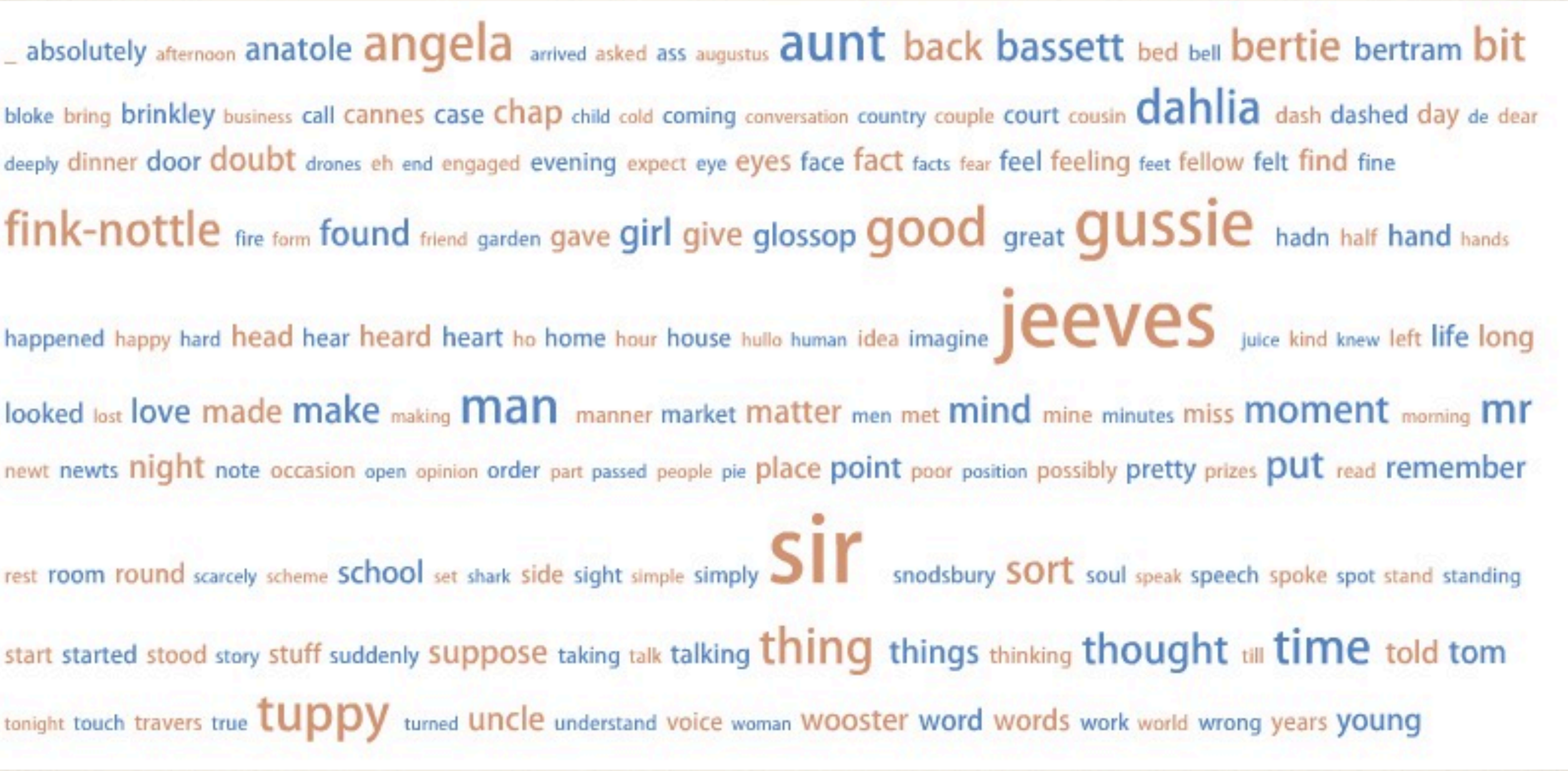
$$TF_{td}(word) = count(word) \text{ in } d$$

Term Frequency by Inverse Document Frequency

$$TF.IDF_{td}(word) = TF_{td}(word) * log \frac{N}{Df(word)}$$

Df() is # of documents containing the word, N is the number of documents

Tag cloud



Showing 200 out of 7355 words

ManyEyes

sir
Yes
Jeeves
like
Gussie
one
Well
know
mean
thing
time
must
something
man
Fink-Nottle
Aunt
got
Bertie
Angela
Tuppy
Dahlia
seemed
well
thought
now
good
Mr
just
bit
right
never
back
Bertram
Bassett
going
much
course
little
Oh
see
might
think
get
go
make
come
old
girl
tell
take
sort
mind
quite
nothing
looked
trying
Uncle
whole
eyes
fact
find
even
feeling
first
young
anything
stuff
give
always
put
went
Miss
stood
better
words
looking
door
house
seen
way
moment
felt
yes
head
Wooster
dinner
face
Glossop
though
heart
life
best
away
saying
start
feel
pretty
look
still
chap
along
gone
since
Brinkley
Quite
love
let
last
long
Sir
round
saw
two
gave
Court
found
another
want
school
night
heard
matter
hand
without
great
word
day
told
ever
suppose
place
done
made
remember
Cannes
may
point
far
came
Tom
Anatole
talking
doubt
case
bed
able
sort
seem
voice
stuff

Wordle

Right ho, Jeeves

sir
Yes
Jeeves
like
Gussie
mean
Well
know
thing
one
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Wordle

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able
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seem
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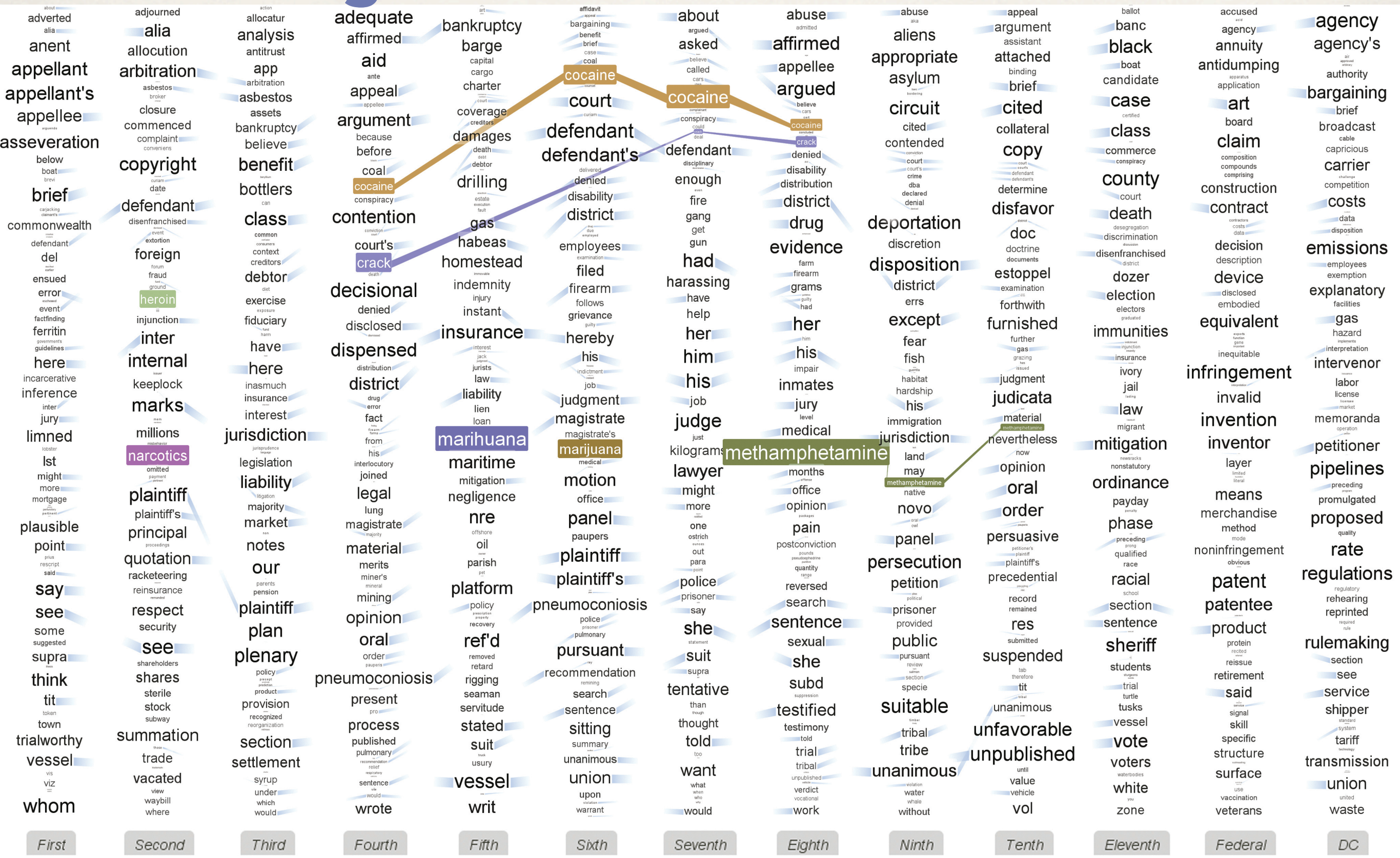
Anatole
doubt
whole
eyes
103
119
147

Wordle

GOP Candidate to Obama:‘Man up’ and meet me on the basketball court

Brazil passes Bill on Internet Privacy

Parallel Tag Clouds



Collins, "Parallel Tag Clouds to Explore and Analyze Faceted Text Corpora"

SparkClouds

Lee et al., "SparkClouds: Visualizing Trends in Tag Clouds"

Word Tree

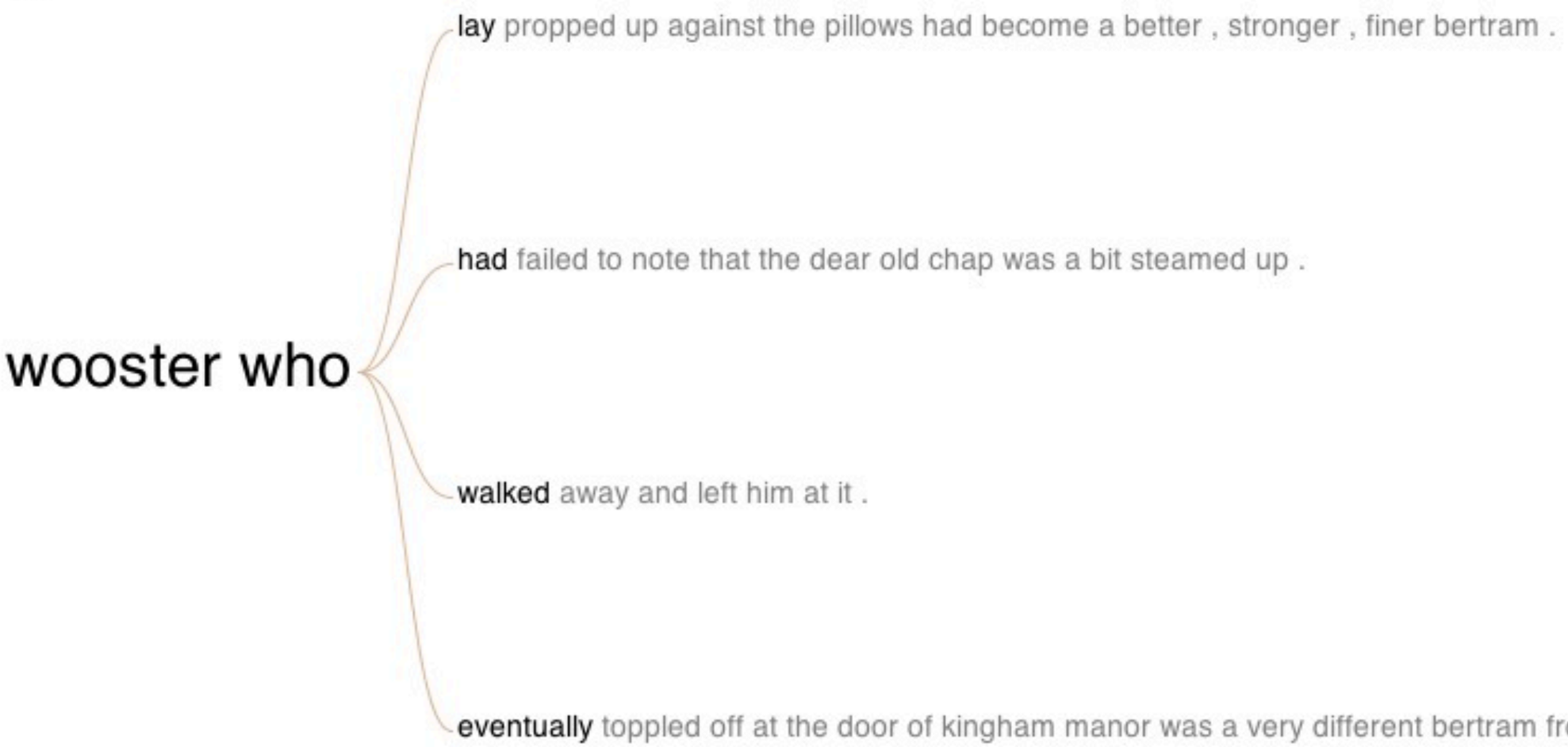
51
hits

wooster

ManyEyes

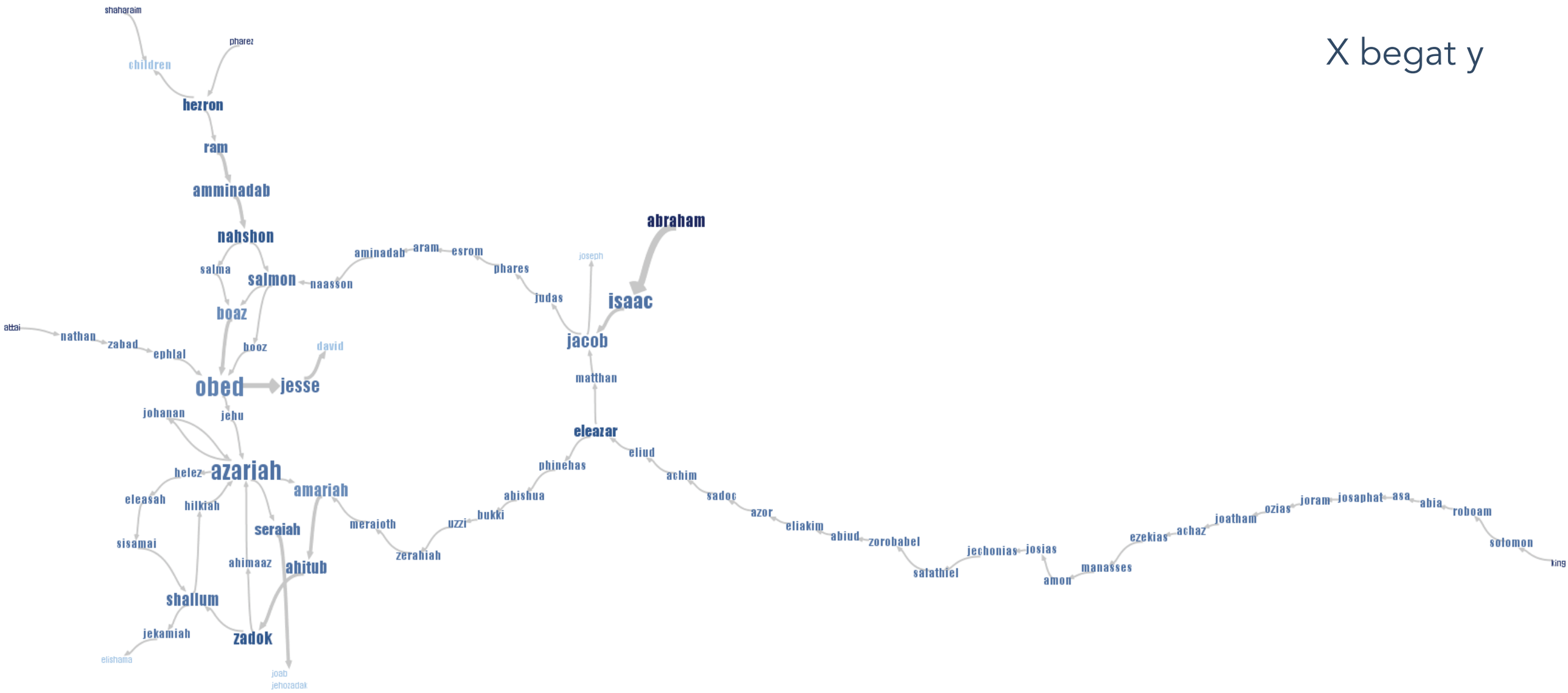
Word Tree

4
hits



ManyEyes

Phrase net

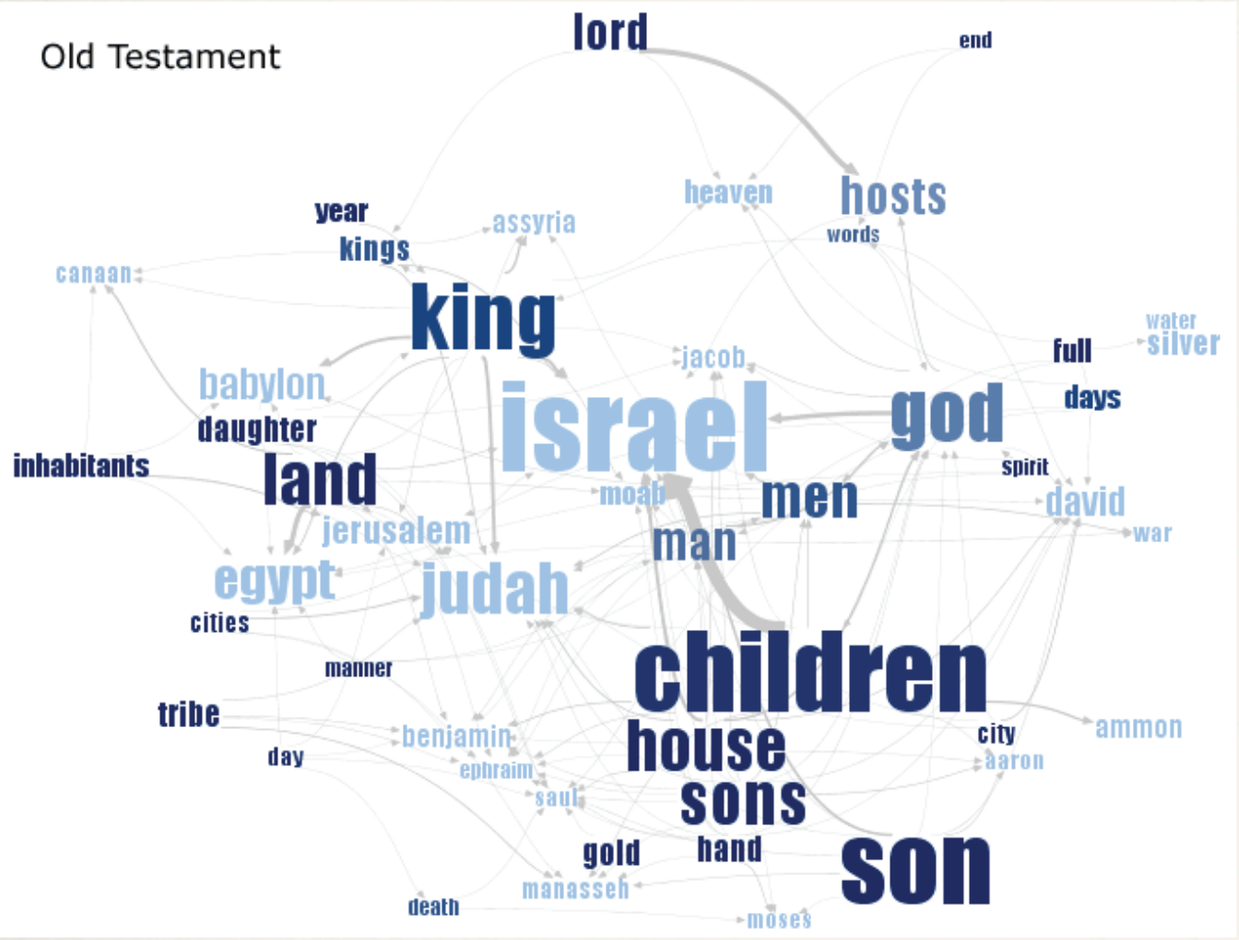


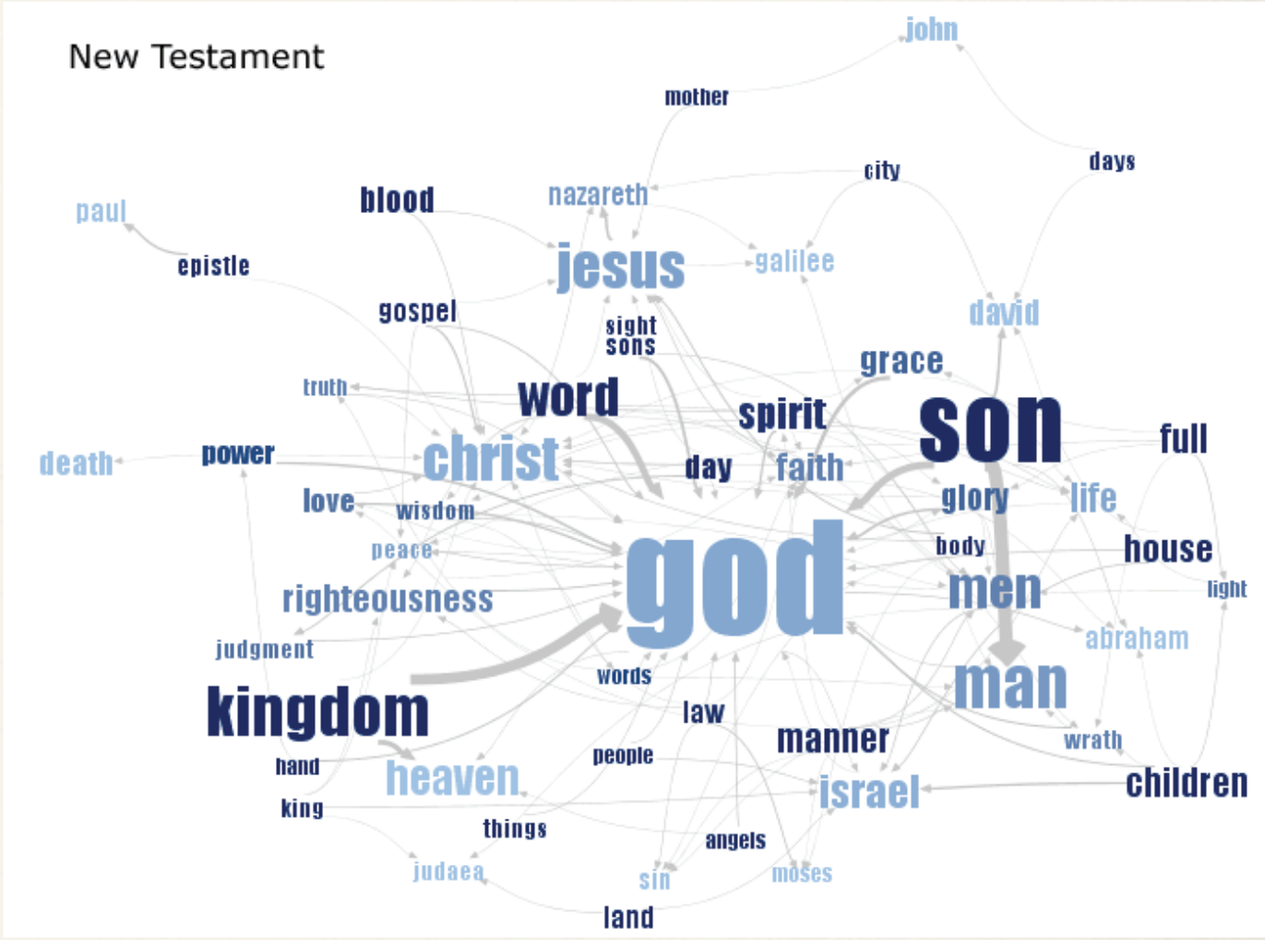
X begat y

van Ham et al. “Mapping Text with Phrase Nets”

Phrase net

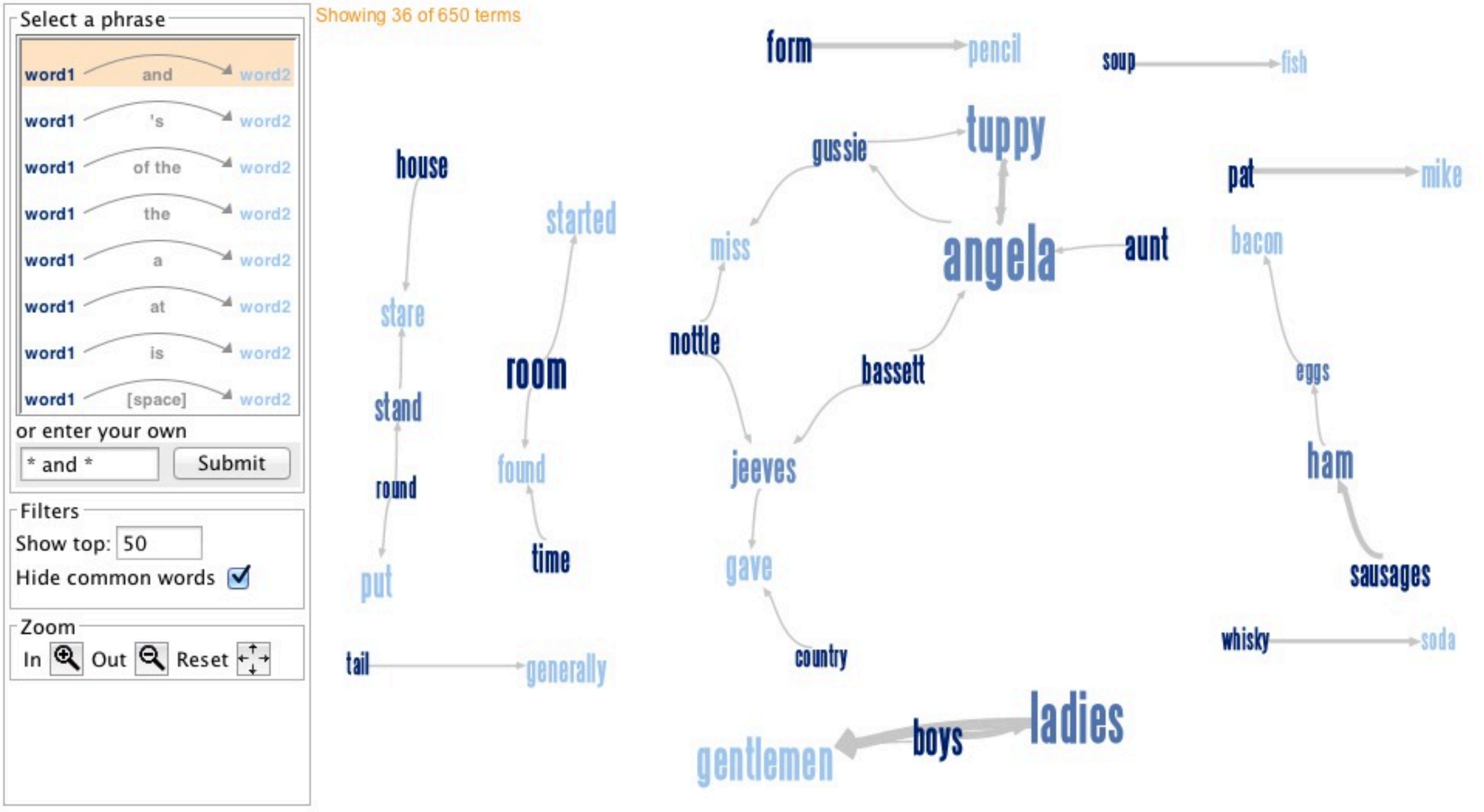
X of y





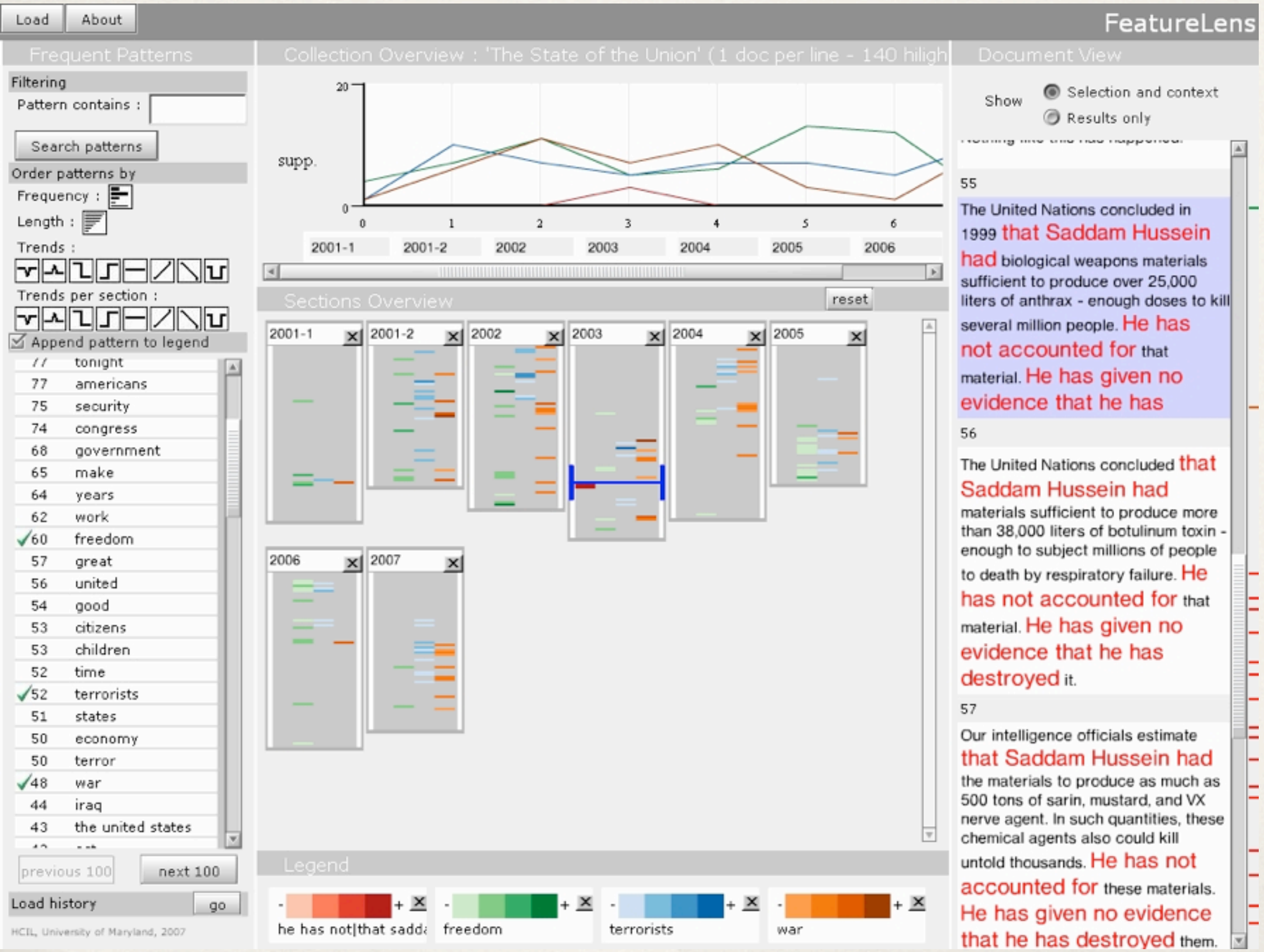
van Ham et al. “Mapping Text with Phrase Nets”

Phrase net



ManyEyes

FeatureLens

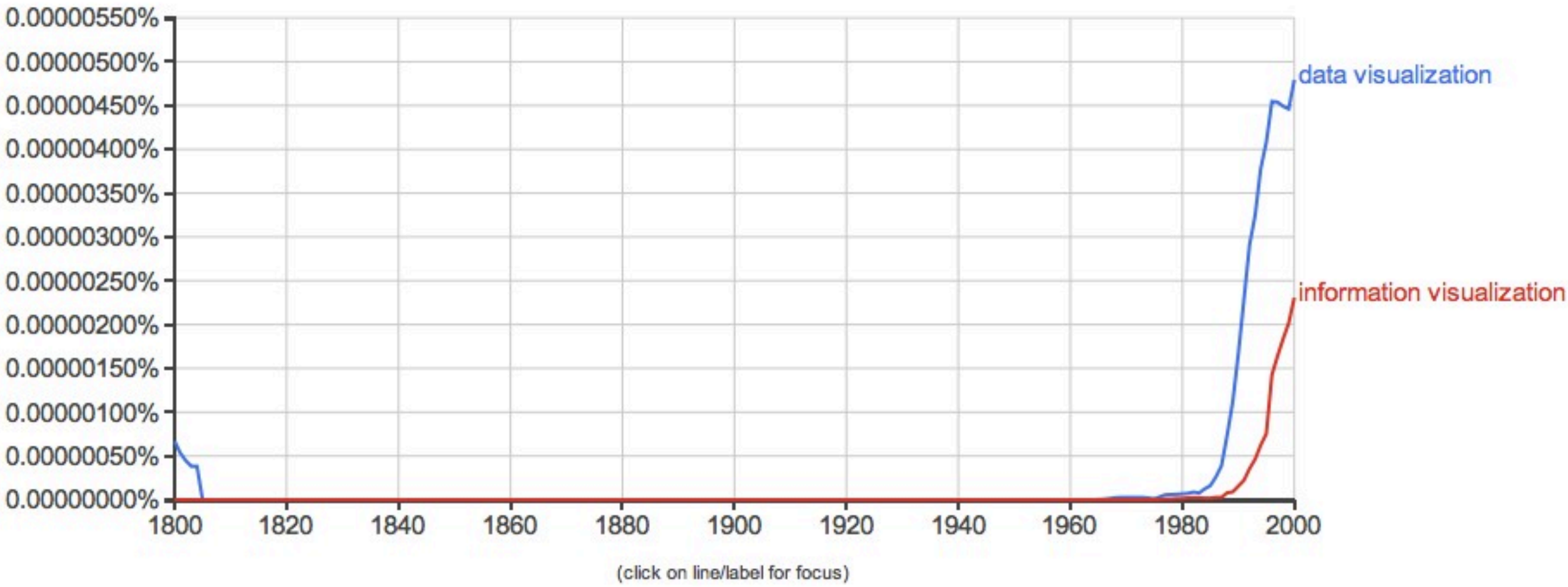


Don et al., "Discovering interesting usage patterns in text collections: integrating text mining with visualization"

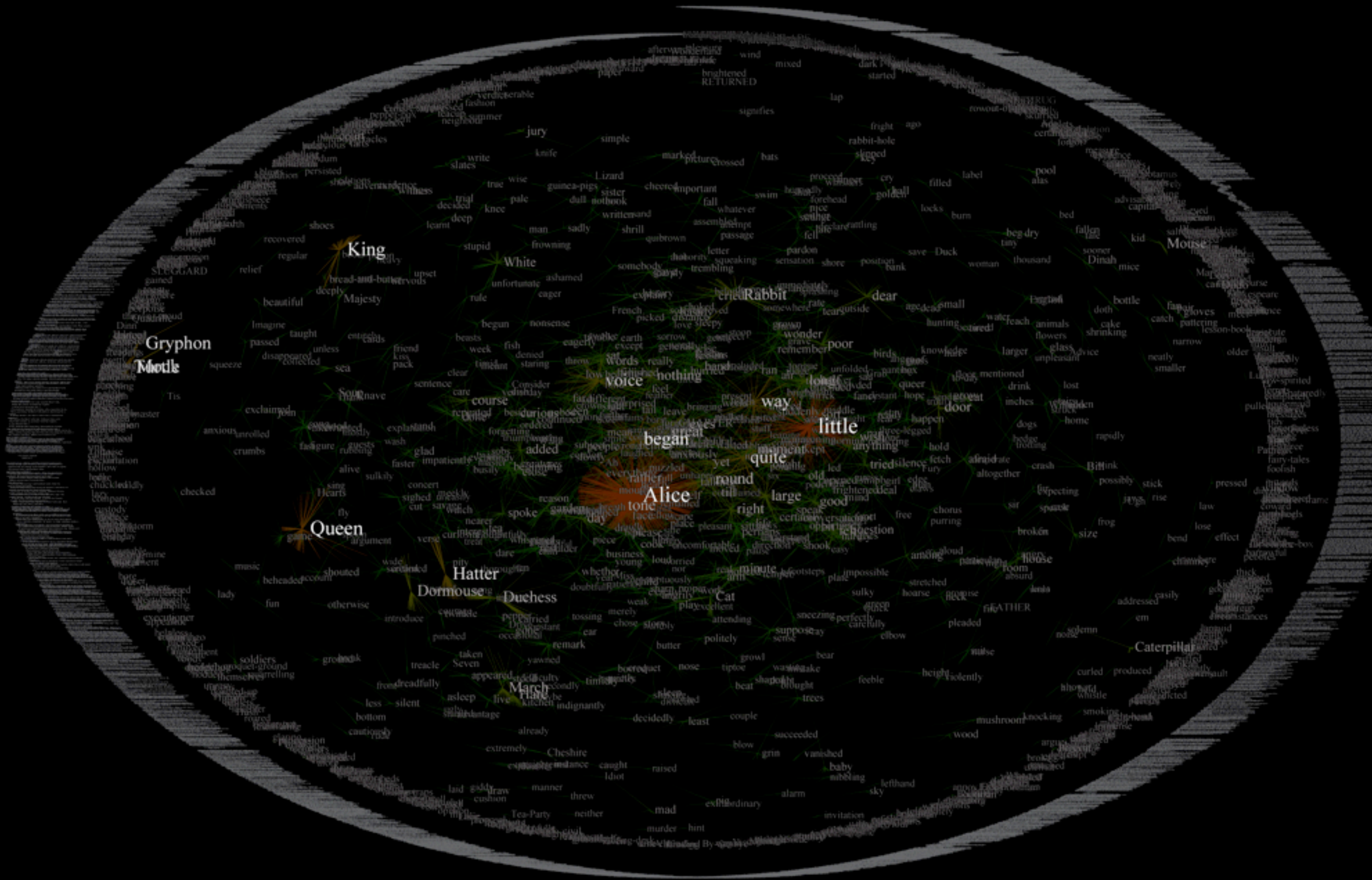
Google nGram Viewer

Graph these comma-separated phrases: data visualization,information visualization case-insensitive

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



https://books.google.com/ngrams


King
White
Rabbit
dear
Mouse
Gryphon
Mock
voice
nothing
way
little
began
quite
round
Alice
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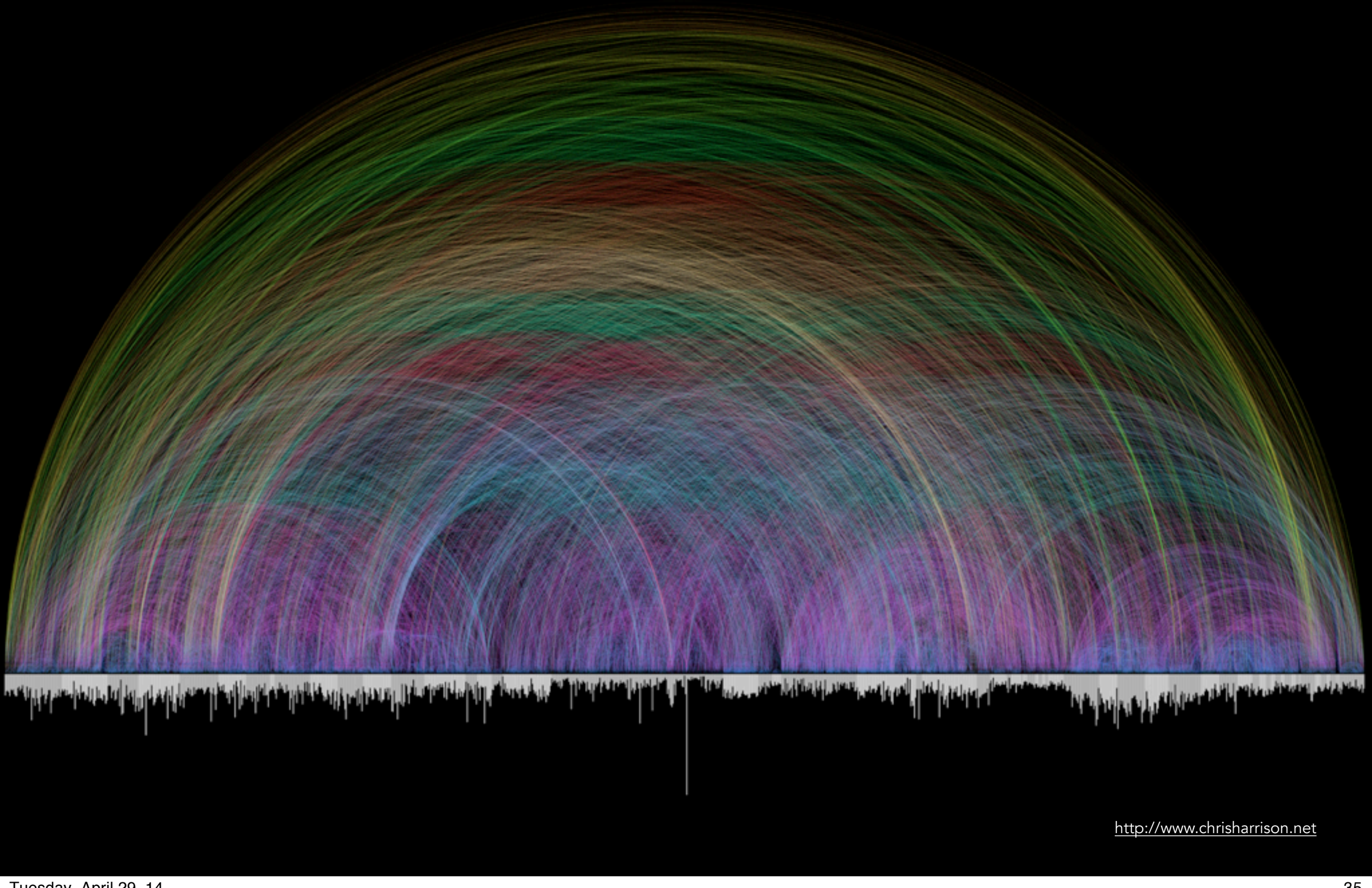
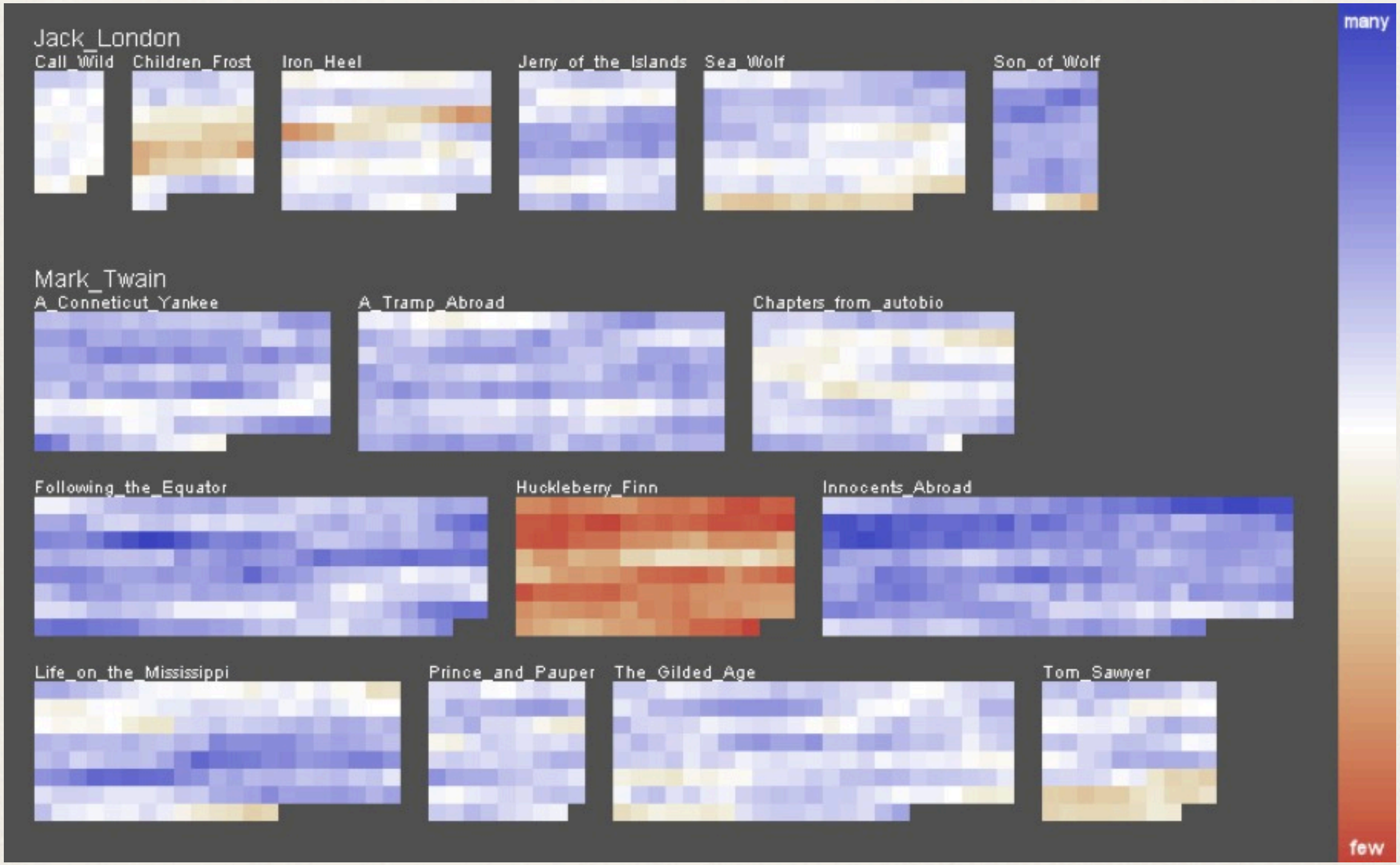
Queen
Hatter
Dormouse
Duchess
Cat
Caterpillar
March
Hare
Cheshire

TextArc


http://www.chrisharrison.net

Literature fingerprinting

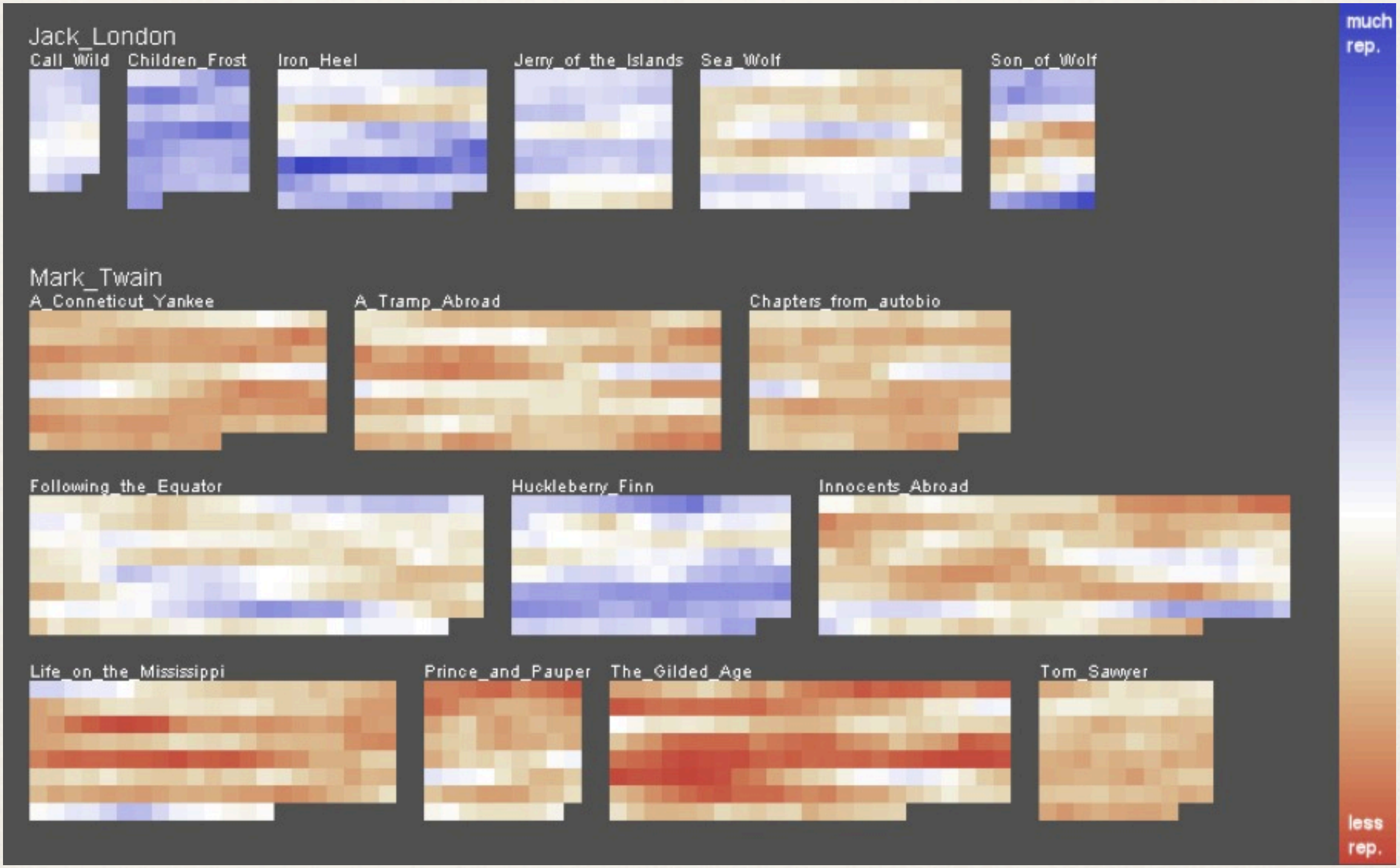


Hapax Legomena

word that appears only once

Keim, Oelke, "Literature Fingerprinting: A New Method for Visual Literary Analysis"

Literature fingerprinting

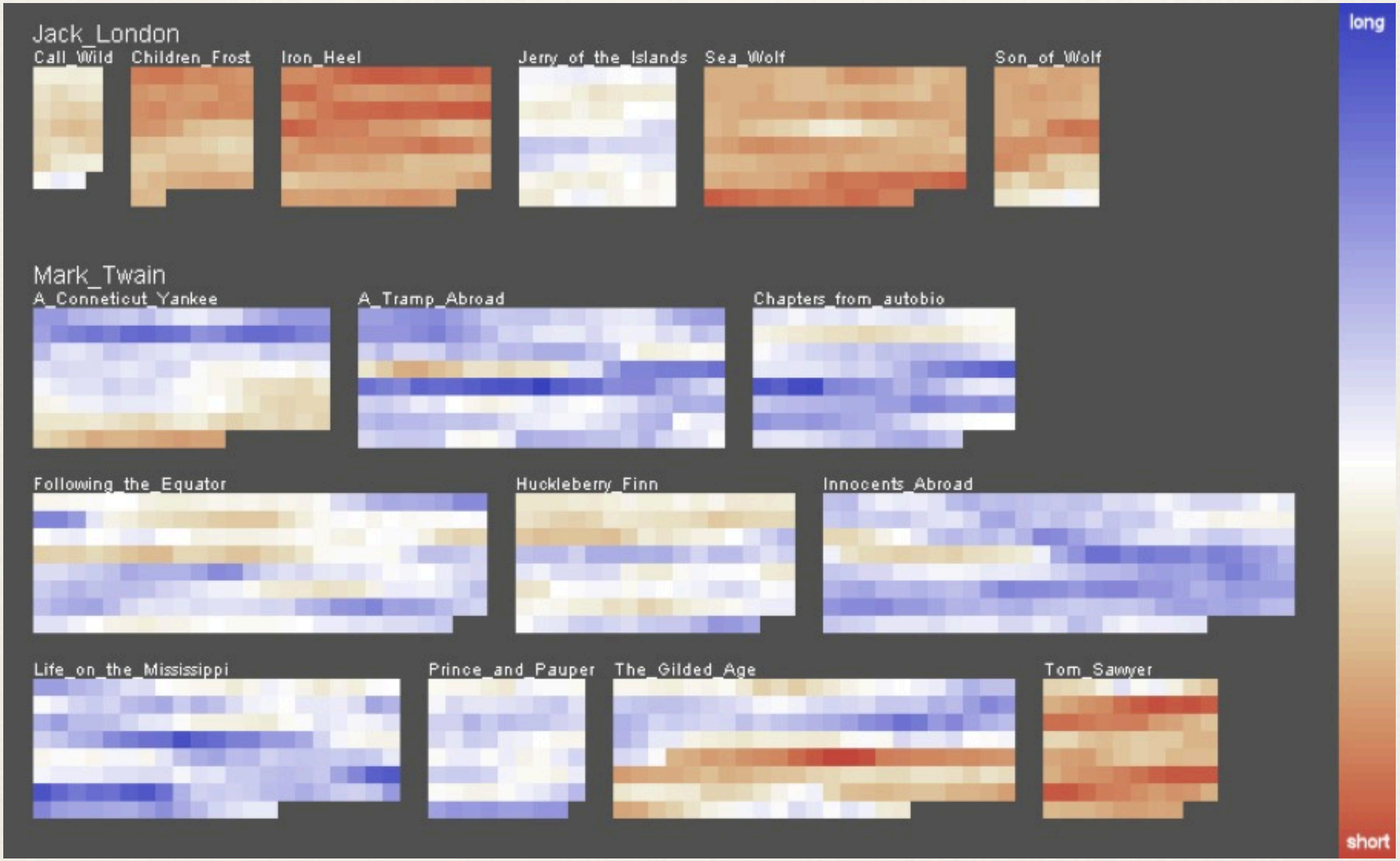


Simpson's Index

probability that a token belongs to the set

Keim, Oelke, "Literature Fingerprinting: A New Method for Visual Literary Analysis"

Literature fingerprinting



Average sentence length

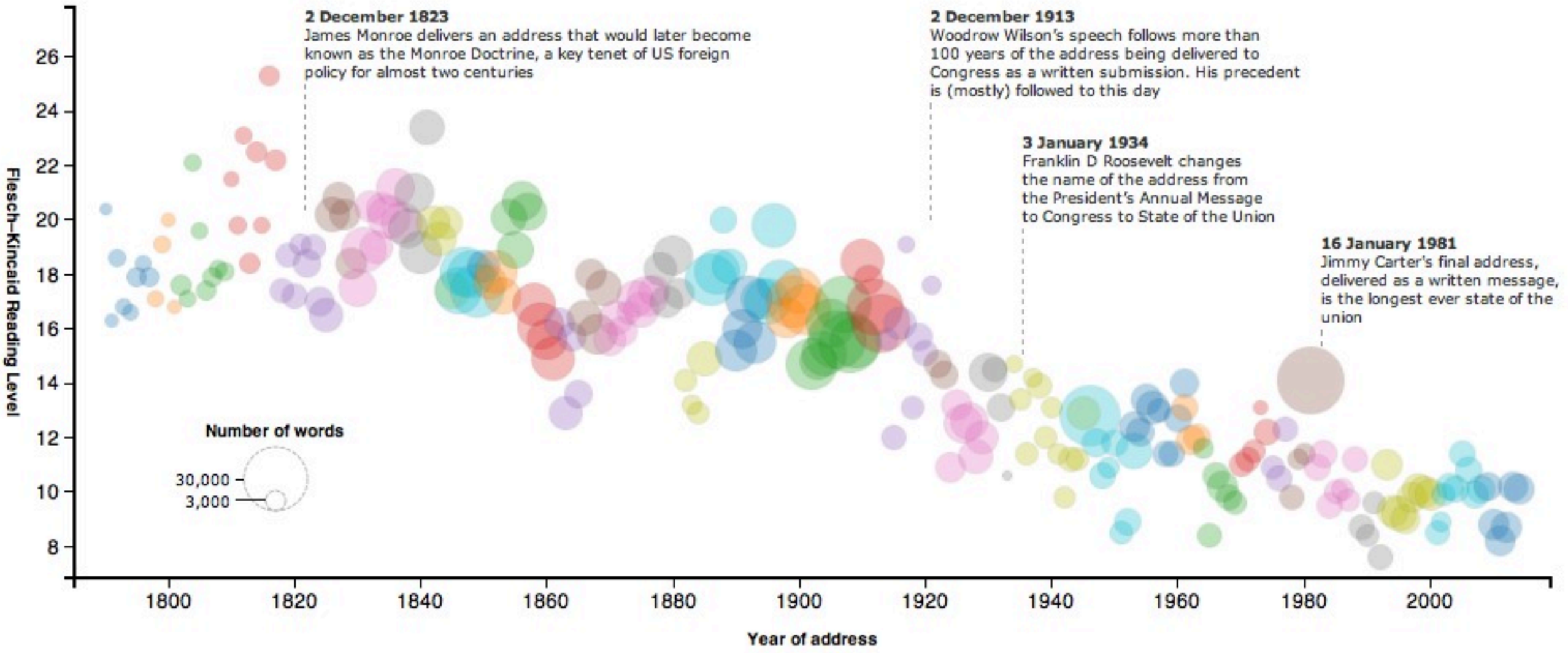
Keim, Oelke, "Literature Fingerprinting: A New Method for Visual Literary Analysis"

Reading level

The state of our union is ... dumber:

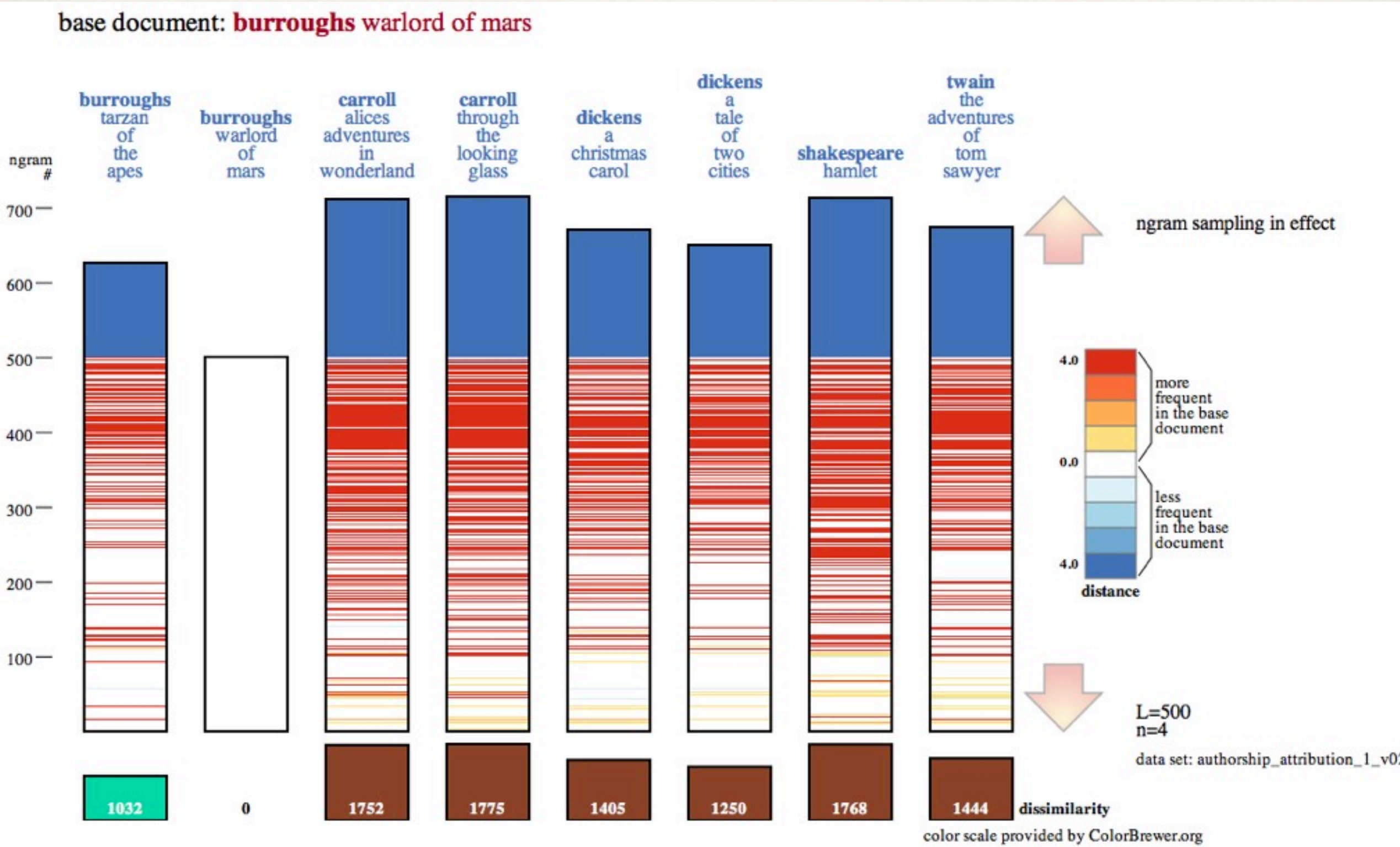
How the linguistic standard of the presidential address has declined

Using the Flesch-Kincaid readability test the Guardian has tracked the reading level of every State of the Union



http://www.theguardian.com/world/interactive/2013/feb/12/state-of-the-union-reading-level

Relative n-gram signatures

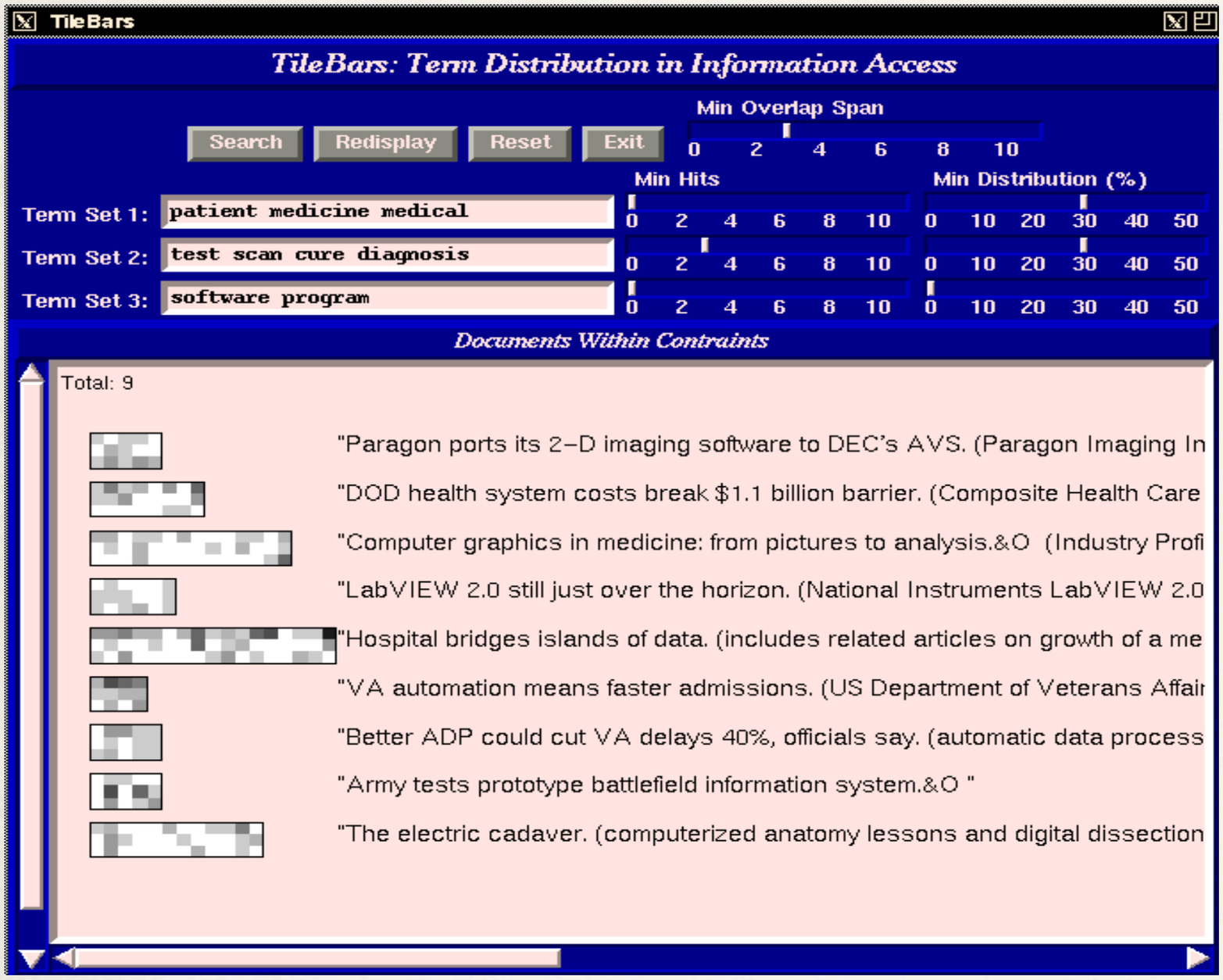


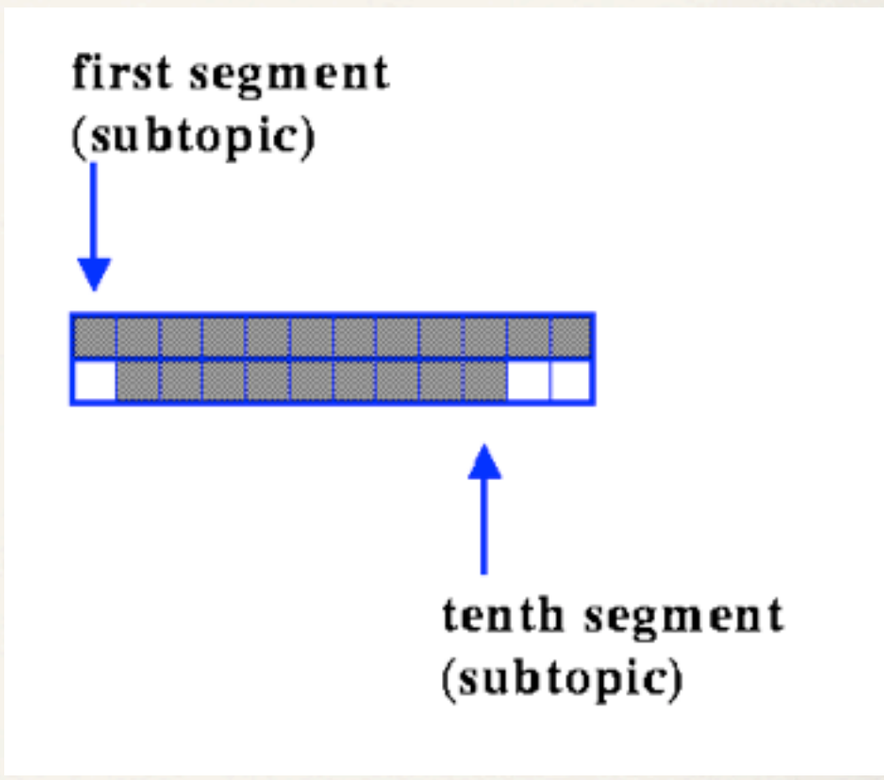
https://web.cs.dal.ca/~jankowsk/ngram_signatures/

Themail

Viégas, “Visualizing Email Content: Portraying Relationships from Conversational Histories”

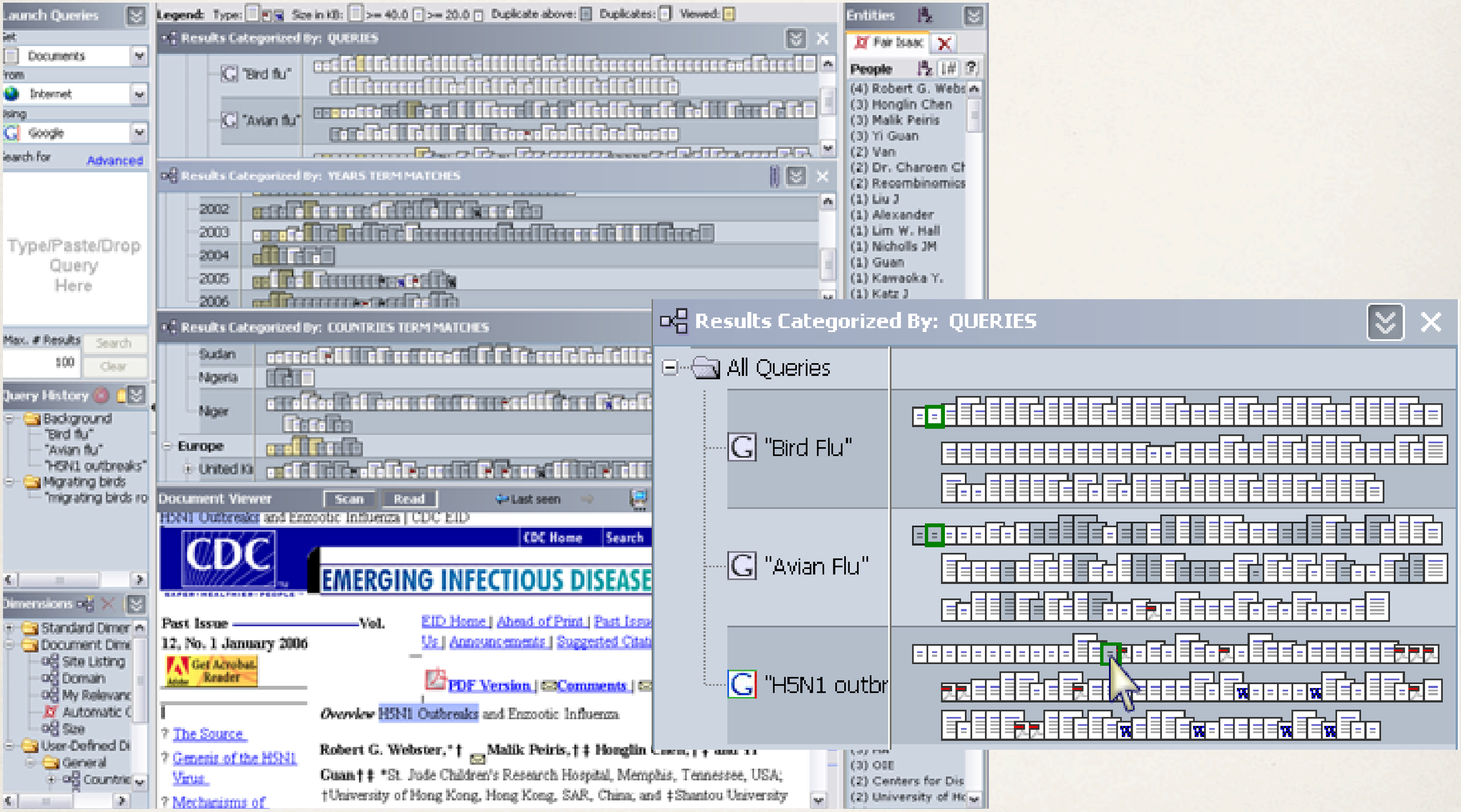
Tilebars





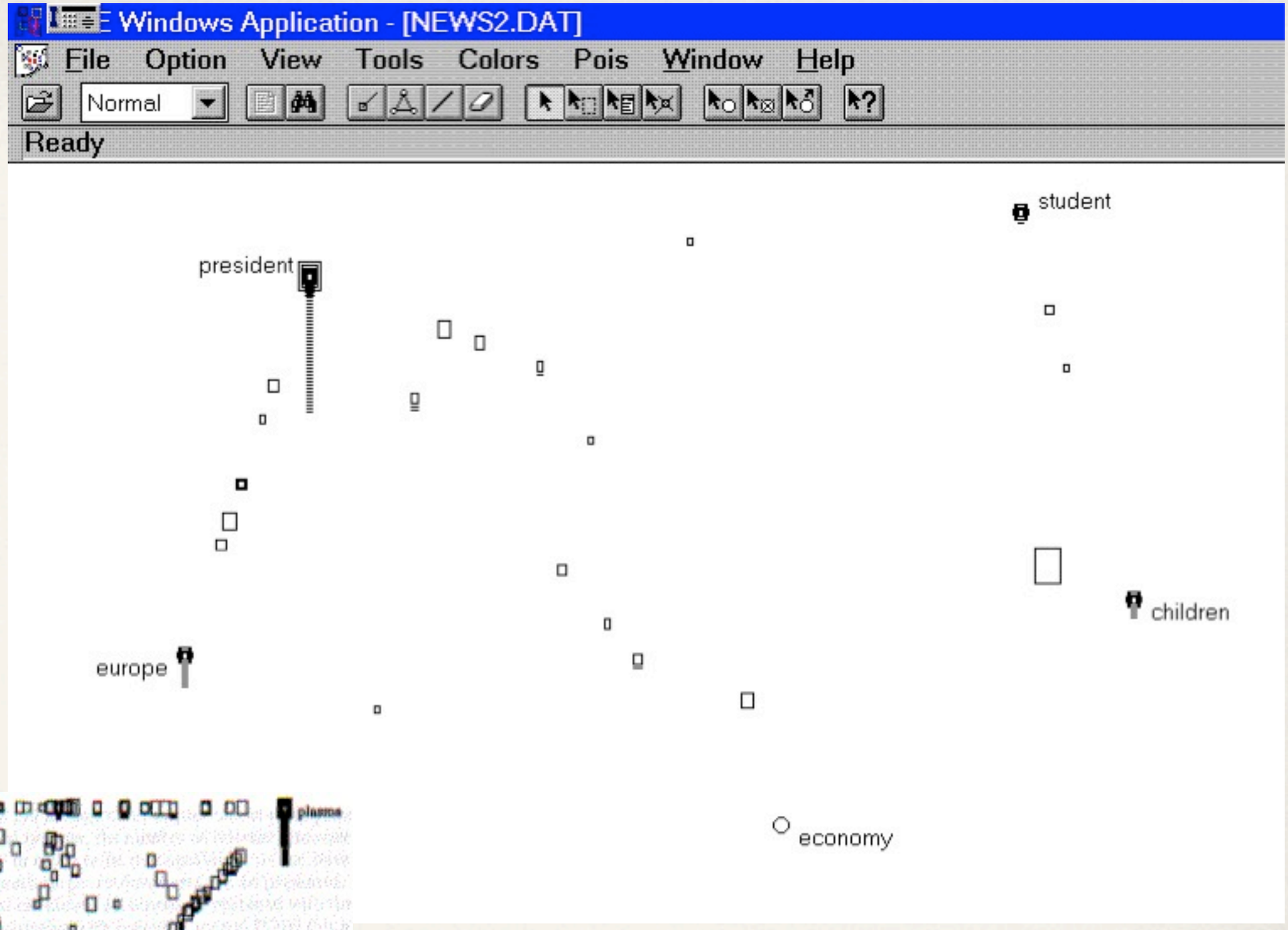
Hearst, "TileBars: Visualization of Term Distribution Information in Full Text Information Access"

TRIST The Rapid Information Scanning Tool



Proulx et al., "Avian Flu Case Study with nSpace and GeoTime"

VIBE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File Option View Tools Colors Pois Window Help
Normal
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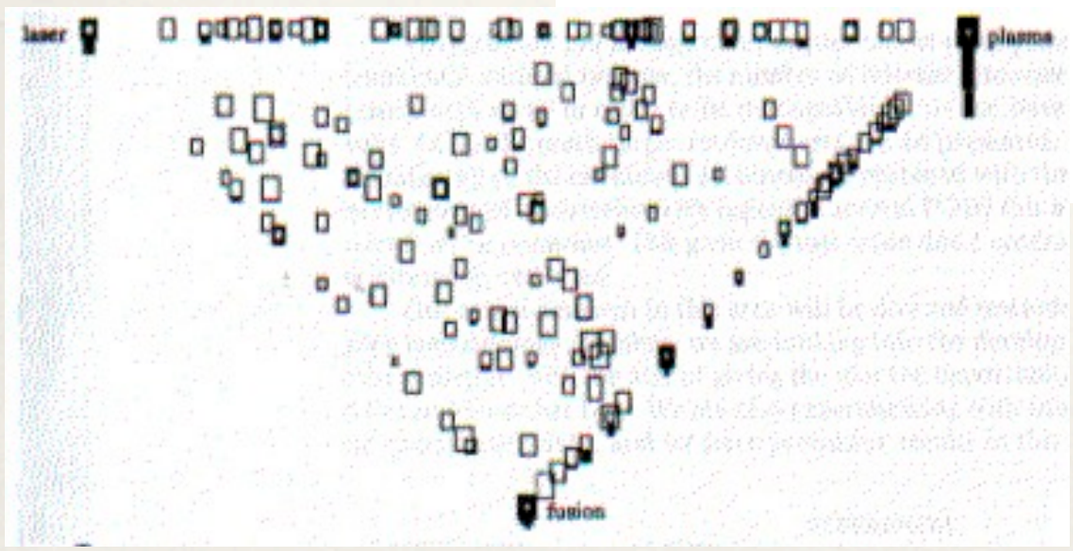
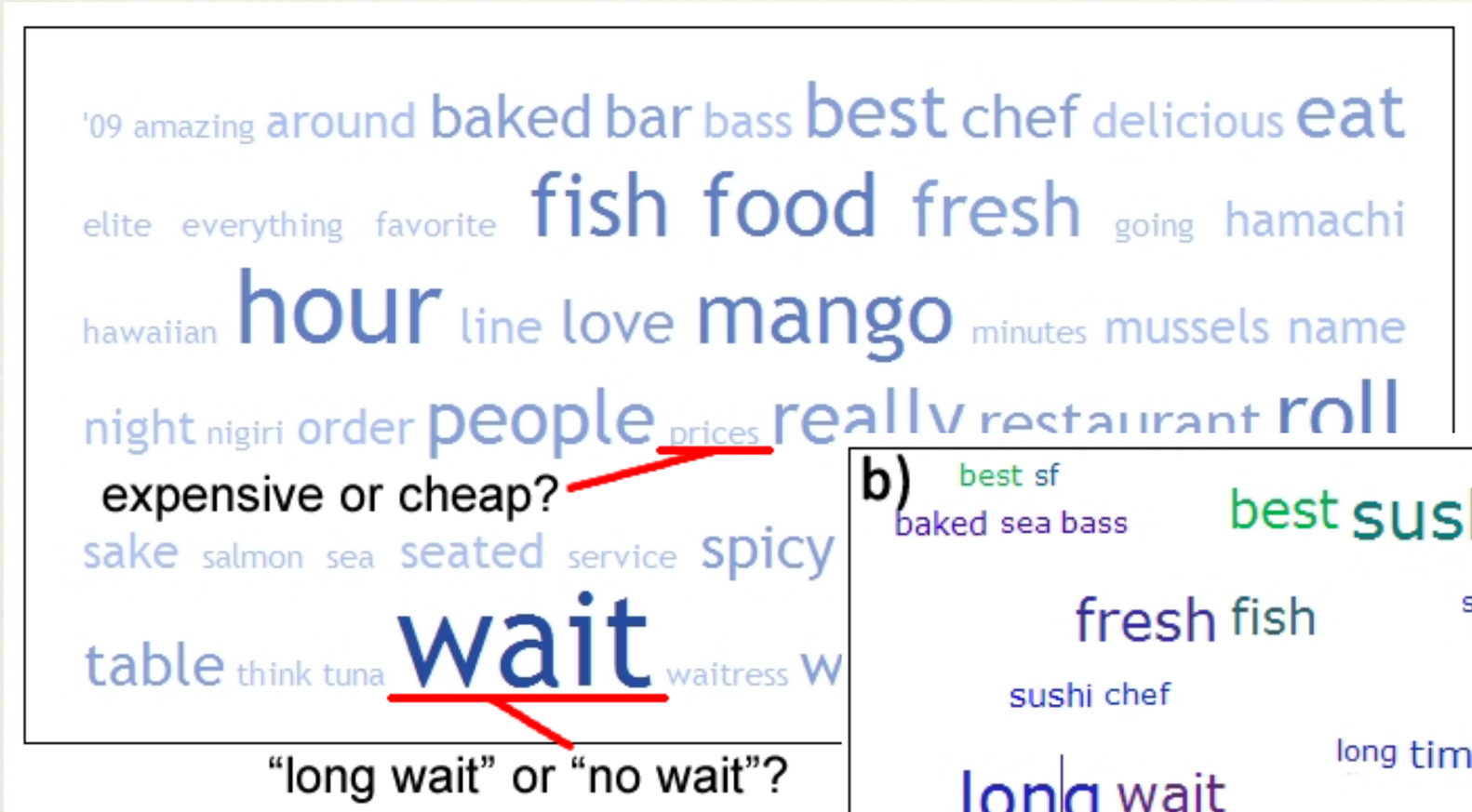
children
economy


laser
plasma
fusion

Review Spotlight



Yatani et al. "Review Spotlight: A User Interface for Summarizing user-generated Reviews Using Adjective-noun Word Pairs"

Named Entity Extraction

A senior police officer was killed near Cairo on Wednesday in a bomb attack claimed by a militant group, while security forces stormed a hideout used by another Islamist organisation near Alexandria in a raid that left an officer and a militant dead. Militant violence has spiralled since last July, when the army toppled elected head of state Mohamed Mursi and the authorities launched a fierce crackdown on his supporters in the Muslim Brotherhood and other Islamist sympathisers. The attacks underline lingering instability in Egypt ahead of a presidential election in May that Abdel Fattah al-Sisi, the former army chief who deposed Mursi, is expected to win. The prime minister said the state was in "a fierce war" on terror. The police officer killed near Cairo was named as Brigadier General Ahmed Zaki. State media said he was killed outside his home in 6th of October City, 32 km (20 miles) outside Cairo, when a bomb placed under his car went off. Two conscript policemen were wounded in the bombing. A militant group called Ajnad Misr, or Soldiers of Egypt, said it carried out the attack in a statement posted on a Facebook account in its name that has carried past statements. The post included a photo of a man said to be Zaki on his way to his vehicle, describing him as "the criminal brigadier general in the (security) force for killing protesters". Mursi's removal from power last summer after mass protests against his rule tipped Egypt into the worst internal strife of its modern history. Hundreds of his supporters were killed by security forces as they broke up their protest camps. Militant attacks since then have killed around 500 people, mostly policemen and soldiers. The threat has been compounded by a flow of weapons from neighbouring Libya. The Interior Ministry said the hideout targeted by police at dawn on Wednesday near Alexandria was used by Ansar Bayt al-Maqdis, or Supporters of Jerusalem, the group behind some of the deadliest attacks of the last nine months. The militants had opened fire on the security forces as they arrived at the hideout in Borg El Arab, some 45 km (28 miles) south-west of Alexandria. The police officer killed in the raid was named as First Lieutenant Ahmed Saad and the dead militant as Hassan Abdel Aal, a 25-year old from the Nile Delta province of Dakahlia. Two other militants were detained, the ministry spokesman, Hany Abdel Latif, said in a televised statement. Footage broadcast on state TV appeared to show the body of a militant on the ground. The militants were "among the dangerous elements of the terrorist group Ansar Bayt al-Maqdis, which was planning to target police and military facilities and the security forces", the ministry said. The police seized weapons including explosive belts, automatic weapons, hand grenades and ammunition.

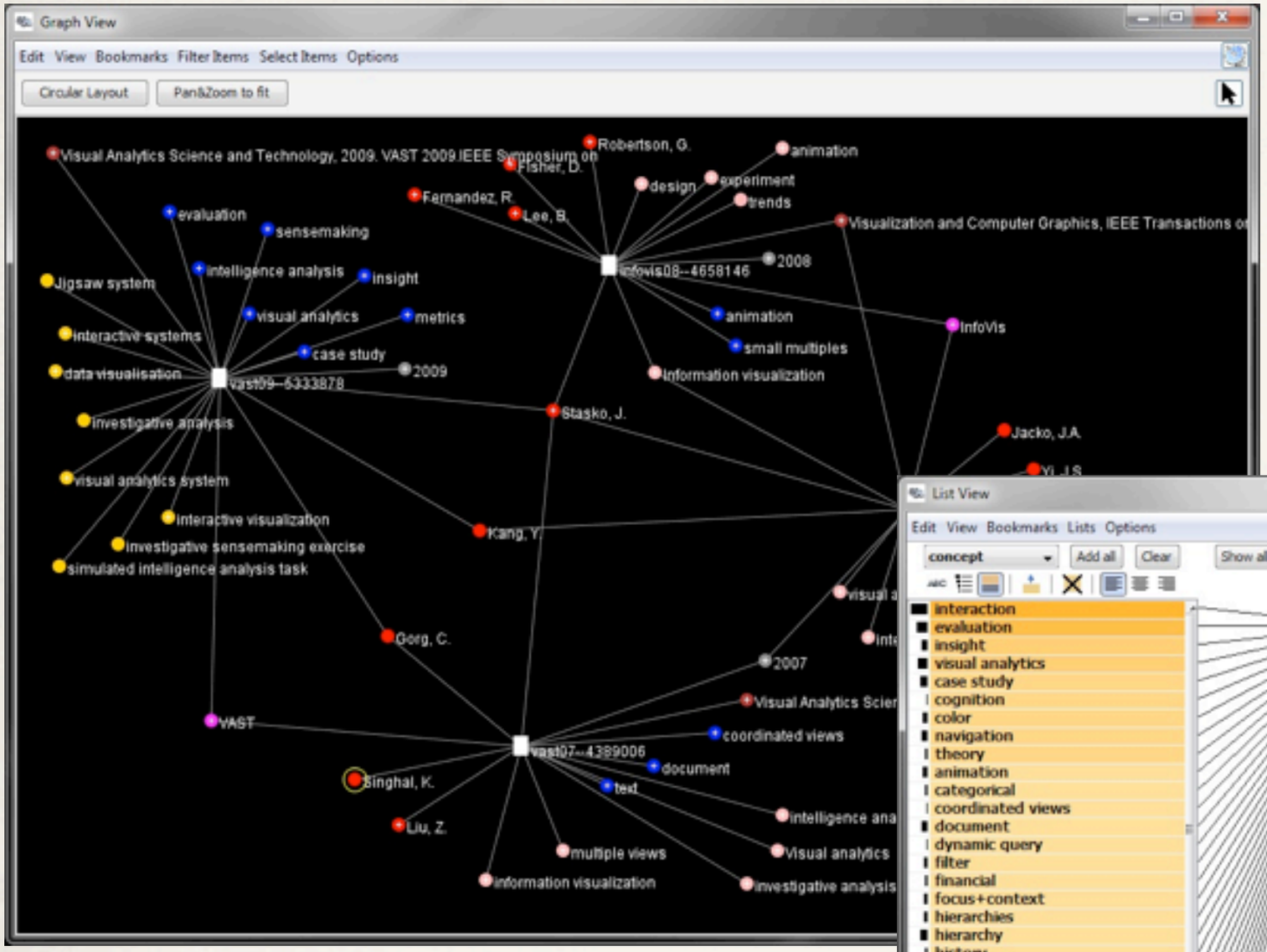
Potential tags:

- LOCATION
- TIME
- PERSON
- ORGANIZATION
- MONEY
- PERCENT
- DATE

http://uk.reuters.com/article/2014/04/23/uk-egypt-violence-idUKBREA3M1KO20140423

Stanford NLP Named Entity Tagger

Jigsaw


Graph View
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Pan&Zoom to fit
Visual Analytics Science and Technology, 2009. VAST 2009.IEEE Symposium on
Robertson, G.
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animation
design
experiment
trends
Fernandez, R.
Lee, B.
evaluation
sensemaking
Visualization and Computer Graphics, IEEE Transactions o
intelligence analysis
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2008
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2007
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Time Line View
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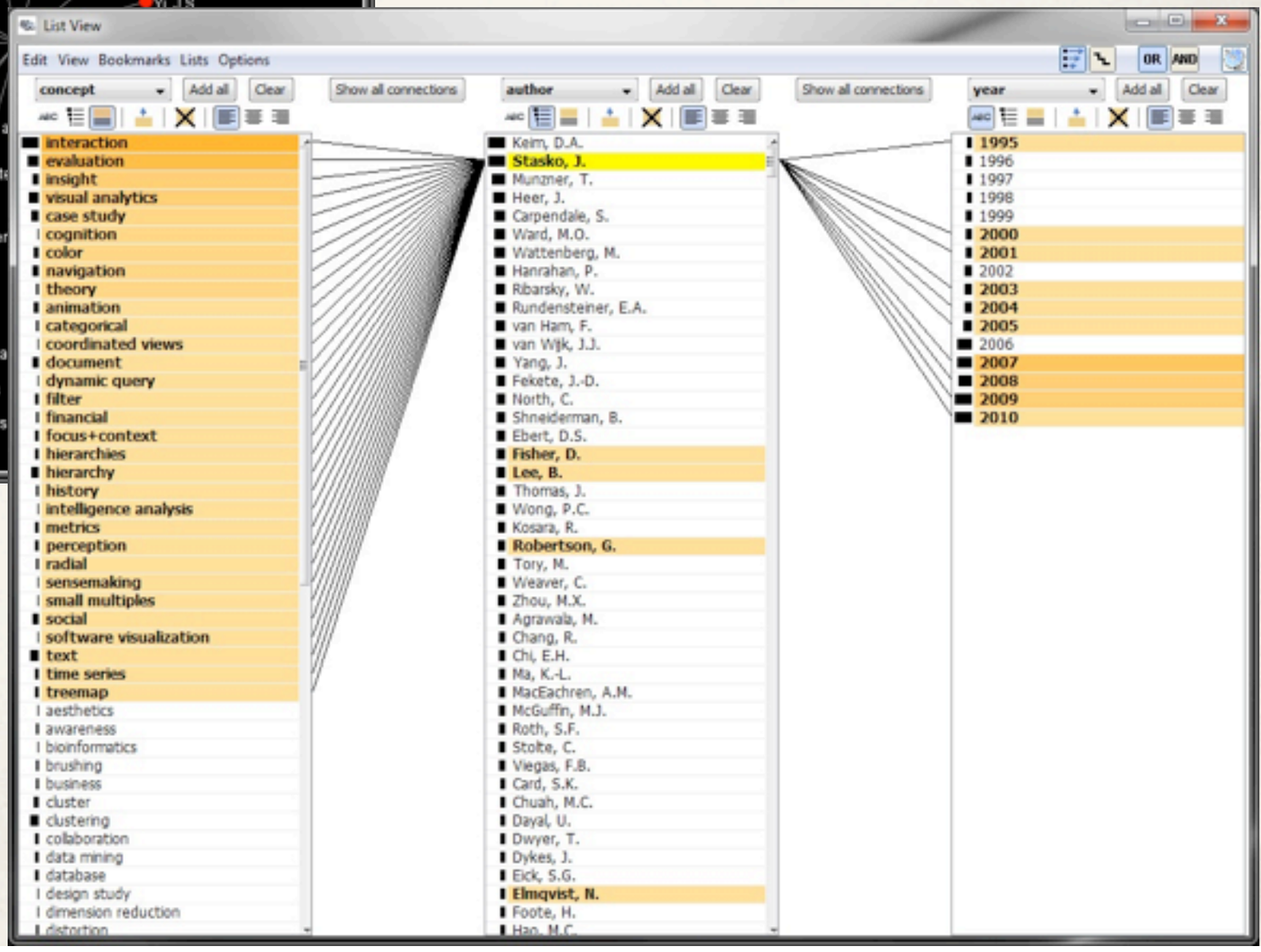
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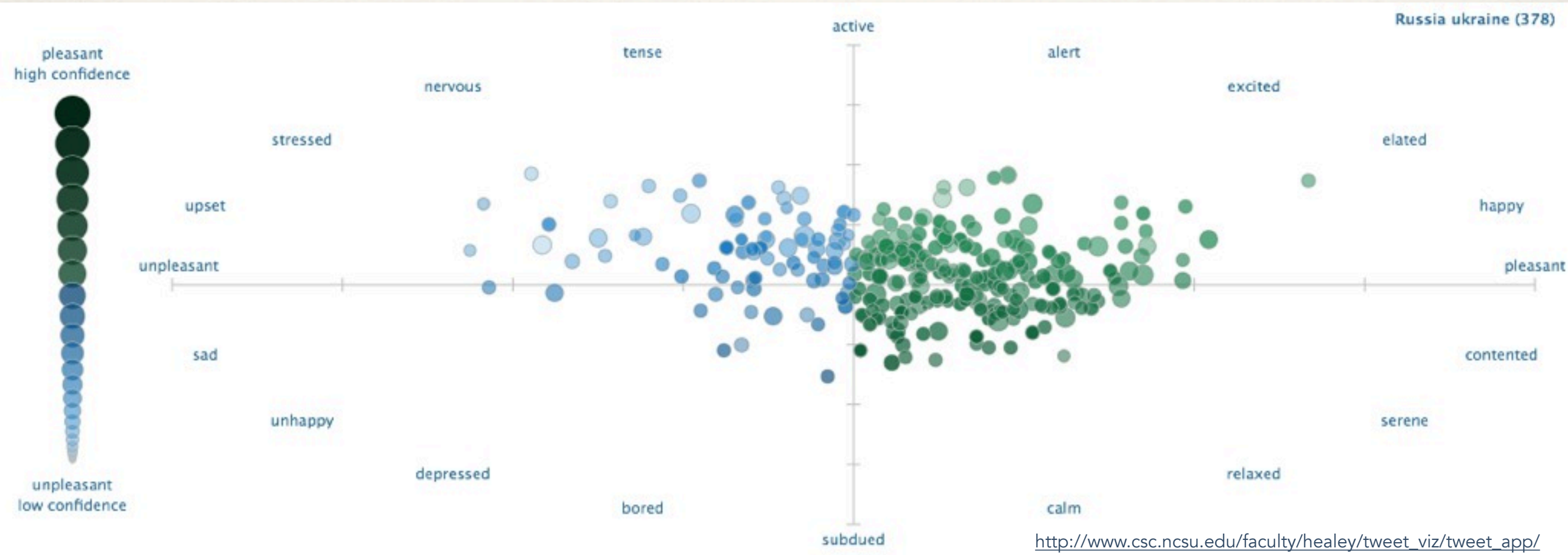
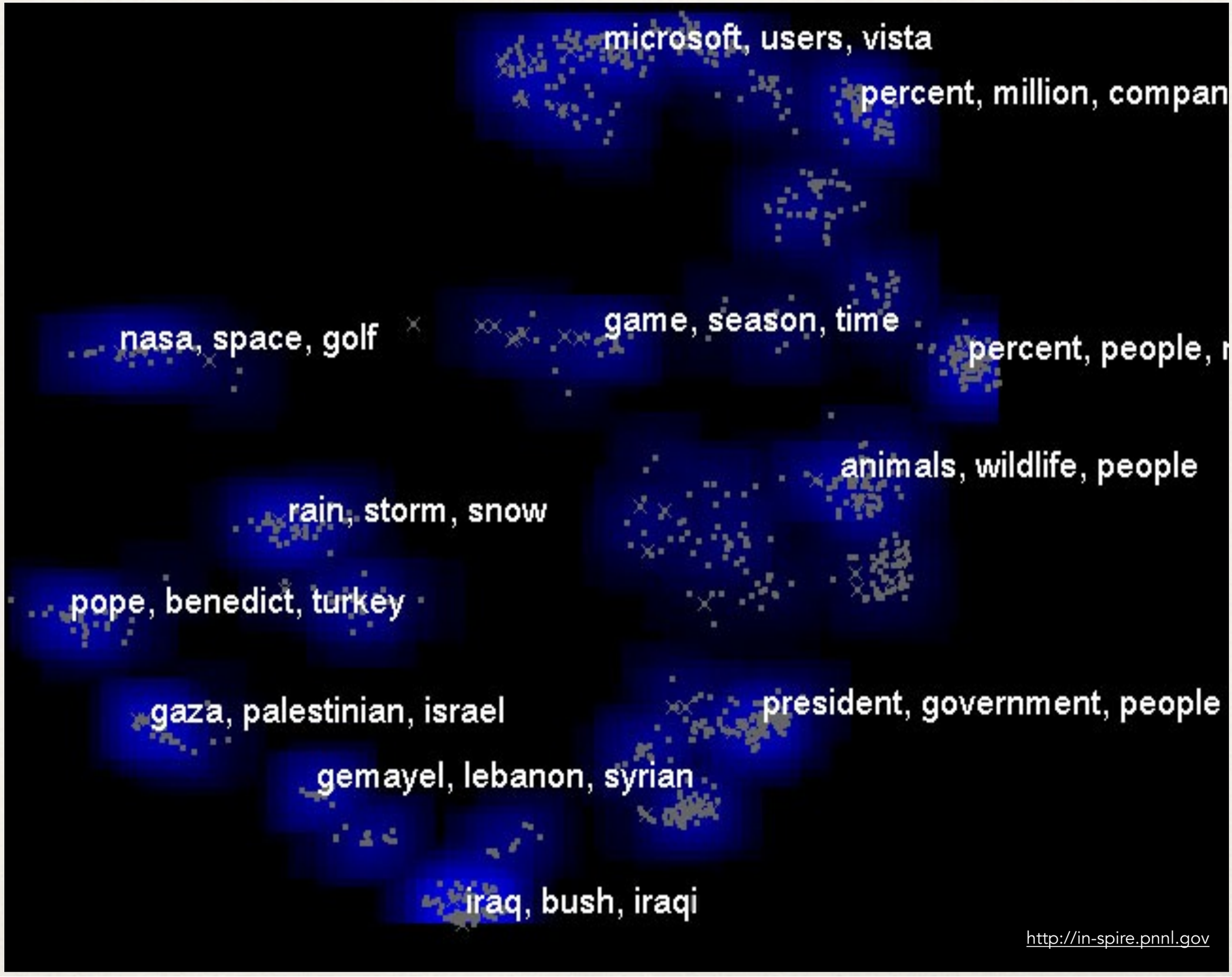
Sentiment analysis



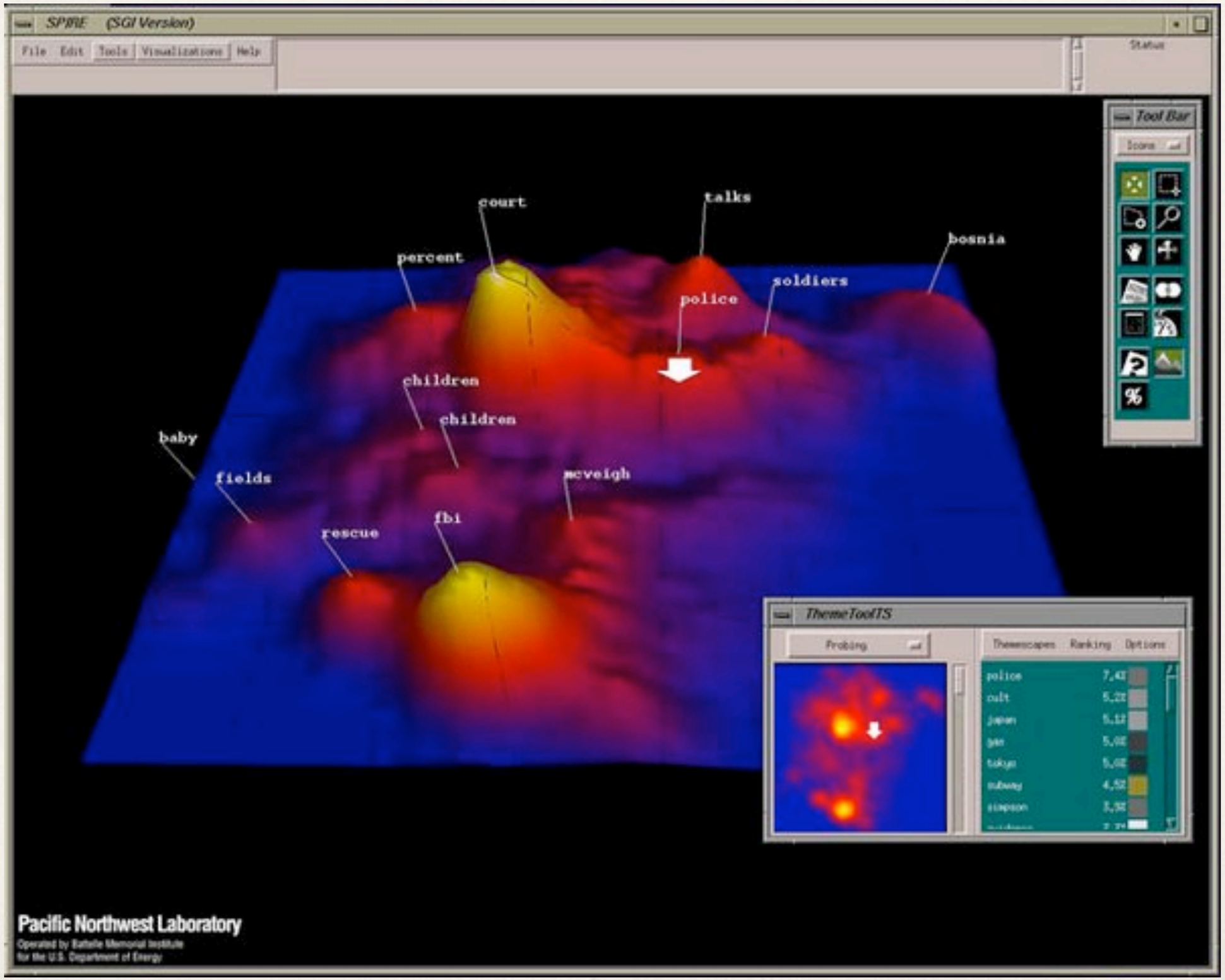
http://www.csc.ncsu.edu/faculty/healey/tweet_viz/tweet_app/

Date	User	v	a	Tweet
04-23-14 21:56	NaijaAviators	5.36	4.79	In an *apparent show* of *force* to #Russia, #U.S. troops have landed in Poland http://t.co/isDqsvkxM6 #Ukraine via @cnni @omojuwa
04-23-14 21:56	SecretNews	5.21	5.42	Sergey Lavrov: 'If Russian Troops Or *People Attacked*, We'll Retaliate': http://t.co/P2k4FCc9Nj #breakingnews,#*breaking*,#*politics*,#military
04-23-14 21:56	VNBreakingNews	5.19	5.64	Russia says it will *respond* if Ukraine *interests attacked* at http://t.co/F75YVJhklc
04-23-14 21:56	jackdrsm	5.92	3.96	RT @GregRaths: Is Ukraine the *starting point* of the next Exodus? http://t.co/KILQlcDAJp #Ukraine #Russia #america #americanidol
04-23-14 21:58	YokelChang	6.34	4.61	#YokelChang Vladimir Putin's *shopping list*: Which country could be next?: *Plenty* of Russia's neighbors are wor... http://t.co/WjPg2ARDwE
04-23-14 21:58	AndresSuurkuusk	3.88	5.35	#Ukraine Resumes *Bid* to Oust Militants Amid #Russia'n #*Threat* http://t.co/1tyBlKRqU7 via @BloombergNews
04-23-14 21:58	MockCasbah	5.87	4.94	@miodragsoric @AtlanticCouncil @MKasyanov *Well* first we need to *make sure* Ukraine *makes* it that long. Russia is *mighty hungry*.
04-23-14 21:58	SonyaHeaney	5.96	4.76	RT @peterbakernyt: *Fascinating look* at *links* btwn *mysterious* "*green men*" in Ukraine and Russian troops. @AndrewKramerNYT Higgins Gordon htt…
04-23-14 21:59	Spiritof1642	6.15	5.55	Russian *Foreign* Minister Sergey Lavrov *gives* Russia Today interview, in English, re #Ukraine. http://t.co/qSqqbo8nYT
04-23-14 21:59	tanialucyjade	5.89	5.23	RT @EuromaidanPR: #Russia Warns #Ukraine of Potential Military *Response* - *New* York *Times* http://t.co/x4iZ5C1vas @BlogsofWar | EMPR *News*
04-23-14 21:59	GregoryHSmith2	5.39	5.11	"@cnni: In an *apparent show* of *force* to Russia, U.S. troops have landed in Poland: http://t.co/Cb9vVhRxyf" *Growing risk* of violence
04-23-14 21:59	euromaidantwit	5.28	5.57	Hillary Clinton *calls* for more sanctions on Russia& she *believes* the *outcome* in #Ukraine will be a *bad one* for Russia http://t.co/ecNLRwdE4e
04-23-14 21:59	LanellePenaflor	5.04	3.89	Amid Russia *warning*, Ukraine is in a *security bind*
04-23-14 21:59	josephwosk	5.31	6.18	RT @Thoreau_H_D: Russia: Duma(*Congress*) to *recognize* the 'Independence' of Transnistria, bordering on Moldova/Ukraine. #euromaidan http:/ …

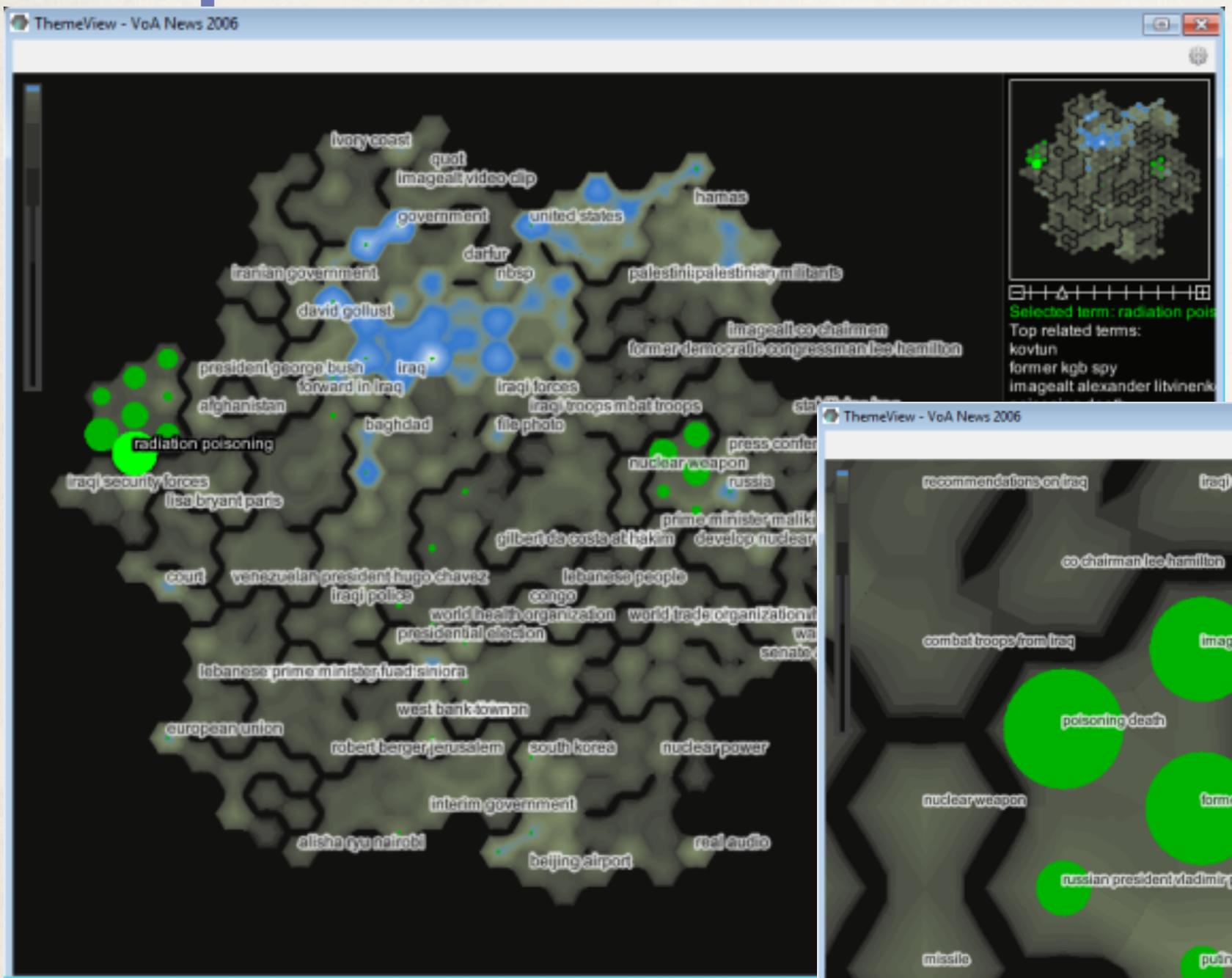
In-Spire: Galaxy view



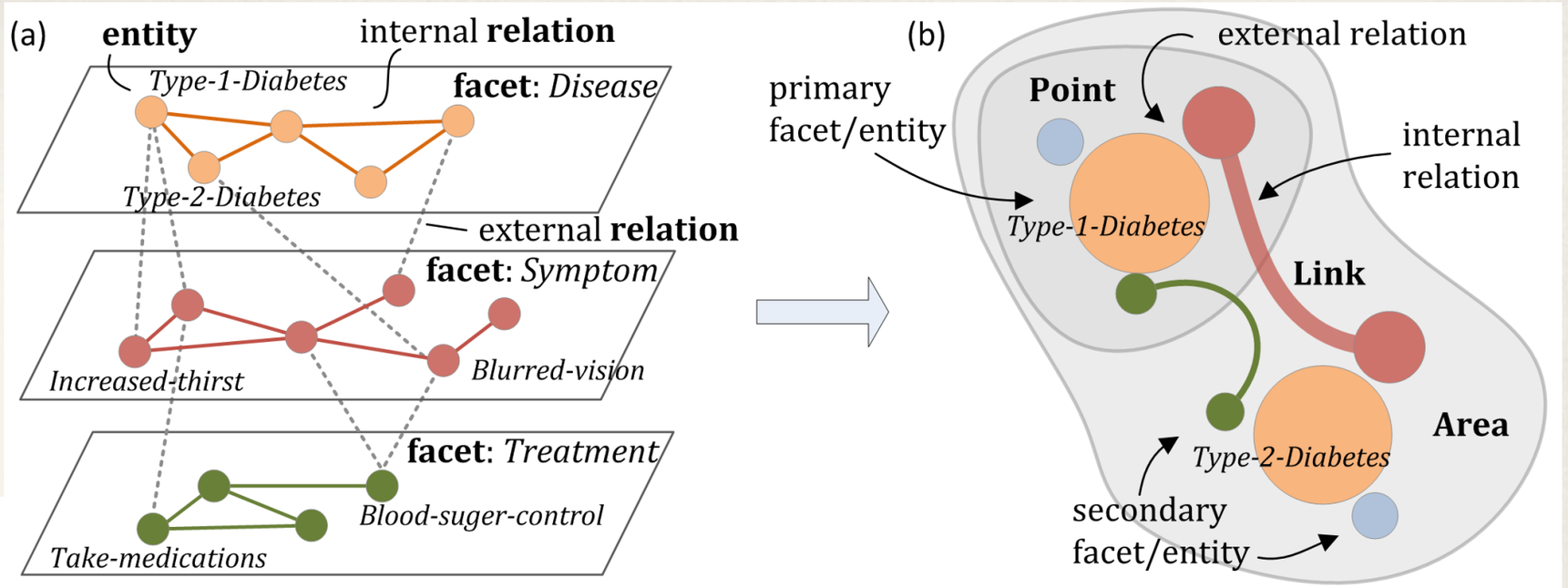
In-spire: Theme view [classic]



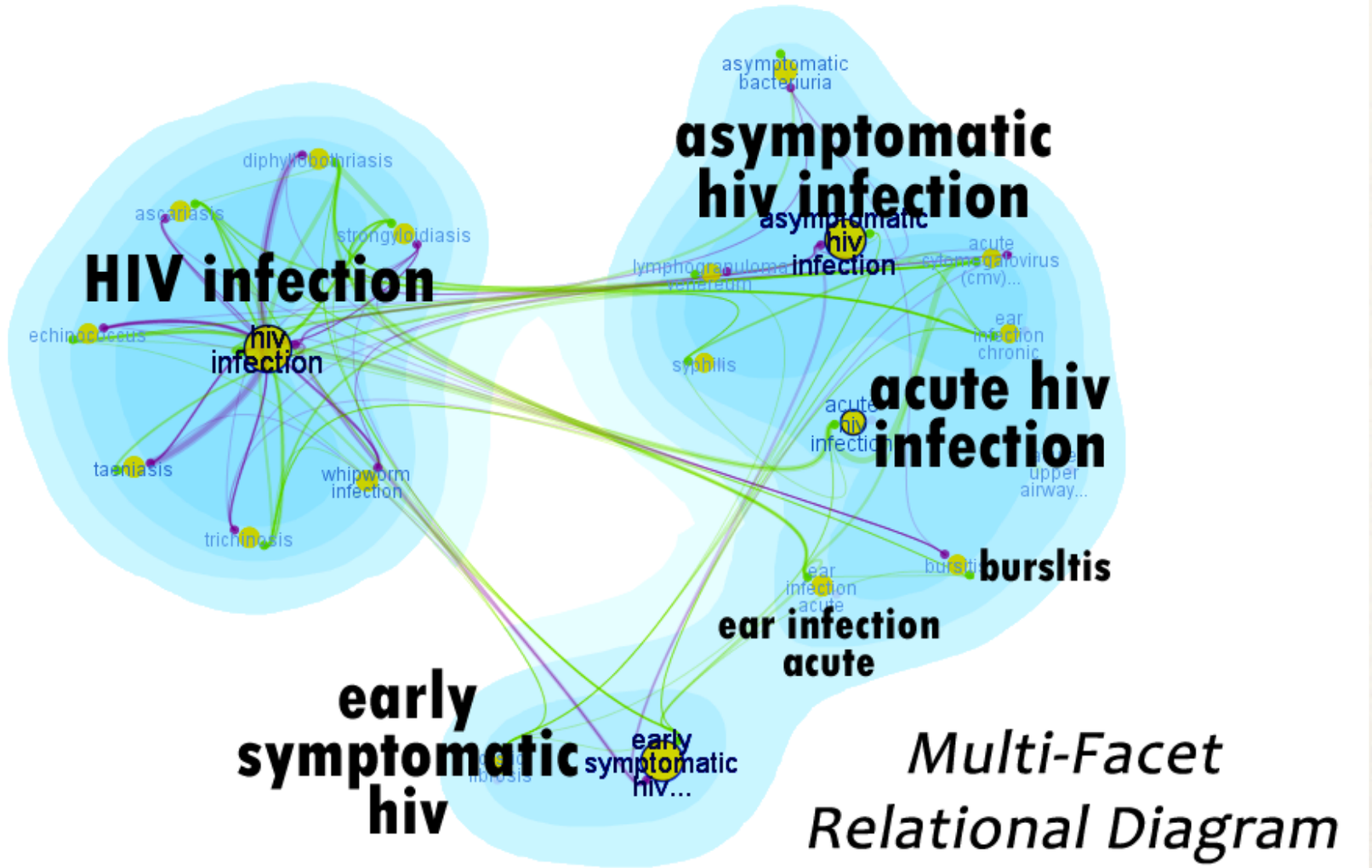
In-Spire: Theme view



FacetAtlas



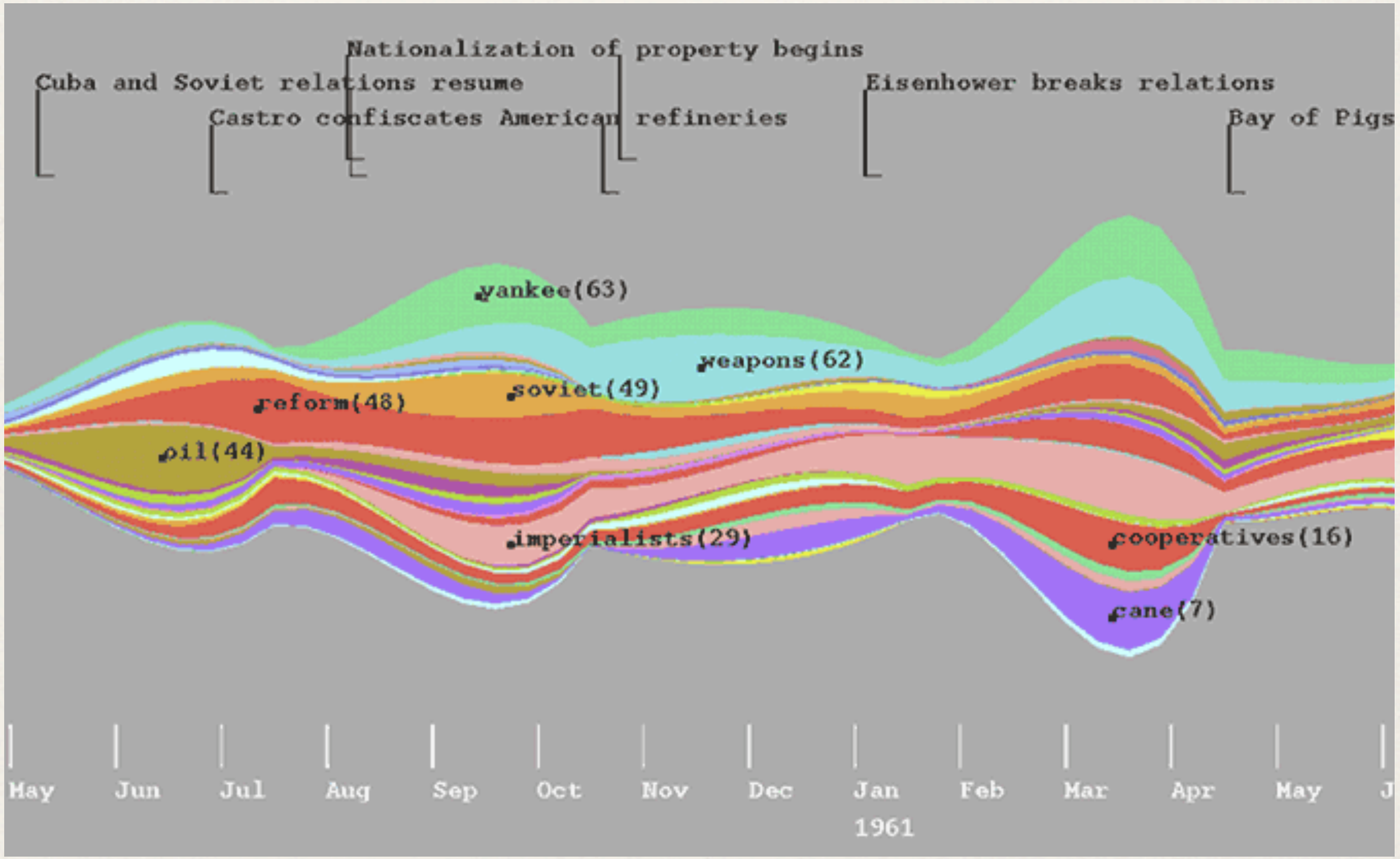
Multi-Facet Query Box



Multi-Facet Relational Diagram

Cao et al., "FacetAtlas: Multifaceted Visualization for Rich Text Corpora"

ThemeRiver


Nationalization of property begins
Cuba and Soviet relations resume
Eisenhower breaks relations
Castro confiscates American refineries
Bay of Pigs
yankee(63)
weapons(62)
soviet(49)
reform(48)
oil(44)
imperialists(29)
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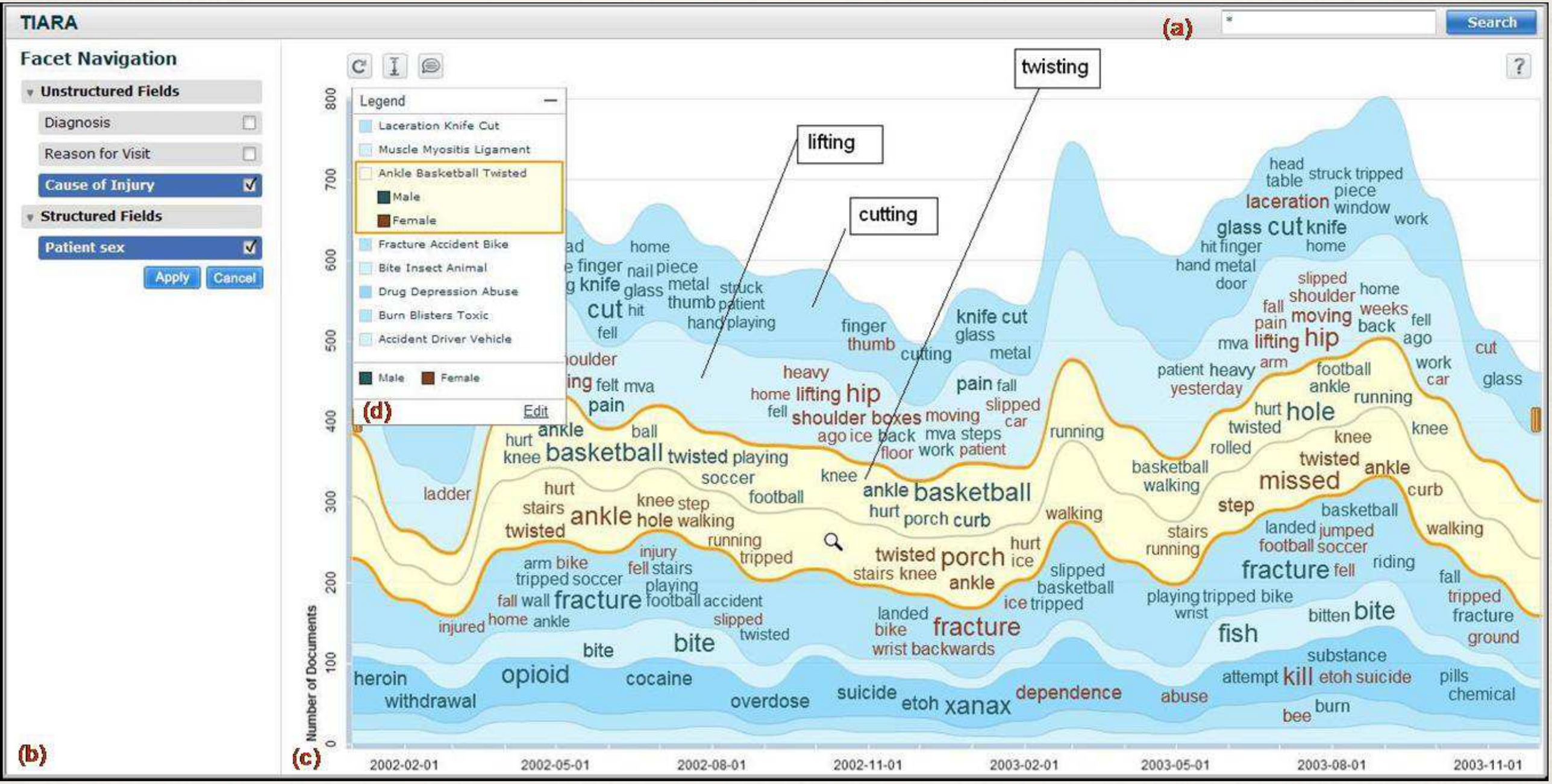
TIARA



Wei et al. "TIARA: A Visual Exploratory Text Analytic System"