



2019 ZJU International Summer School on Visual Analytics



Cross Media Visualization

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OUTLINE

1 Text Visualization

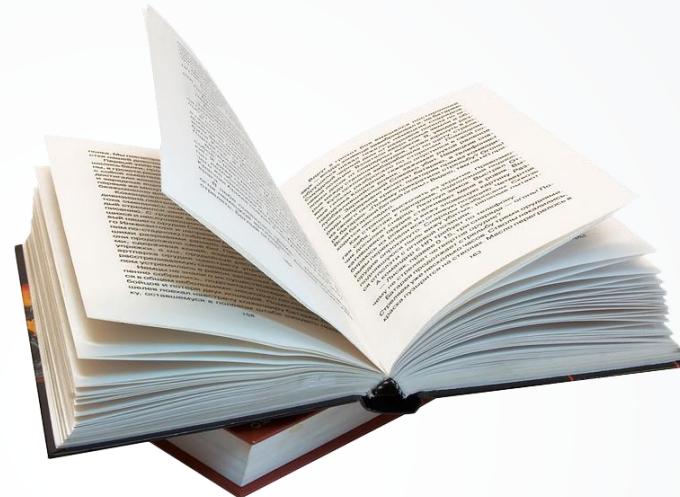
2 Multimedia Visualization

Text Visualization



Text Data

- Books.
- News.
- Web pages.
-



Possible Applications



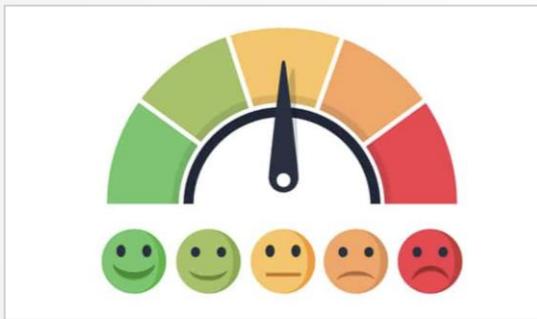
E-Discovery



Social Computing



Business Intelligence



Customer Experience



Predictive Analysis



Public Relation

Tasks

- How to summarize:
 - Content.
 - Topics.
- Useful for:
 - Analyzers.
 - Researchers.

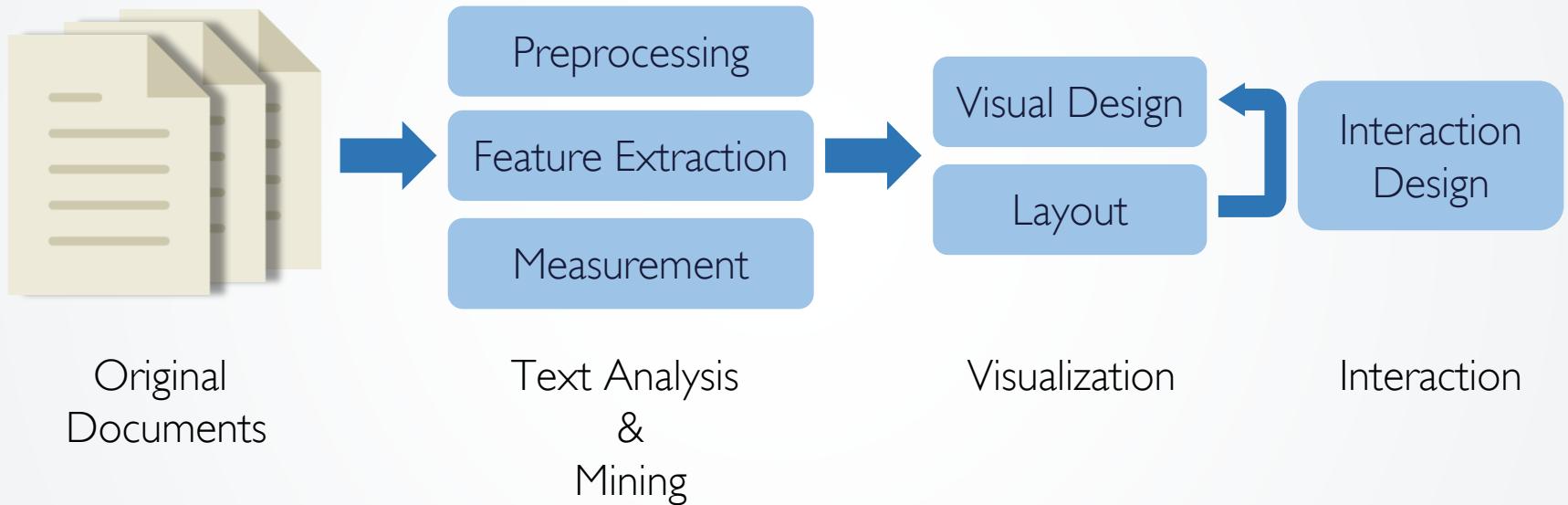
Levels in Text Information

- Based on understanding levels:
 - **Lexical** Level: basic unit of text.
 - **Syntactic** Level: structure information.
 - Semantic Level: meaning of text contents.

Research Direction

- Type of text:
 - Single document.
 - Document collection.
 - Temporal documents.
- Features of text:
 - Content.
 - Structure.
 - Multi-level information.

Process



Process: Text Analysis & Mining

- Preprocessing:
 - Text wrangling.
- Feature Extraction:
 - Keywords.
 - Word frequency.
 - Topics.
- Measurement:
 - Document similarity
 - Clustering

Process: Visualization

- Visual Design:
 - Chernoff Face.
 - Flow metaphor.
 - ...
- Layout:
 - Force-directed.
 - Treemap
 - Scatterplot
 - ...

Process: Interaction

- Linking & Brushing:
 - Brushing: focusing.
 - Linking: highlighting.
- Zooming
- Focus + Content
- Filtering

Text Analysis Methods

- Tokenization
- Vector-space Model
- Topic retrieving

Tokenization

"I have a dream that one day this nation will rise up and live out the true meaning of its creed: We hold these truths to be self-evident, that all men are created equal."



- Remove stop words: a, the, that, etc.
- Plural form to singular form: men->man, truths->truth



I, dream, one, day, nation, rise, up, live, out, true, meaning, creed, hold, truth, be, self-evident, all, man, created, equal

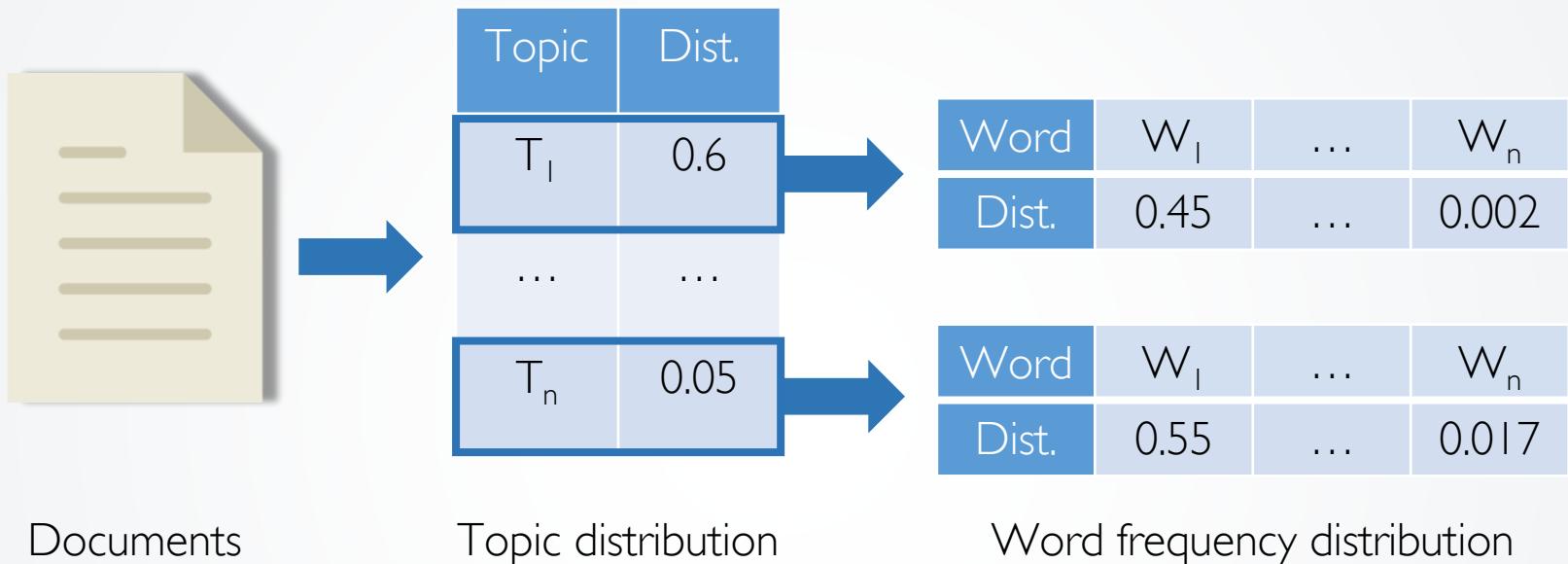
Vector-space Model

- Bag-of-words

Word	I	dream	color	skin	nation	slave	injustice	owner
Frequency	4	4	1	1	2	2	1	1

- Document similarity: compute similarity between two word-frequency vectors
 - Cosine: $\cos \theta = \frac{\mathbf{v}_1 \mathbf{v}_2^T}{\|\mathbf{v}_1\| \cdot \|\mathbf{v}_2\|}$
 - TF-IDF

Topic Retrieving



- Approaches:
 - Latent Semantic Indexing
 - pLSI
 - LDA

Text Visualization

- Categorized based on features
 - Visualizing Document Content
 - Visualizing Document Relations
 - Multi-level Document Visualization

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Visualizing Document Content

- Keyword-based Visualization
- Temporal Document Visualization
- Feature Distribution Visualization
- Opinion Analysis
- Query Visualization
- Software Visualization

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Visualizing Document Content

- Tag Cloud/Text Cloud/Word Cloud
 - Retrieve keywords and arranged in a pattern
 - Encoding: color and size



Tag cloud of "I have a dream".

Visualizing Document Content

Music Artist Cloud

Enter artist here ...

Passengers [Bono](#) [R.E.M.](#) [INXS](#) [Bruce Springsteen](#) [The Police](#) [Simple Minds](#) [Coldplay](#) [Noel Gallagher's High Flying Birds](#) [Bryan Adams](#) [Sting](#) [Peter Gabriel](#) [Pearl Jam](#) [The Cranberries](#) [The Rolling Stones](#) [Phil Collins](#) [Paul McCartney](#) [Robert Plant](#) [Lenny Kravitz](#) [Oasis](#) [Aerosmith](#) [Tom Petty](#) [Bon Jovi](#) [Sinead O'Connor](#) [Tom Petty and the Heartbreakers](#) [David Bowie](#) [Crowded House](#) [Midnight Oil](#) [Alanis Morissette](#) [Dire Straits](#) [Bruce Springsteen & The E Street Band](#) [Guns N' Roses](#) [Queen](#) [Elton John](#) [The Killers](#)

[Read biography](#)

 [G+](#)

U2


01. White Light Without You
02. Pride
03. One
04. Beautiful Day
05. Vertigo
06. Every Breaking Wave
07. Where The Streets Have No Name
08. Swelling Thing
09. Walk On
10. I'm Ready
11. Electrical Storm
12. Bloody Sunday
13. Invisible
14. I Still Haven't Found What I'm Looking For
15. Sold Me Someones
16. Ball
17. The Miracle
18. New Year's Day
19. Little Voice
20. If I Should Fall In Love Tonight

U2 Greatest Hits Full Album - The Best of U2 - U2 Love Songs Ever


U2 - With Or Without You (U2 At The BBC)
The Best of U2 - U2 Greatest Hits Full Album
As Melhores de U2 / the best of u2
U2 - With Or Without You (live 1987) [lyrics]
U2: Where The Streets Have No Name
U2 - Stuck In A Moment You Can't Get Out Of
U2 New Years Day (Full Version)

[Learn more about U2 on Wikipedia](#)
[Get details on music albums by U2 at Discogs](#)

Music Artist Cloud
version 6.2.php
©mac 2017

Camaris Dev Team
[contact us](#)

powered by Google App Engine

<https://musicartistcloud.appspot.com/>

Derivation: Wordle

- Aesthetic Modification
 - Customable shape
 - Encoding: font style, size, color
 - Tightly arranged



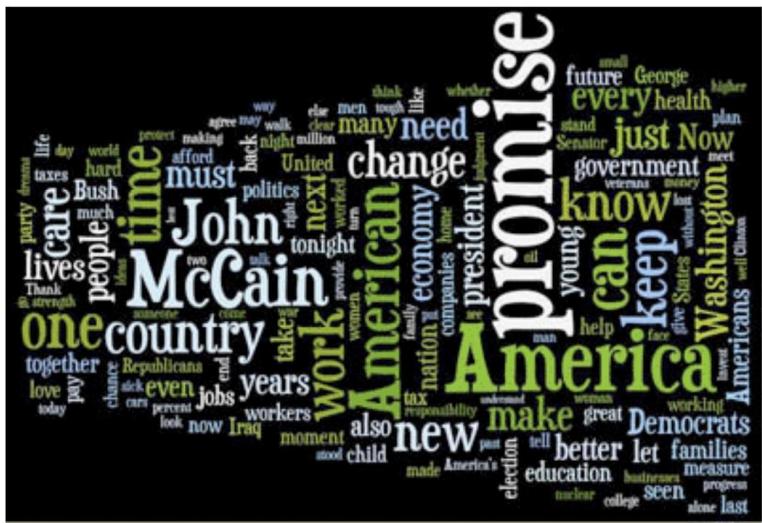
Wordle of “I have a dream”.

Wordles



Other wordle of “I have a dream”.

Created by: <https://wordart.com/create>



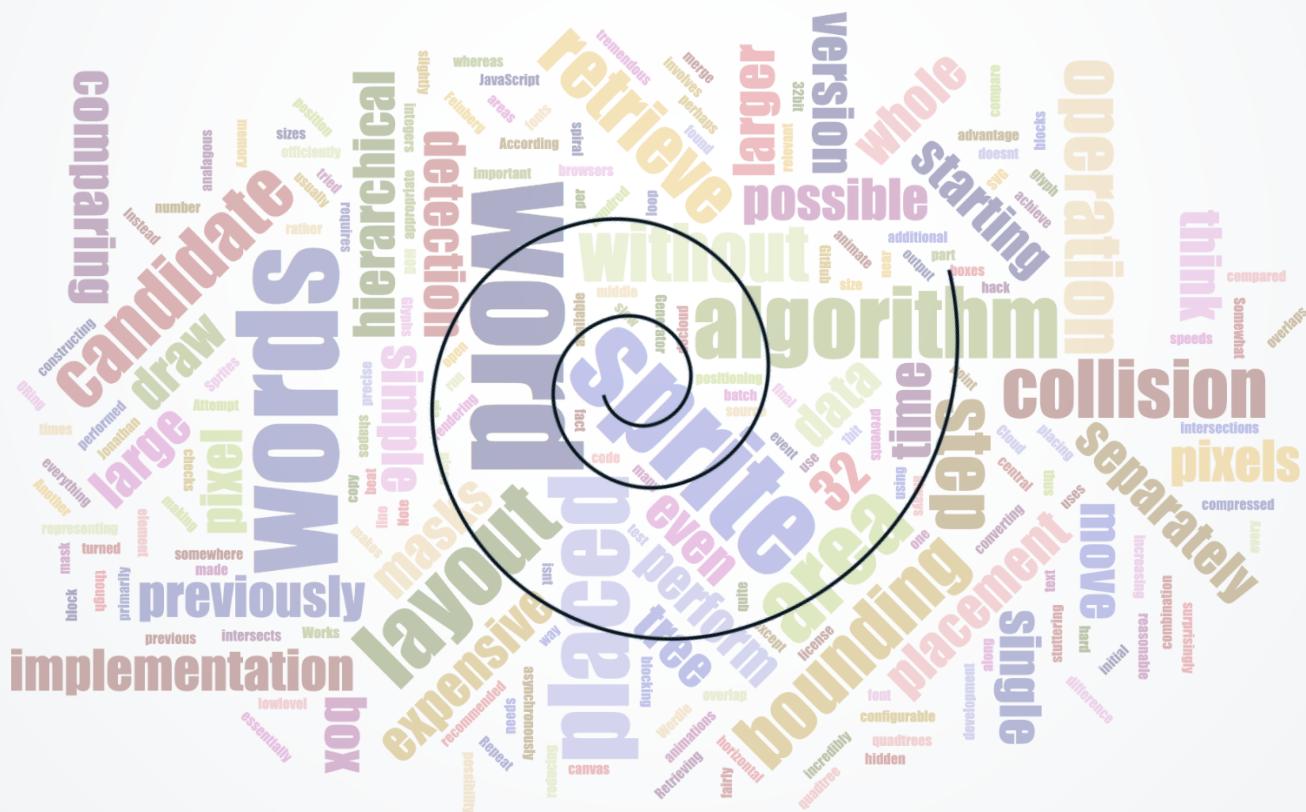
11 addiction admit afford afghanistan ago agree ahead alive **america american americans** army auto back
benefits breaks bush business businesses **Care cars century challenges chance change** child children clean clear clinton college
companies **Country** create cut daughters day days debate decades decent **democrats deserve dignity dollars dreams drive economic**
economy education election end energy face failure families family finally find finish fix fundamental fundamentals future
generation george give giving good government grateful great hands hard health hear heard higher home hope idea ideas
invest iraq job jobs **john judgment kennedy lead leave life lives long longer lost love made make makes making man**
market **mccain measure meet men michelle middle-class military million moment moments money moral nation new**
night nuclear obligation oil part party past pay people percent plan plans plant politics poverty power president programs
progress **promise protect proud provide pursue put ready renewable republicans require respect responsibility restore**
reward rise safe security senator sense set sick sights small stand standards start **states stood strength student talk talking tax taxes teachers**
technology ten things they threats **time today tonight tough troops turn understand united veterans walk Washington**
watch watching whiners woman women **work worked workers working world years young**

Fernanda B. et al. Participatory Visualization with Wordle. (IEEE TVCG 2009).

Wordle vs. Tag Cloud of Barack Obama's speech at the Democratic Convention in 2008.

Layout

- Spiral layout



Layout

- Horizontal and vertical layout



Layout

- Random layout



Layout

- Shape layout



Context-preserving Word Cloud

● = Appearing ● = Disappearing ● = Unique



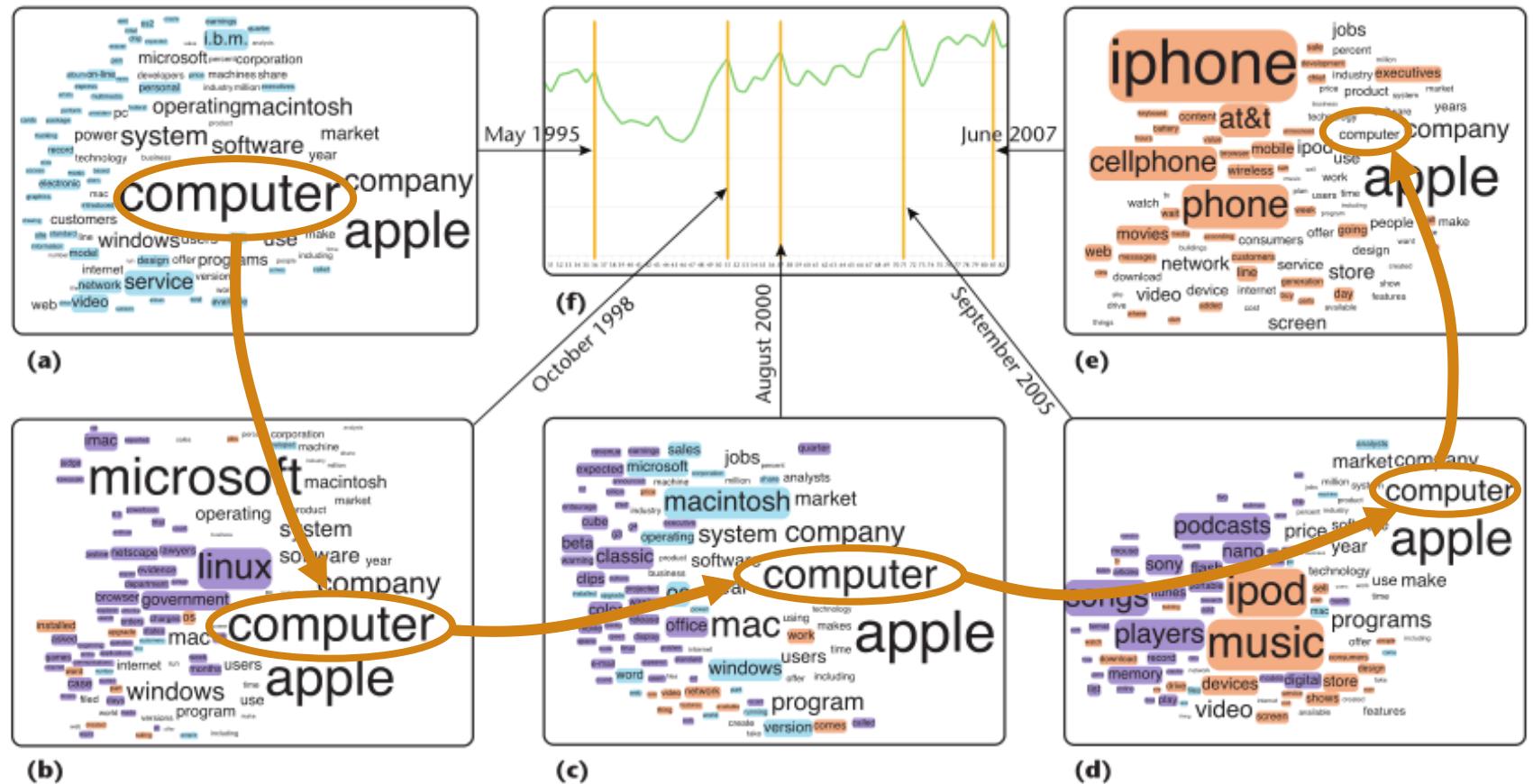
The importance criterion

● = Appearing ● = Disappearing ● = Unique



The co-occurrence criterion

Context-preserving Word Cloud



Consistency-preserving Word Cloud



Word cloud of five articles

Consistency-preserving Word Cloud

INFOVIS PAPER

EdWordle: Consistency-preserving Word Cloud Editing

yunhai wang, Xiaowei Chu, Chen Bao, Lifeng Zhu, Oliver Deussen,
Baoquan Chen, Michael Sedlmair



1–6 October 2017
Phoenix, Arizona, USA

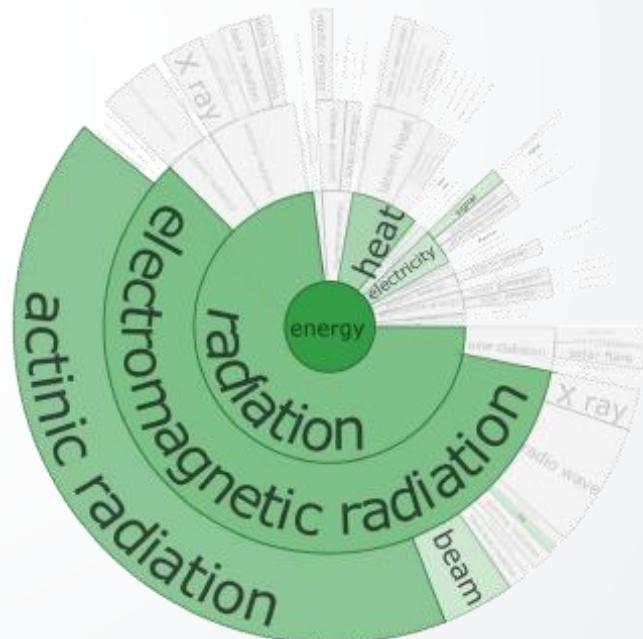
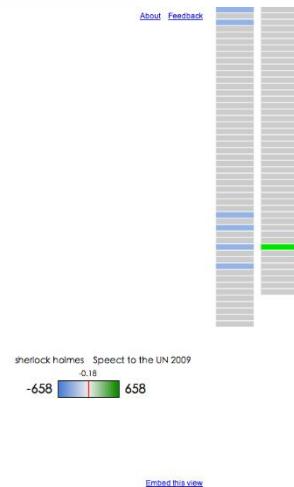
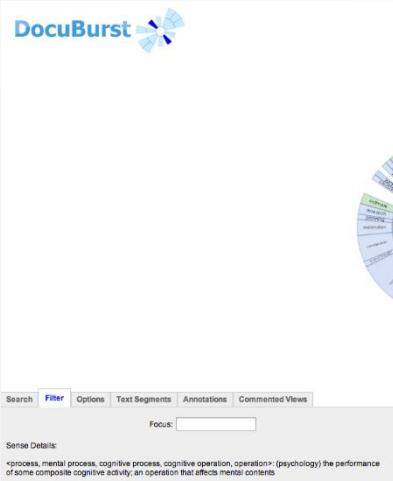
ieeevis.org

Generating Wordle

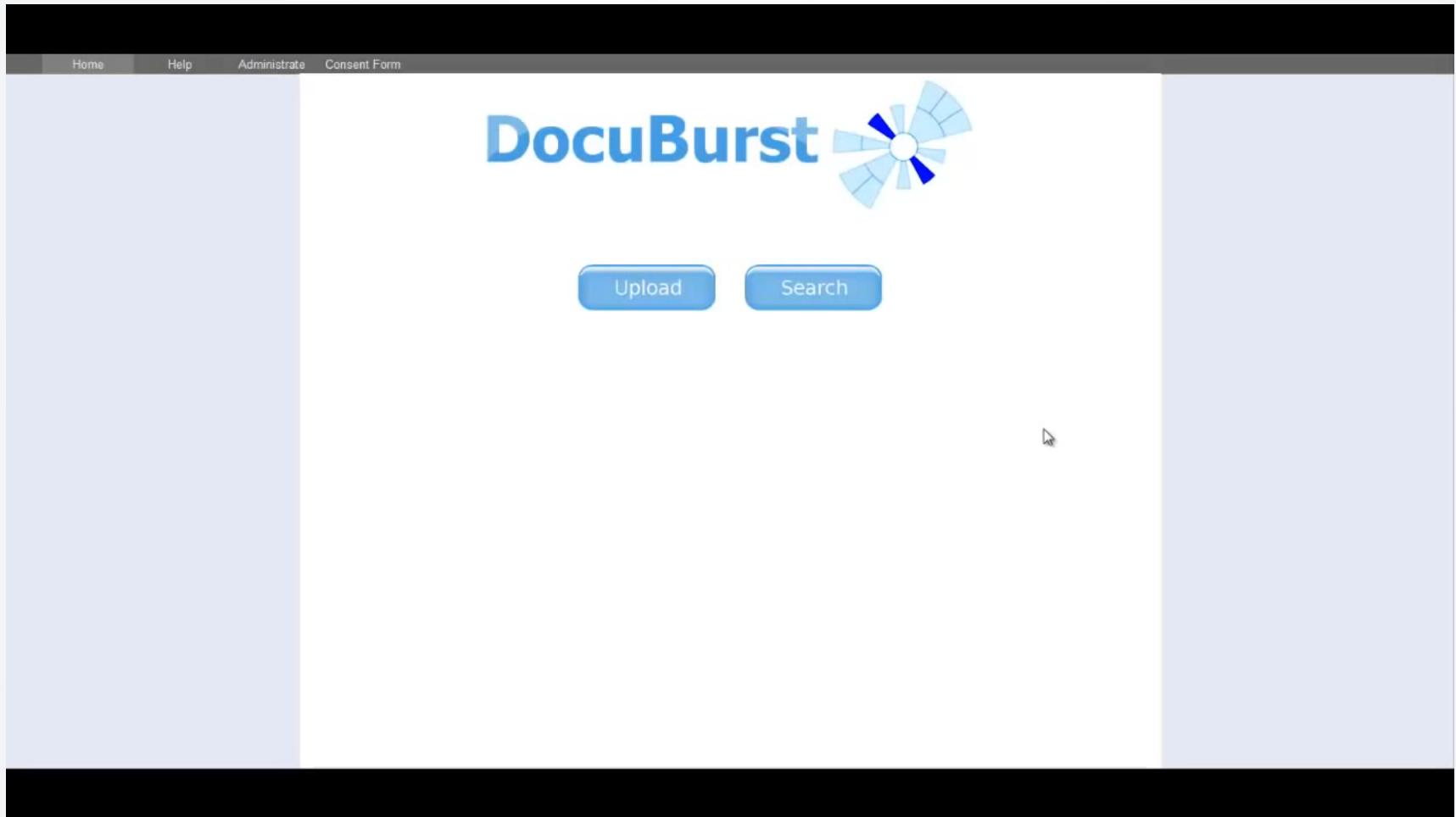
- Sort words by frequency or importance (encoded by font size)
- Specify layout rule:
 - Spiral
 - Horizontal and vertical
 - Random
 - User-specified shape
- Remember the shape (if necessary)

DocuBurst

- Keyword-based method
- Radial layout: words in outer circles are hyponyms of those in inner circles
- Tree-like structure



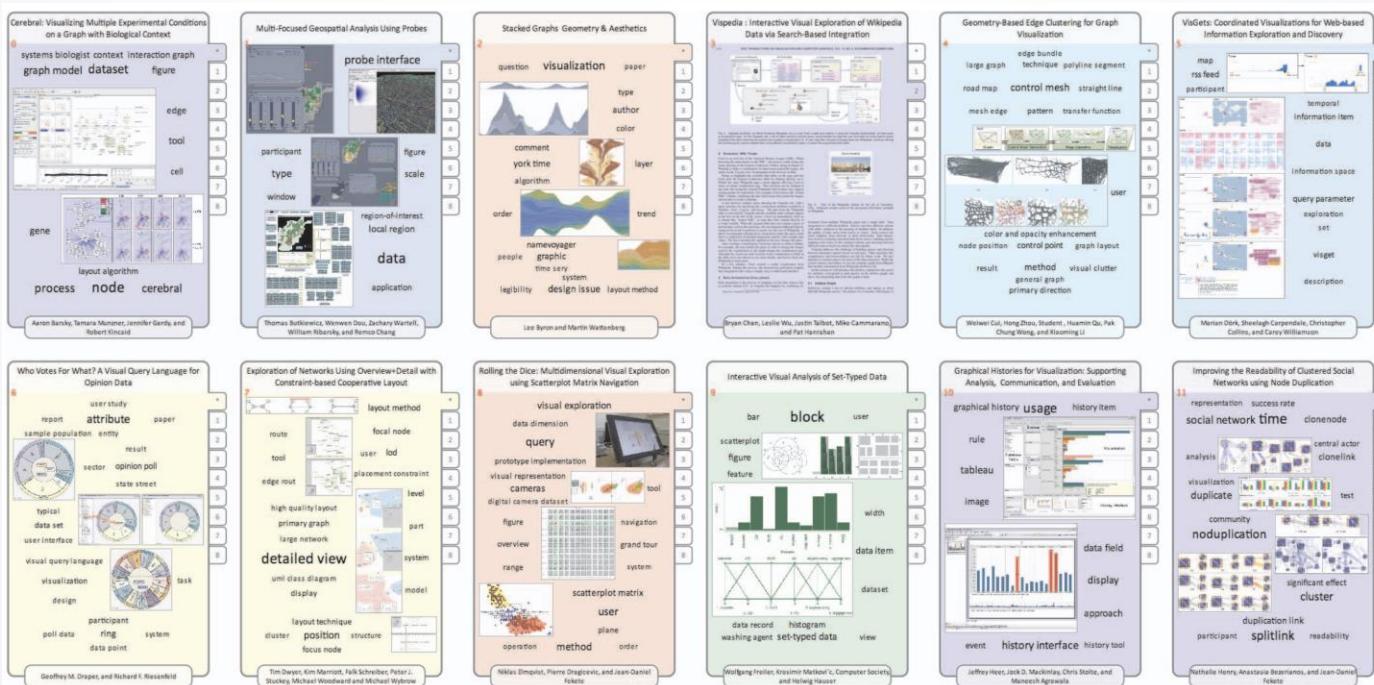
DocuBurst



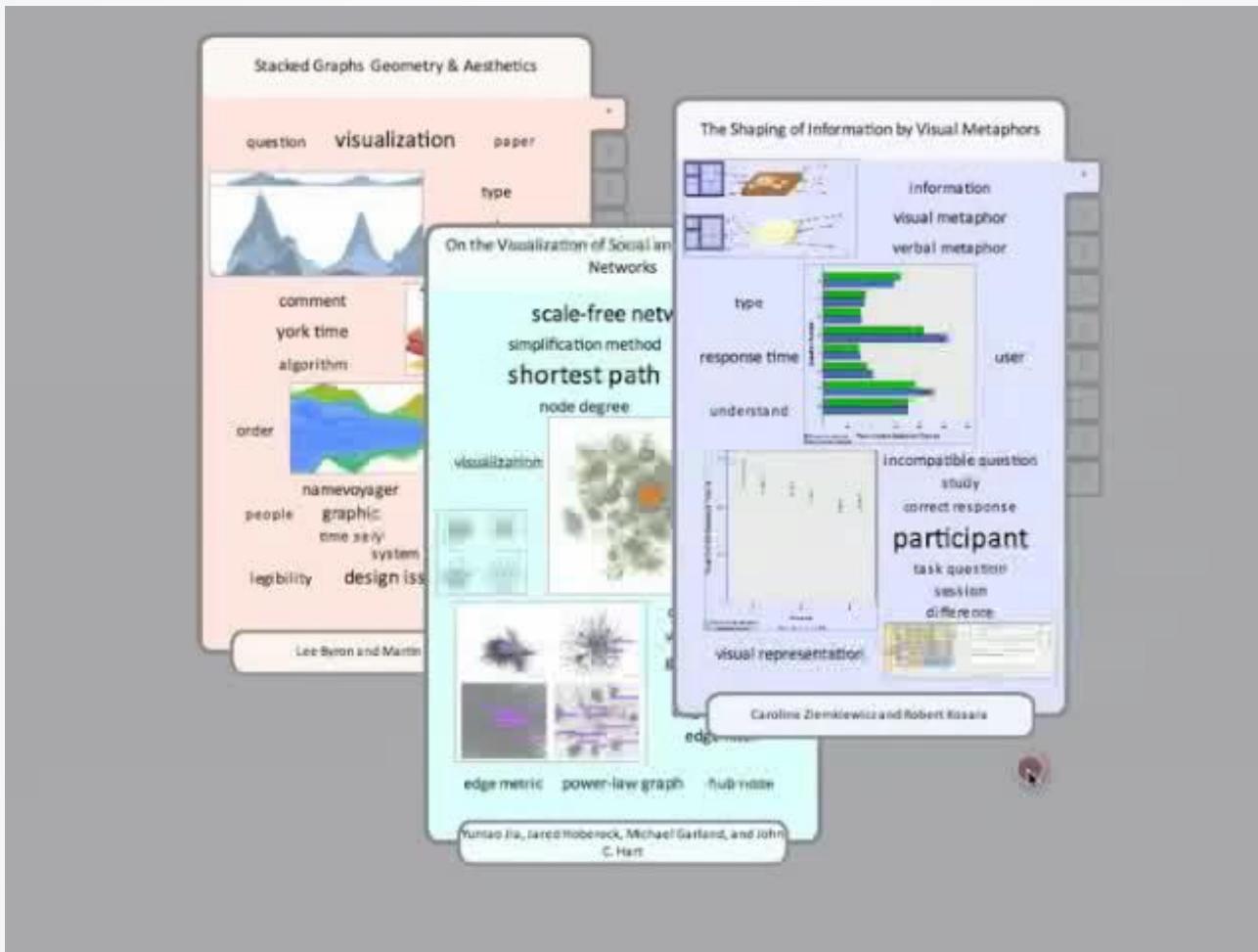
Christopher Collins et al. DocuBurst: Visualizing Document Content using Language Structure. (IEEE CGF 2009)

Document Card

- Summarize a document with keywords and images in the document
- Layout in a card-like space



Document Card



Hendrik Strobelt et al. Document Cards: A Top Trumps Visualization for Documents. (IEEE TVCG 2009)

Visualizing Document Content

- Keyword-based Visualization
- Temporal Document Visualization
- Feature Distribution Visualization
- Opinion Analysis
- Query Visualization
- Software Visualization

Temporal Document Visualization

- Temporal/Ordinal Documents
- Revolution feature:
 - Plot of a novel
 - Events in new reports

Morphable Word Cloud



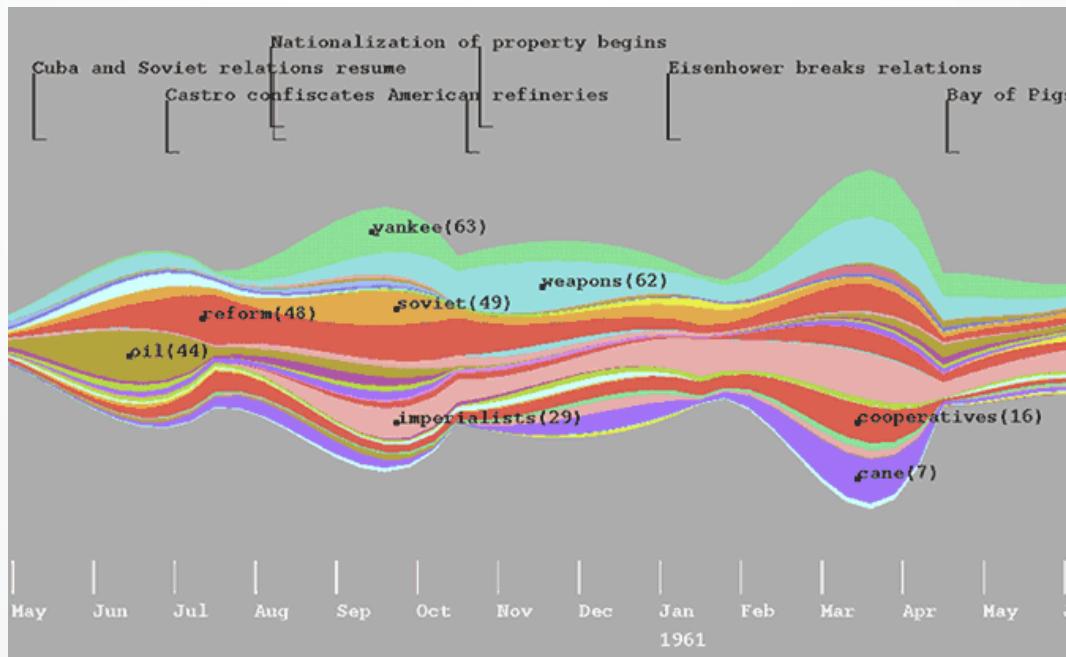
The stages of the human life cycle (from infancy to late adulthood)



The frog life cycle

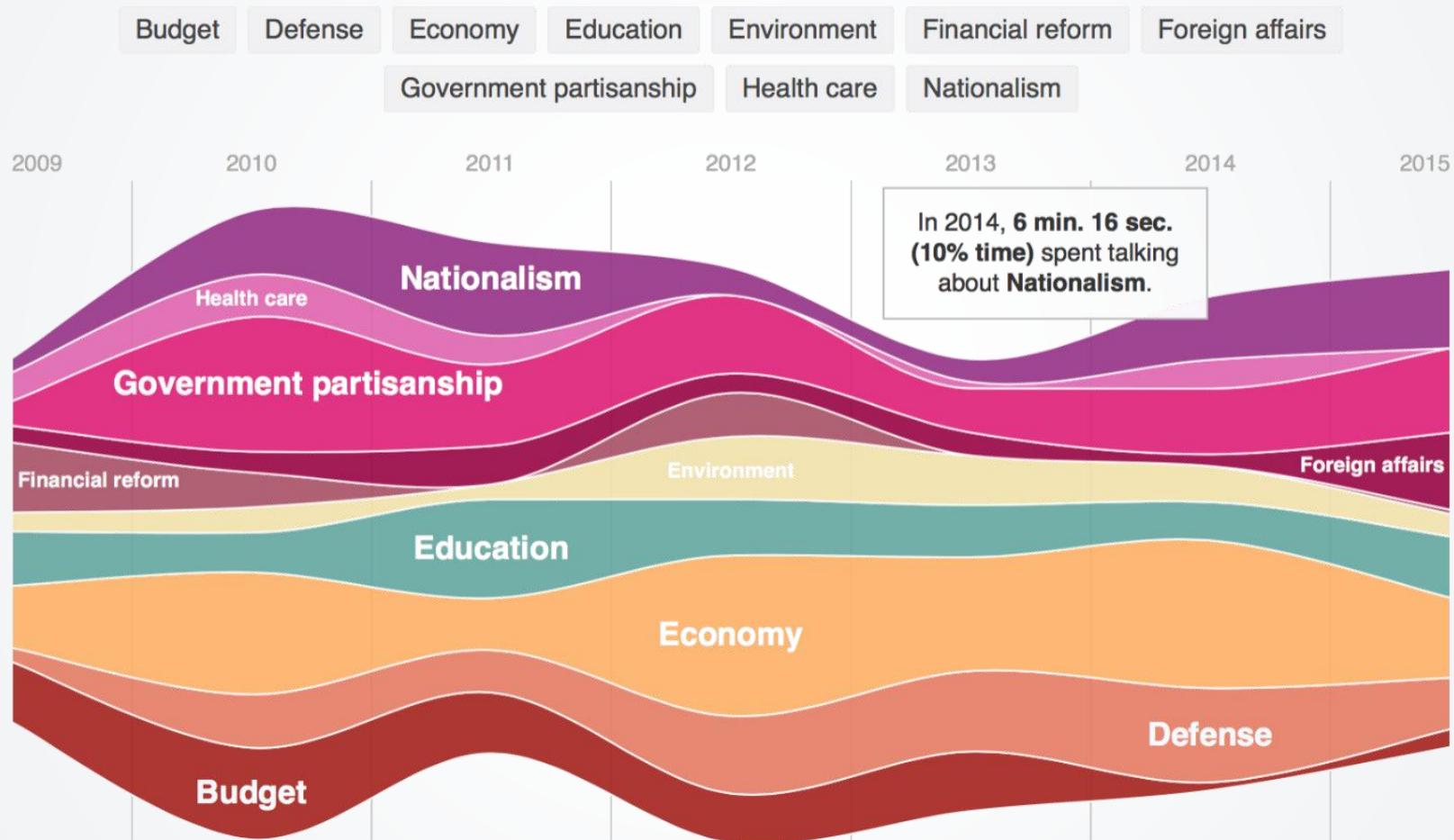
ThemeRiver

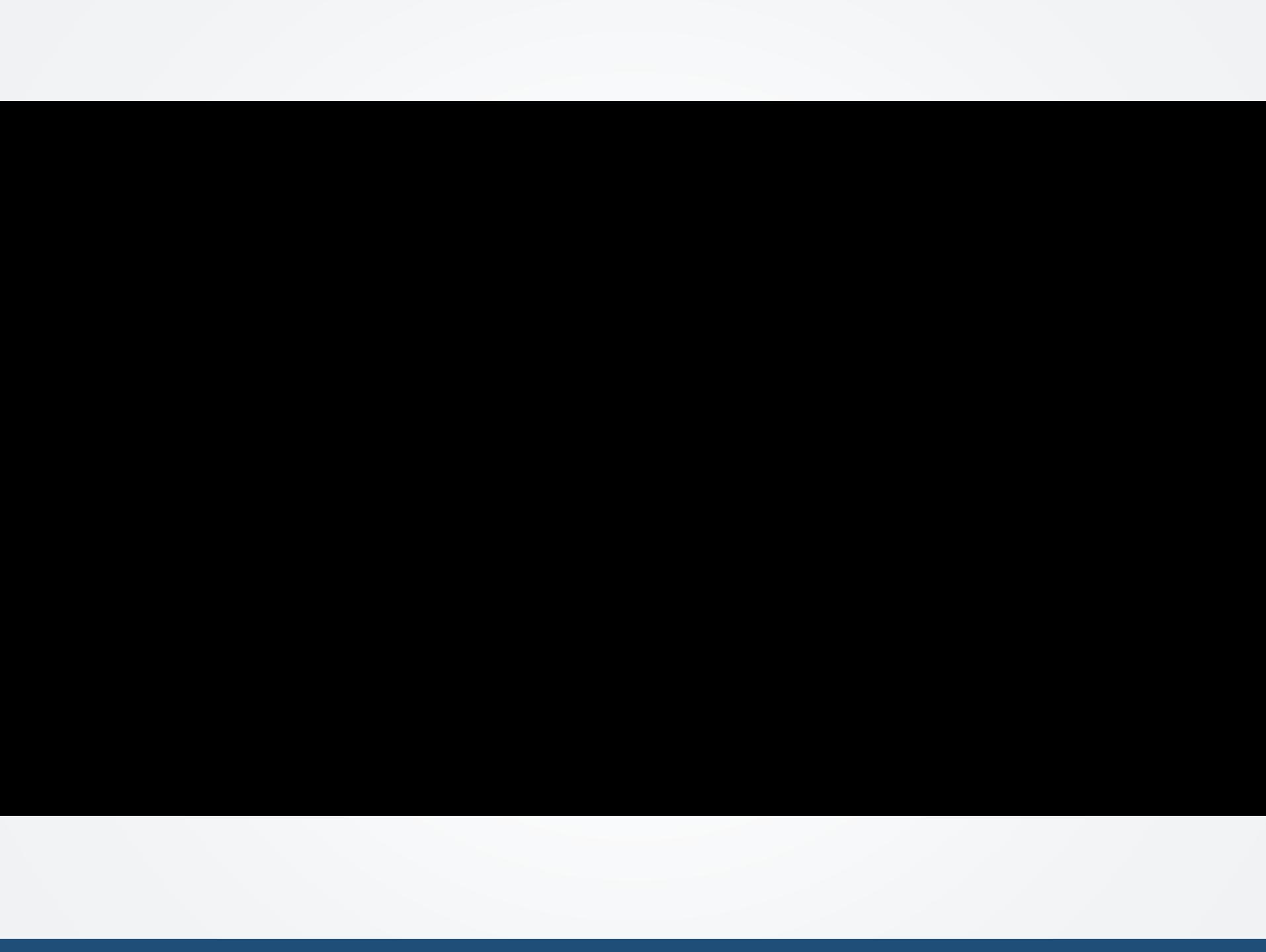
- ThemeRiver
 - Macroscopic topics
 - Metaphor: river -> temporal topic



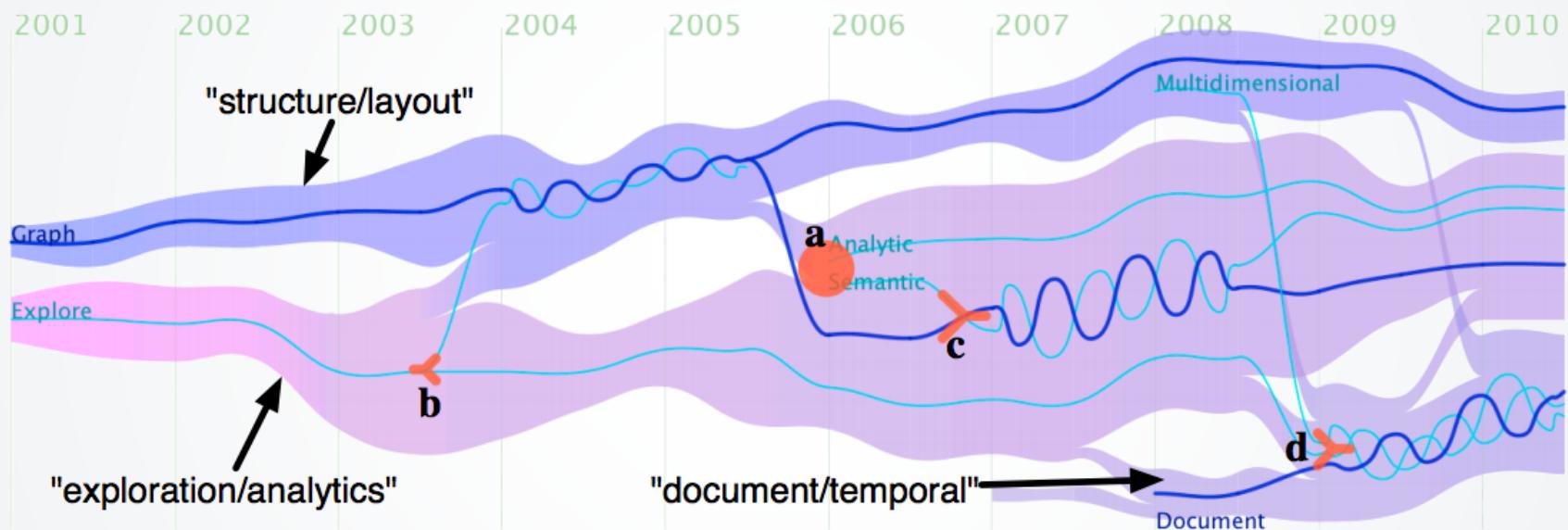
Susan Havre et al. ThemeRiver: Visualizing Theme Changes over Time. (IEEE SIV 2000)

Obama's State of the Union

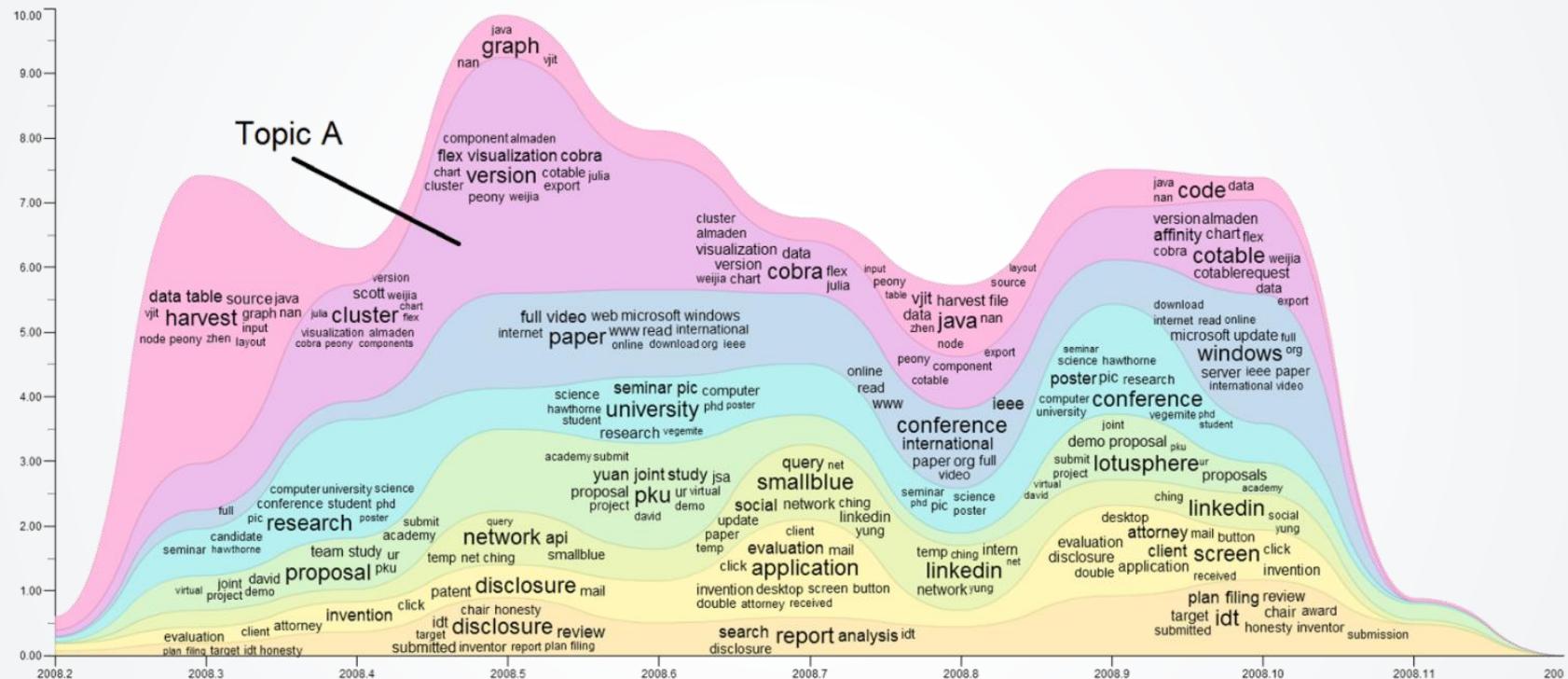




TextFlow

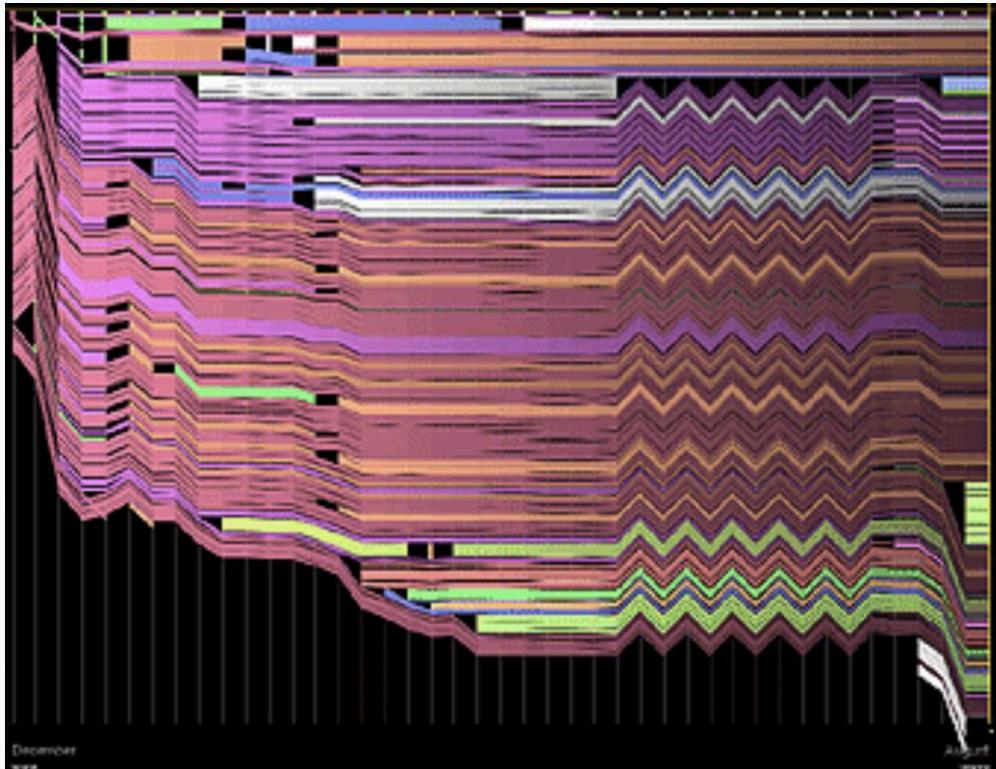


TIARA



Shixia Liu et al. TIARA: Interactive, Topic-Based Visual Text Summarization and Analysis.(ACM TIST 2012)

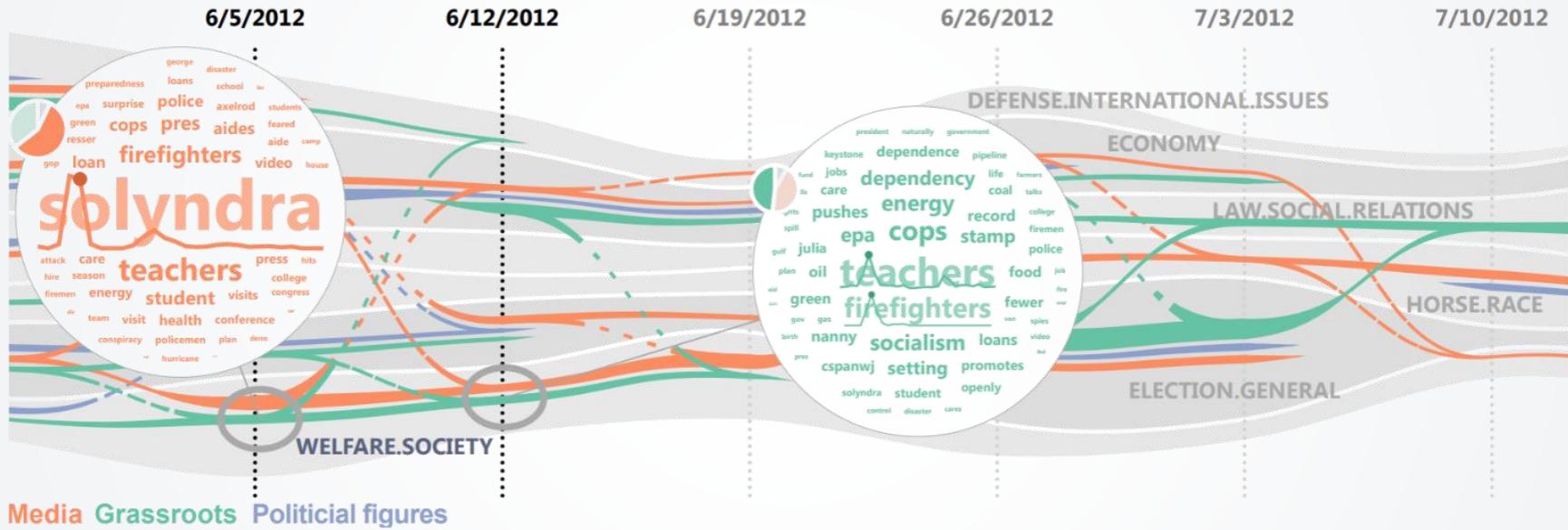
History Flow



Wikipedia: Chocolate
Maintainers and modifications in each version

<http://hint.fm/projects/historyflow/>

Topic Competition on Social Media



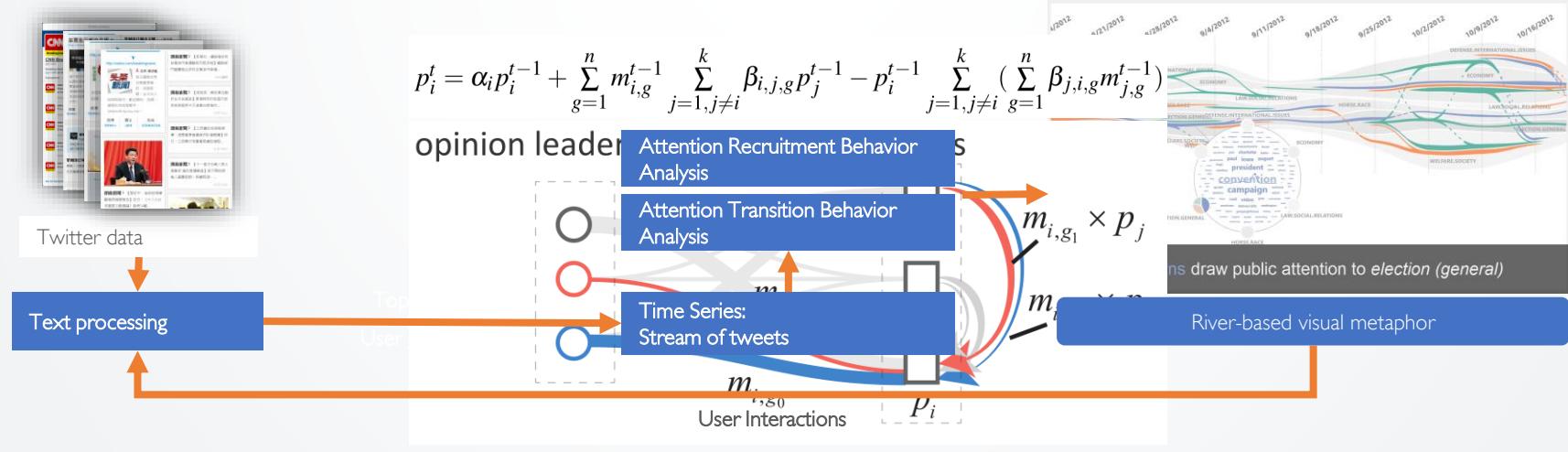
SocialFlow: Visualization of Social Behavior



Modeling of dynamic topic competition and cooperation

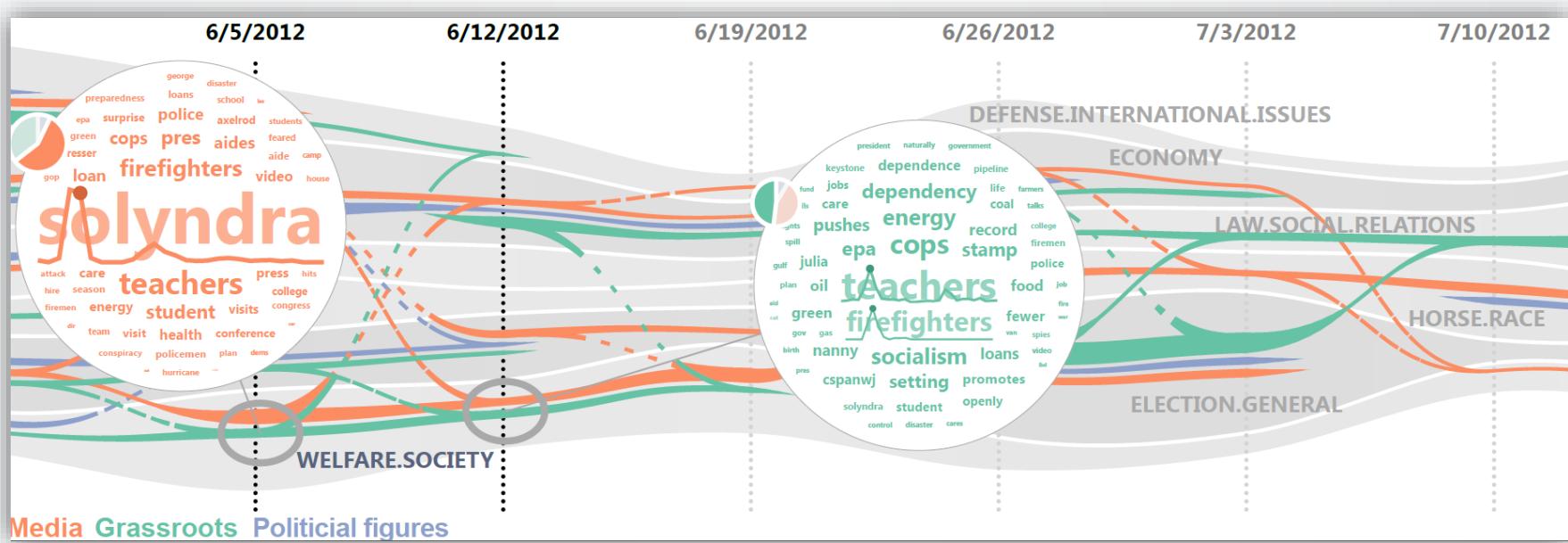
Visualization of dynamic behavior of opinion leaders

Propose a quantitative model, and develop an interactive visualization system to understand the social behavior of opinion leaders



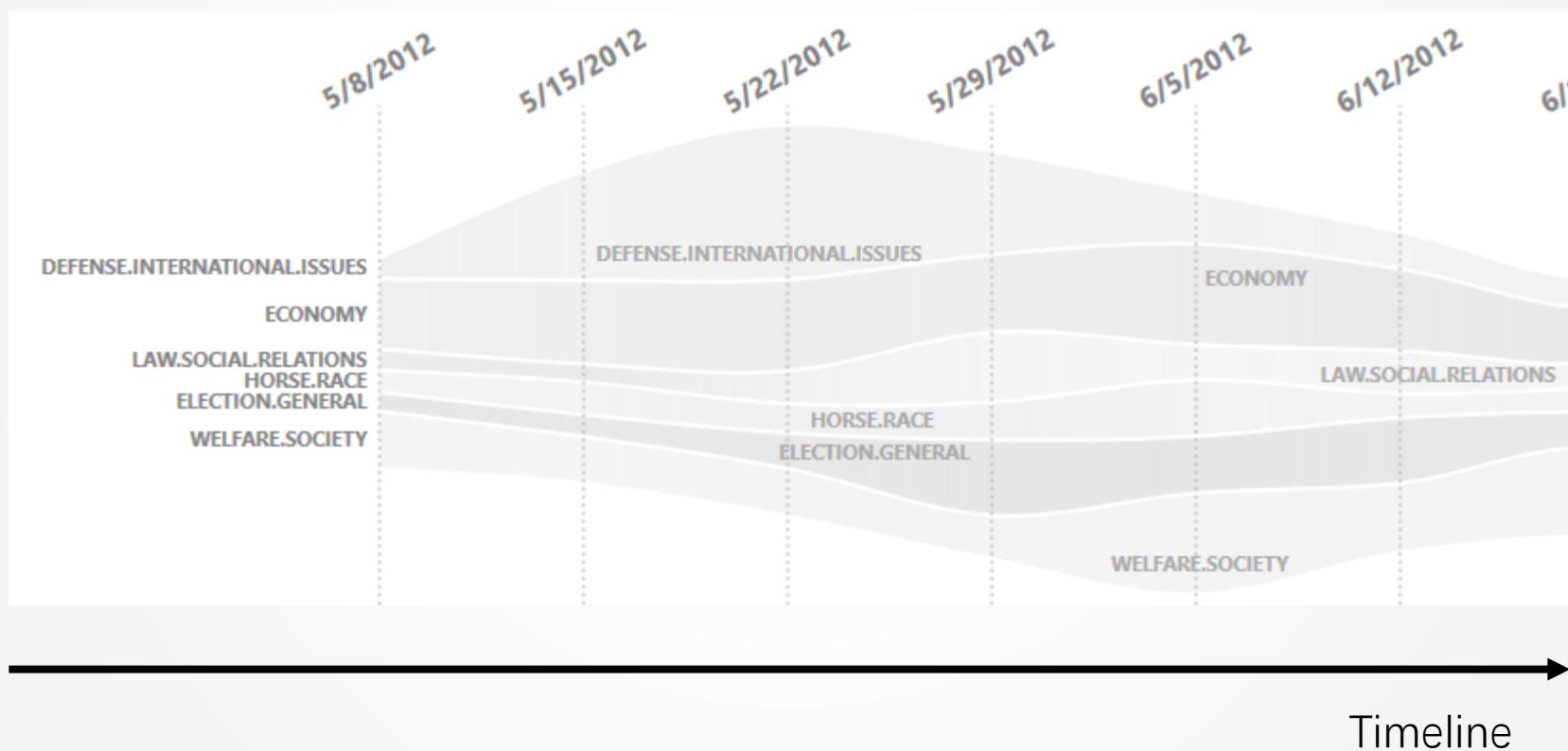
Demo

- 2012 US presidential election Twitter Data
 - 89,174,308 tweets classified into six major topics
 - May 01, 2012 to November 20, 2012



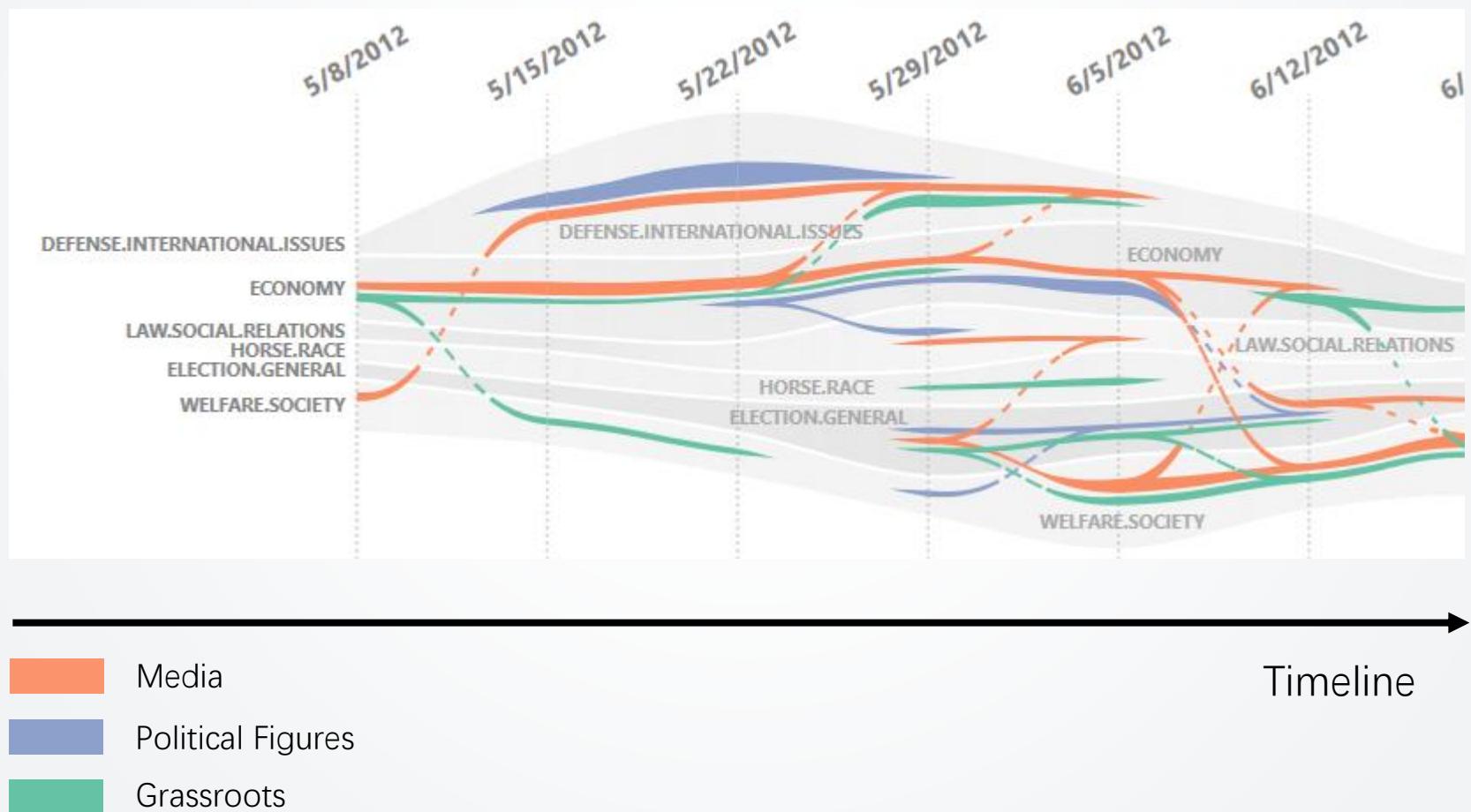
Timeline View (1/3)

- Overall trend of the competitiveness of topics



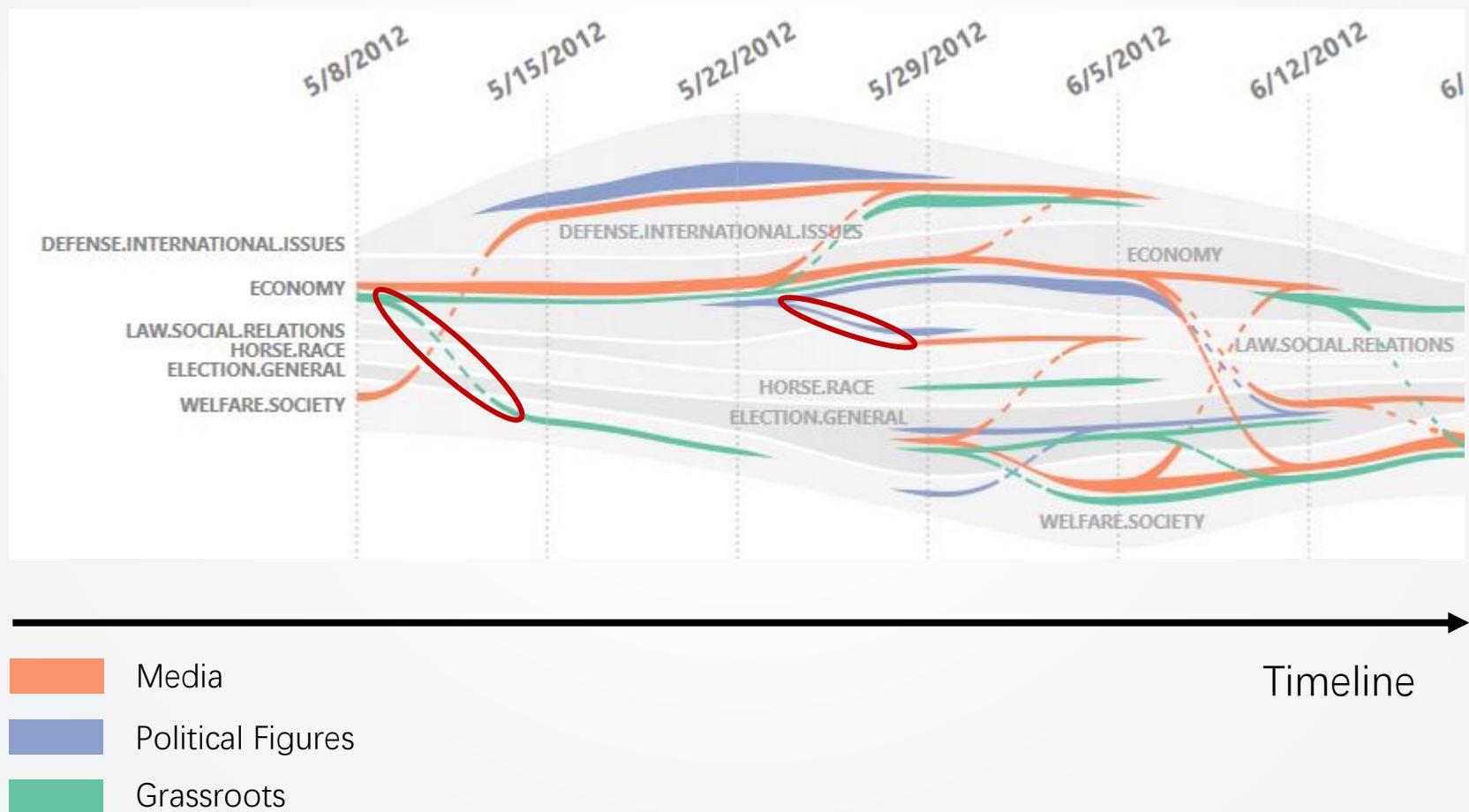
Timeline View (2/3)

- Influences of opinion leaders



Timeline View (3/3)

- Trend of topic transition of opinion leaders

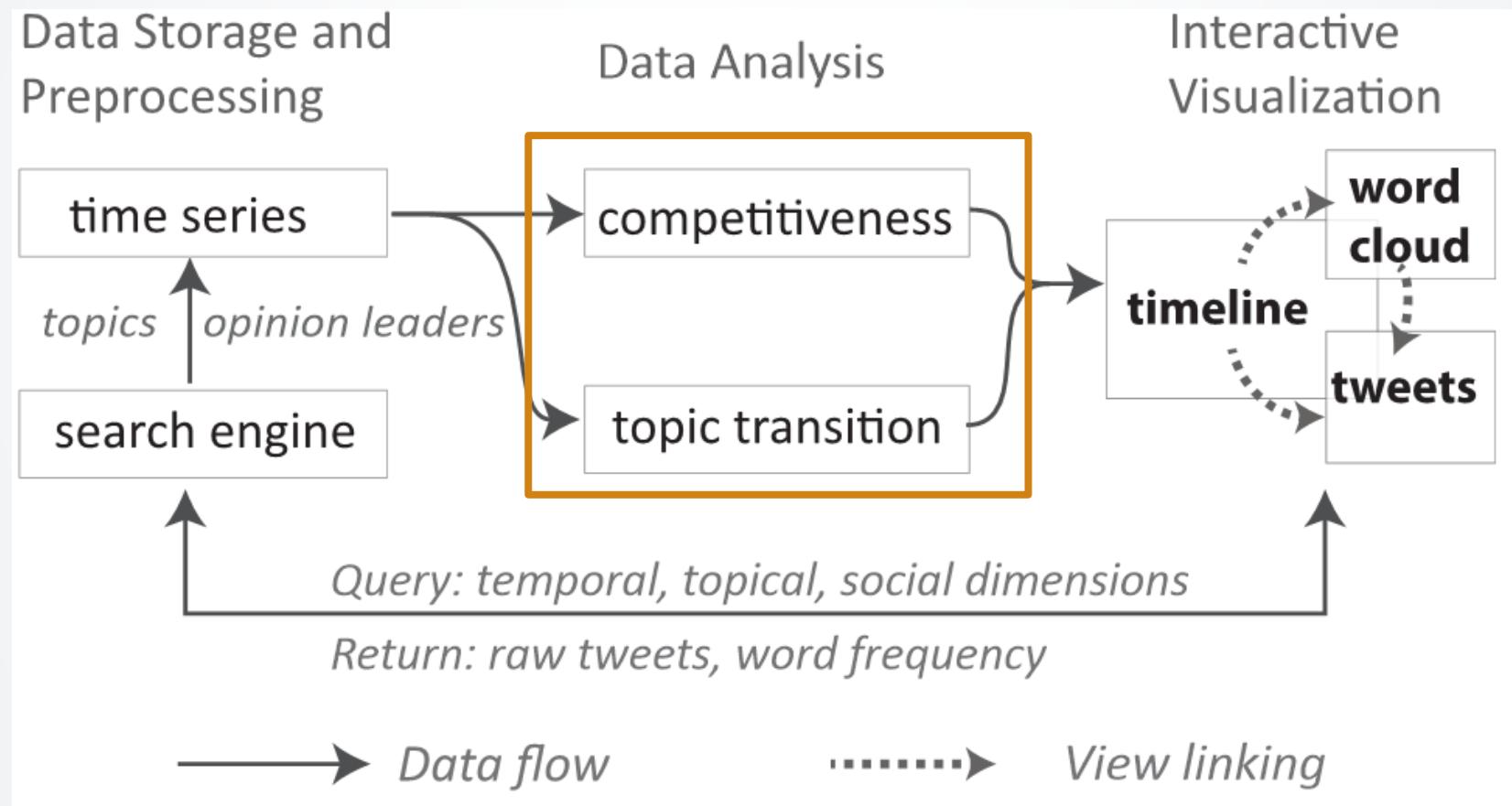


Case Study

**Case Study:
U.S. 2012 Presidential Election**

Data Analysis

- Model-based data analysis

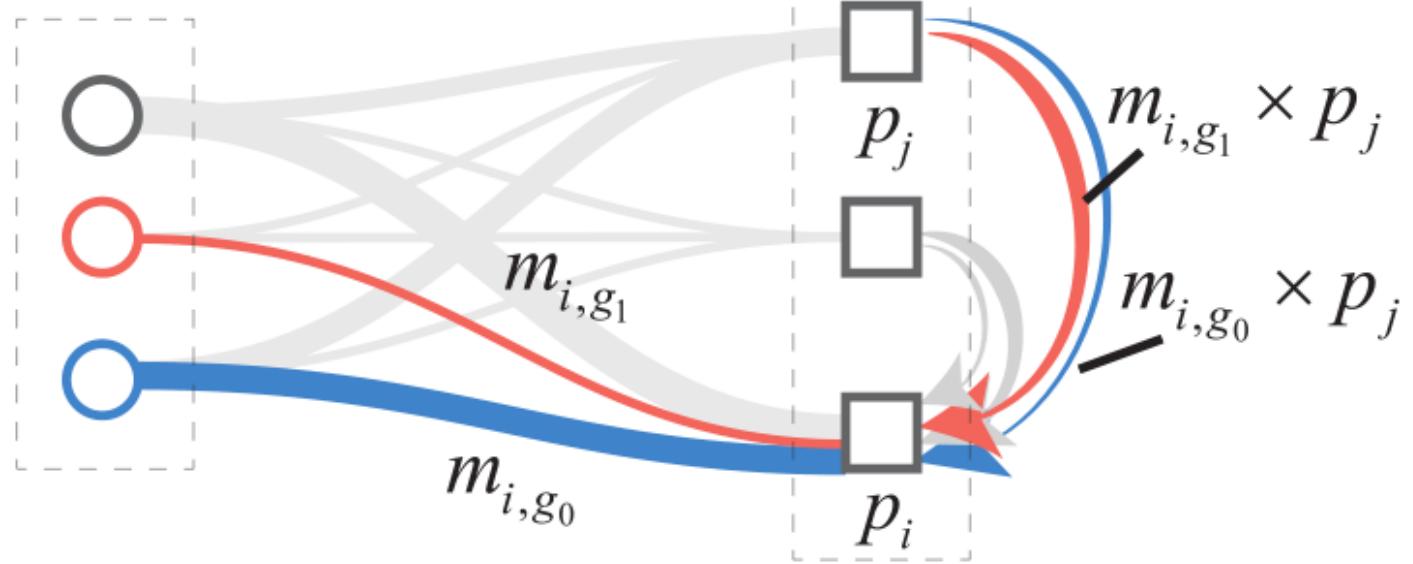


Topic Competition Model

$$p_i^t = \alpha_i p_i^{t-1} + \sum_{g=1}^n m_{i,g}^{t-1} \sum_{j=1, j \neq i}^k \beta_{i,j,g} p_j^{t-1} - p_i^{t-1} \sum_{j=1, j \neq i}^k \left(\sum_{g=1}^n \beta_{j,i,g} m_{j,g}^{t-1} \right)$$

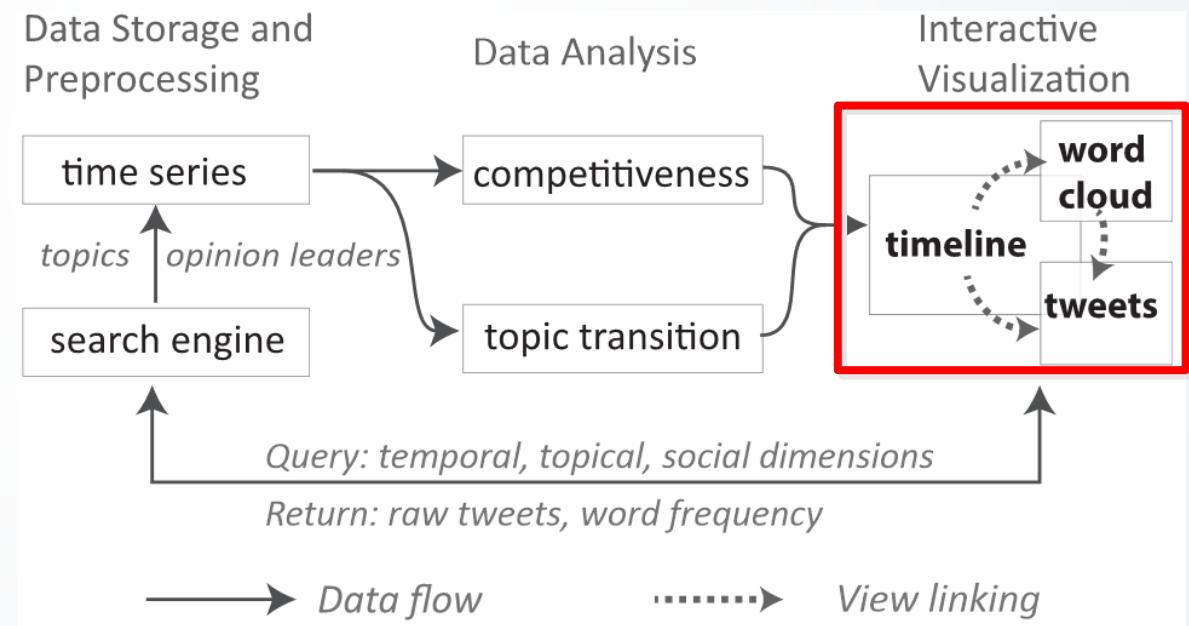
opinion leader groups

topics

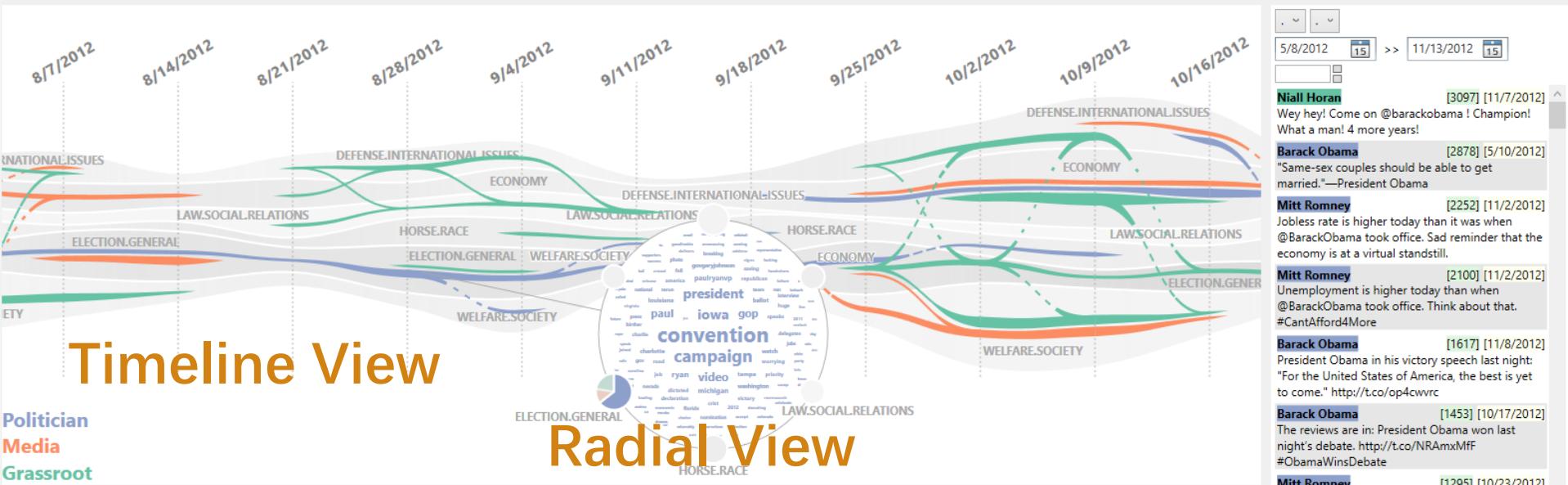


Visual Design

- Visualization system
 - Timeline View
 - Radial View
 - Tweet View



Interactive Visualization



Timeline View

Politician
Media
Grassroot

Radial View

Tweet View

More Topic Interaction?

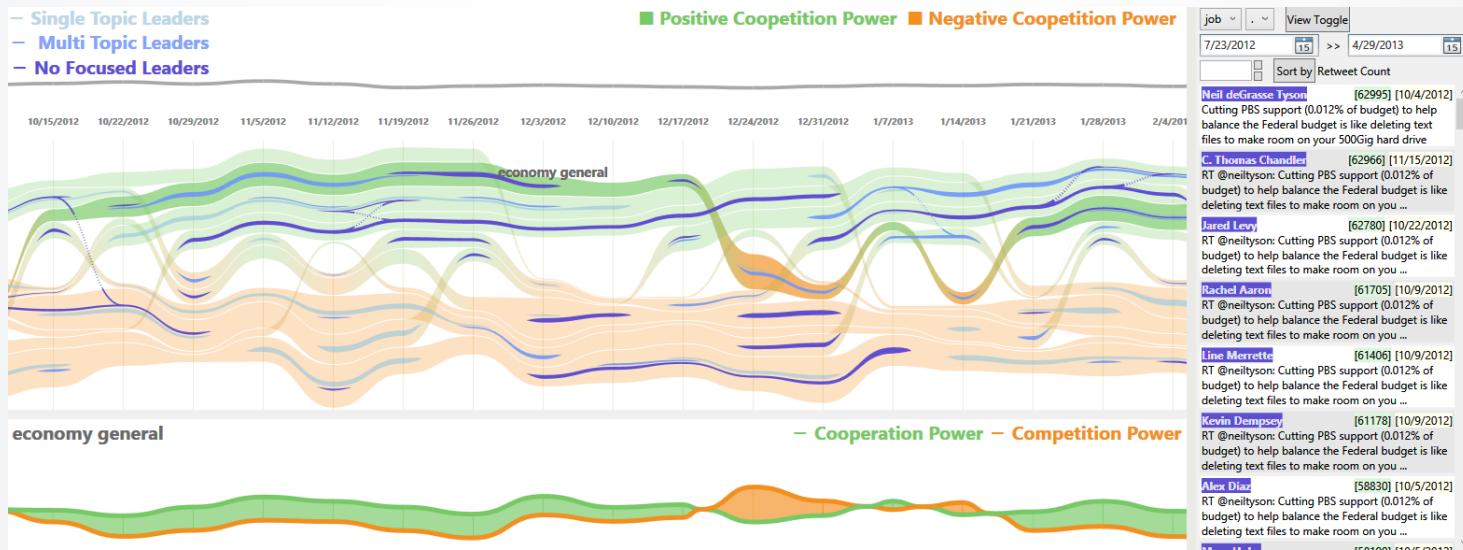
- Topic interaction is far more complex
 - Topic competition
 - Topic cooperation
 - Users' influence on their dynamics

Challenges

- Measurement of dynamic topic coopetition
- Impact of users (topic leaders here)
- Interactive visualization of both above

Our Solution

- A new visual analysis framework
 - A new model that characterizes both topic cooperation and competition
 - A new design that visualizes co-evolutionary patterns between the topics and the topic leaders

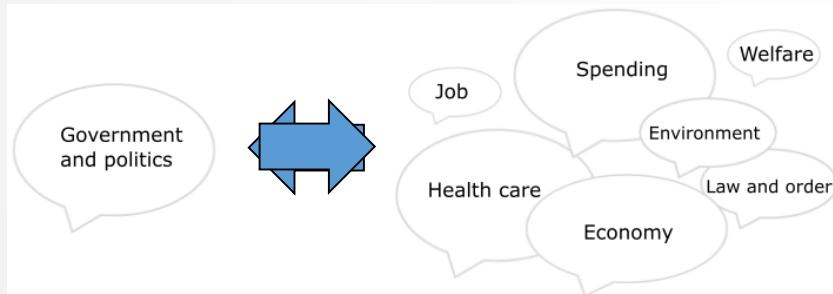


Demo

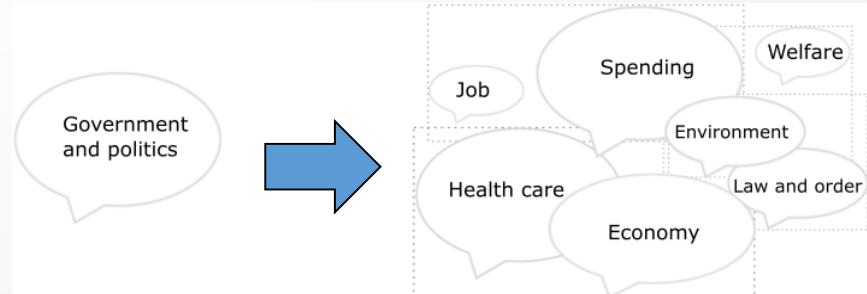
Topic coopetition model

$$\begin{aligned}
 p_i^t = & \boxed{\alpha_i p_i^{t-1}} + \boxed{\sum_{g=1}^n m_{i,g}^{t-1} \sum_{j=1, j \neq i}^k \beta_{i,j,g} p_j^{t-1}} - \boxed{p_i^{t-1} \sum_{g=1}^n \sum_{j=1, j \neq i}^k \beta_{j,i,g} m_{j,g}^{t-1}} \\
 & + \boxed{\sum_{g=1}^n \sum_{j=1, j \neq i}^k (m_{i,g}^{t-1} + m_{j,g}^{t-1}) \theta_{i,j} \sum_{h=1, h \neq i, h \neq j}^k \gamma_{ij,h,g} p_h^{t-1}} \\
 & - \boxed{p_i^{t-1} \sum_{g=1}^n \sum_{j=1, j \neq i}^k \sum_{h=1, h \neq i, h \neq j}^k (m_{j,g}^{t-1} + m_{h,g}^{t-1}) \theta_{j,h} \gamma_{jh,i,g}}
 \end{aligned}$$

Competition destruction effect:



Cooperation destruction effect:



Visualizing Document Content

- Keyword-based Visualization
- Temporal Document Visualization
- Feature Distribution Visualization
- Opinion Analysis
- Query Visualization
- Software Visualization

Feature Distribution Visualization

- Feature distribution in a single document or a document collection:
 - Average sentence length
 - Vocabulary
 -

ConceptVector

Concept Name: Tidal flooding

Save Go Back

Concept Type: Unipolar vs Bipolar

(1) Concept Type

Positive Words Input

(2) User input

Tidal flooding

Click to add suggested words.

Group 0: downpours, flooded, floodwaters, inundated, landslides, mudslides, rains, rainstorms, torrential

Group 1: areas, coast, coastline, coasts, inland, ocean, shore, shoreline, shores, southern

Group 2: affected, caused, causing, damage, devastation, disaster, erosion, fires

Group 3: battering, blizzard, deluge, hail, havoc, katrina, rain, storm, storms, surges, swept, tides, waves

Group 4: approaching, cloud, disappearing, swell, turning, wake

(3) Suggested words

Word Cluster View

(4) Word Cluster View

Irrelevant Words Input

(5) Irrelevant words

Katrina, disaster

Seas Are Rising at Fastest Rate in Last 28 Centuries

Climate scientists report that tidal flooding in communities along United States coastline is largely result of rising seas connected to greenhouse gas emissions, and warn that problem will likely grow worse in 22nd century and beyond: number of flood days in Charleston, SC, jumped from 34 in earlier decade to 219 in more recent, and in Key West, Fla., figure jumped from no flood days in earlier decade to 32 in more recent."

2017-03-11T00:00:00+00:00

Brown, Michael (1996-2014). Ferguson (Mo). Police Brutality, Misconduct and Shootings. Documentary Films and Programs. Strange Fruit (Movie). Pollock, Jason (Filmmaker)

By JUSTIN GILLIS U.S. Article

(6) Article information

CommentPlot Temporal

Jitter Scatter Jitter Gather New Accepted Rejected Picked

(7) Score visualization

Economy

Show me: Tidal flooding vs. Economy

Check this to make it easy to compare groups of different sizes.

(8) Concept refinement

Tidal flooding

Type: unipolar

Positive inputs

Tidal flooding, flooding, flood, floods, tide, tides, coastal, coastline, coasts, inland, ocean, shore, shoreline, rains, rainstorms, downpours, battering, blizzard, deluge, hail, havoc, katrina, rain, storm, storms, surges, swept, tides, waves, approaching, cloud, disappearing, swell, turning, wake

Irrelevant words

Katrina, disasters

Rank comments by Tidal flooding Edit Add

This bar shows the weights for this ranking.

(9) Concept selection

Search for...

New (1286)	Accepted (0)	Rejected (0)	Picked (0)
Miami beach , Sep 16, 2016 3:56:47 AM			

Alonzo guiana "They added that the flooding that is starting to make life miserable in many coastal towns — like Miami Beach . . . I live in Miami Beach and flooding is not making life miserable . For decades the city had some tidal flooding — one to six inches pooling on a couple of blocks, i.e., "nuisance flooding" -- in April and October from spring tides , but even that's been remedied with a new flood control system , and raising some of the streets a few feet as in my bayside neighborhood. The Atlantic beach side of the islands are the highest parts of town and have no flooding at all . Can't speak for the other areas , but the hyperbole does not fit the reality in Miami Beach . score = 1.6020446480374617

Susan Anderson is a trusted commenter , Sep 16, 2016 3:56:47 AM I live ~5 feet above sea level , since 1980 . I've been watching floods and taking pictures and I can assure any doubters that while the increase was subtle and inconsistent in the beginning , it is now obvious that "every" flood tide is higher than the big flood tides used to be . I will have to move in 5 or 10 years . Meanwhile , highrises are going up and much of the city , like many other US cities , is similarly low . Profiters are not interested in the future , they just loot and leave , like frackers and others . If one is obese , first one needs to stop the rate of increase , then slow , then level off , then begin to reduce . Acceleration is like that , and the reductions lately have only been reductions in the rate of increase . Following the obesity metaphor , that's mostly gain . People seem unable to comprehend that increase is a slow process until it isn't any more . We are on the cusp of a more noticeable increase , and the cause of it is a delayed effect , so even with action now we have accepted an unacceptable level of climate chaos . It's really pretty simple : we are accumulating heat-trapping greenhouse gases in our atmosphere , which are increasing the energy (heat) in the system (global warming) which is disrupting our global circulation (climate change) . At this point , we are also experiencing a gross increase in overall moisture , meaning that every storm is bigger than predicted , because predictions are based on historical data , which have been "trumped" by reality . score = 0.9254038076993409

Johnnie SFBayArea , Sep 16, 2016 3:56:47 AM All I can say is we must be awfully fat and lazy that we can think of helping people 100 years from now to deal with presumed problems they might have . Wow I guess the problems we have today must be pretty remote that you people feel compelled to help rich beachfront landowners of the 22nd century deal with their problems . I think part of the problem is you are imagining that it's like these people wake up one day and go "hmm where did all this water come from . My house is flooded . Ouch " The rate of rise is between 0 . 1 inches / year which means in 10 years , the house is about 1 inch . By the way we had the same rate of rise for the last 200 years and nobody was panicing about it even though we've gotten 7-10 inches in the last 100 years . The fact is most flooding today is a nuisance . 100 years ago millions died

(10) Concept ranked by concept

(a) Concept-Building View

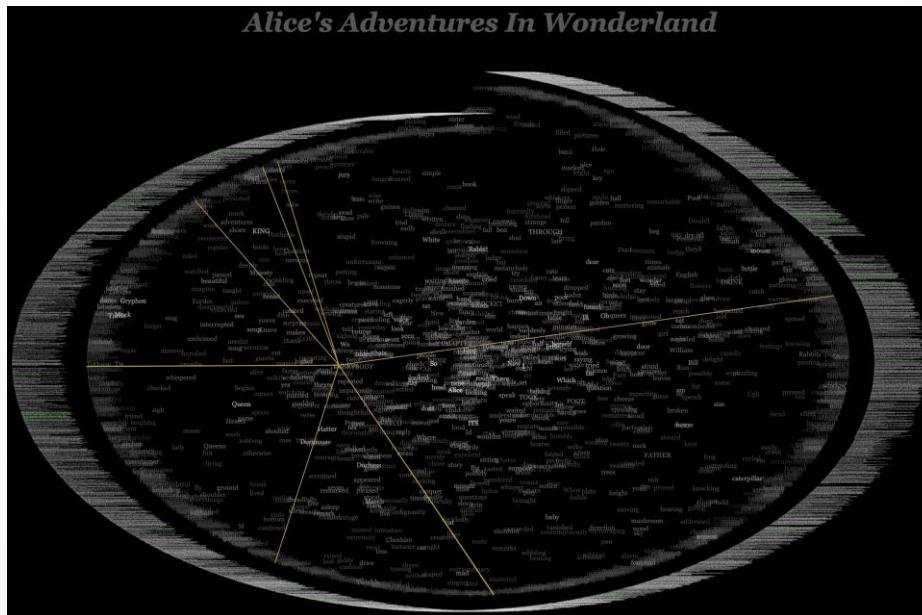
(b) Document Analysis View

Senten Tree



TextArc

- TextArc:
 - Outer arc: sentences in a document
 - Inner words: vocabulary of the document (words closer to center means higher word frequency)



<http://vallandingham.me/textarc/>

TextArc

The screenshot shows the TextArc website's homepage. At the top center is a large, circular visualization of a text corpus, resembling a complex network or a stylized map. To the left of this central image is a sidebar with several sections:

- Thousands of Texts:** Shows snippets from various texts like "Hamlet", "Alice in Wonderland", and "Gulliver's Travels".
- Still Screen Images:** Displays small thumbnail images of book covers.
- Arts:** A section from The New York Times with the heading "Reactions".

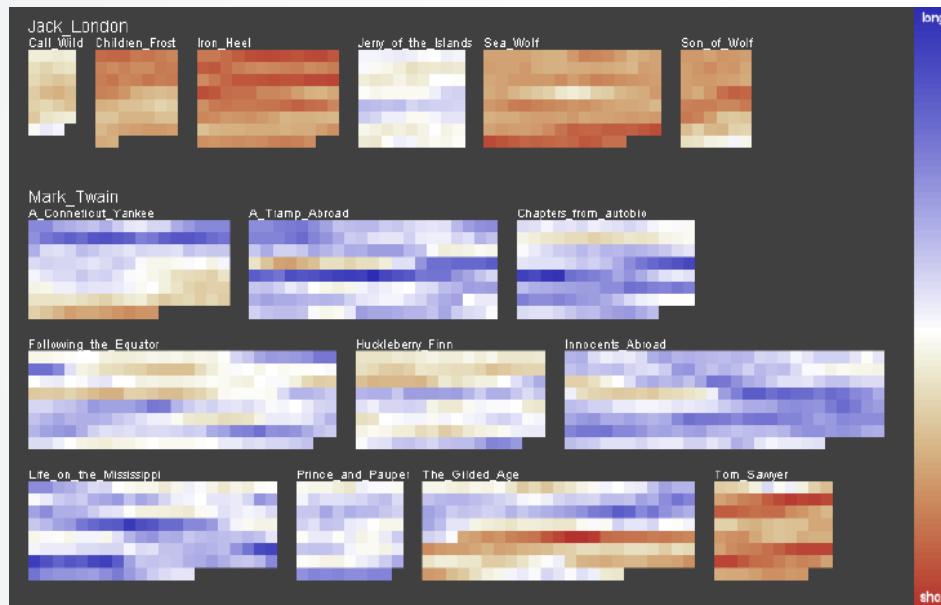
Below the sidebar is a main content area with the following sections:

- News:** A heading followed by the text "TextArc Poster Released".
- We've released the first edition of a TextArc poster.** This print is an inexpensive but *extremely* high quality poster, closer in feeling to a lithograph than an offset print. Please take a look at it on our sister site, textarc.com. (A poster purchase is also one of the best ways to support our efforts.)
- An alternate way to view a text**
- A TextArc is a visual representation of a text—the entire text (twice!) on a single page. A funny combination of an index, concordance, and summary; it uses the viewer's eye to help uncover meaning. Here are more detailed overviews of the [interactive work](#) and the [prints](#).**
- Print Editions:** Shows a stack of books.
- Applications:** Shows a stack of books.
- Other Work:** Shows a grid of small images.
- Those Involved:** Shows a portrait of a person.
- Appearances:** Shows a small image of a book cover.

<http://vallandingham.me/textarc/>

Literature Fingerprinting

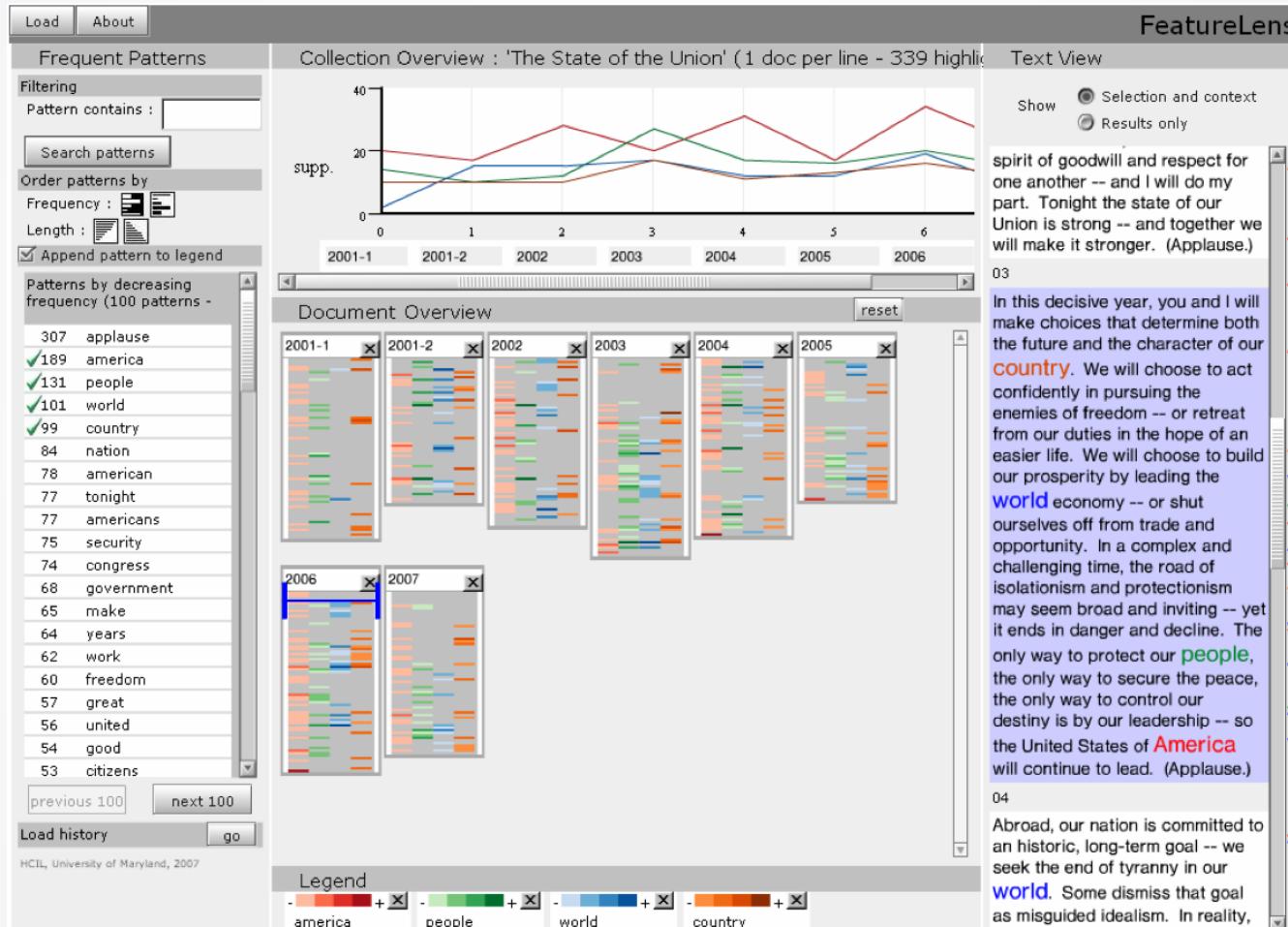
- Describe statistical features of documents



Difference of writing style between
Mark Twain and Jack London –
sentence length

- Each pixel represents a paragraph
- A set of pixels represents a book
- Color encodes sentence length

FeatureLens



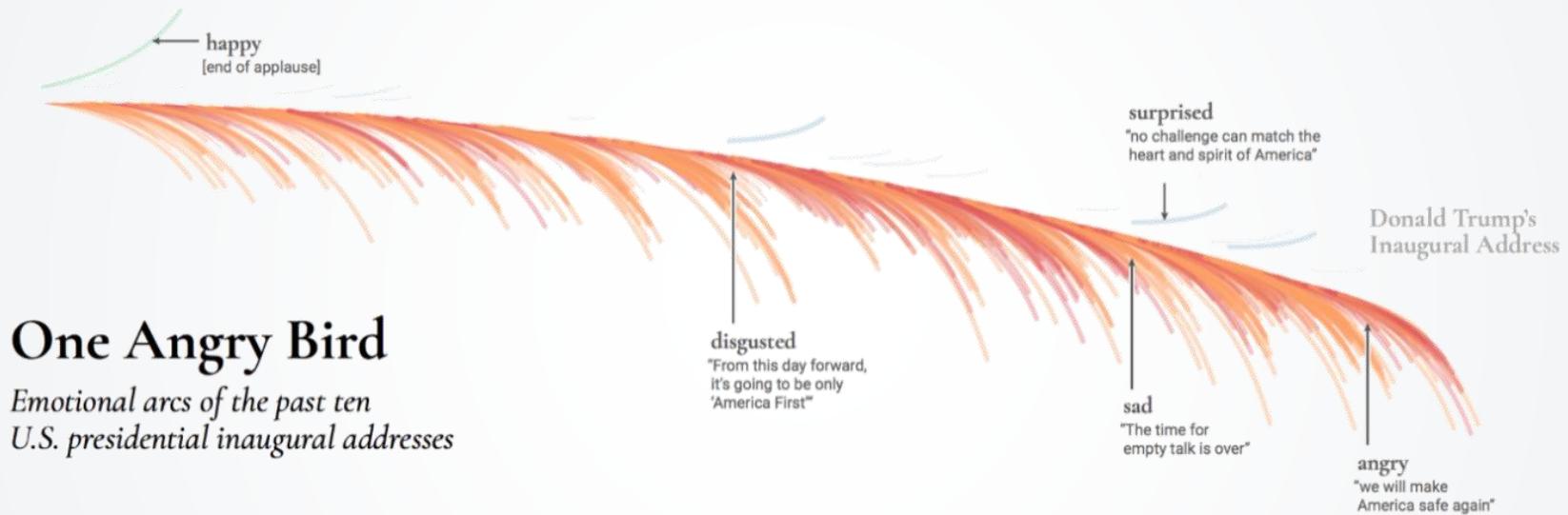
Visualizing Document Content

- Keyword-based Visualization
- Temporal Document Visualization
- Feature Distribution Visualization
- Opinion Analysis
- Query Visualization
- Software Visualization

Opinion Analysis

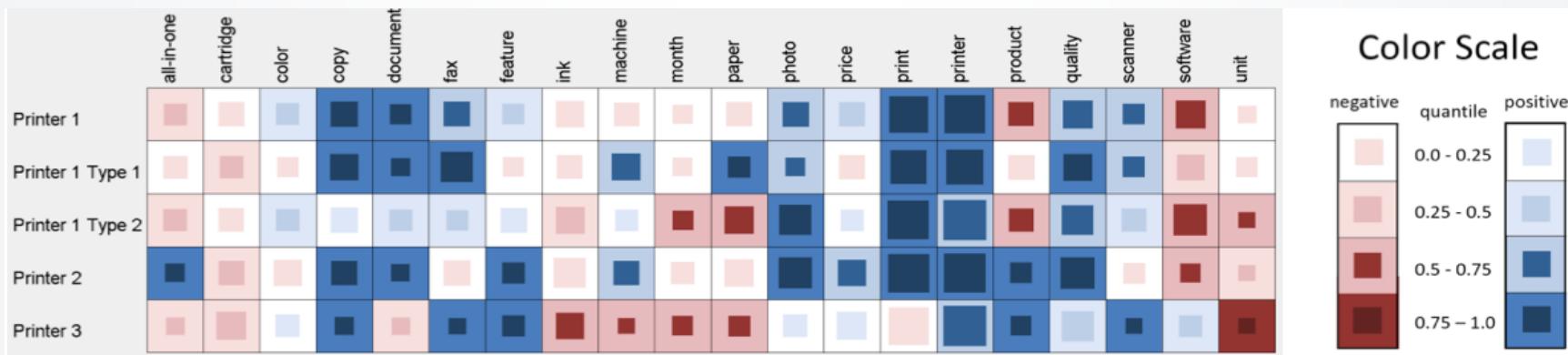
- Opinion analysis; Sentiment analysis
- Subjective feelings: like or dislike, praise or criticize
- Opinion bias: positive↔ negative

Emotional arcs for inaugural addresses

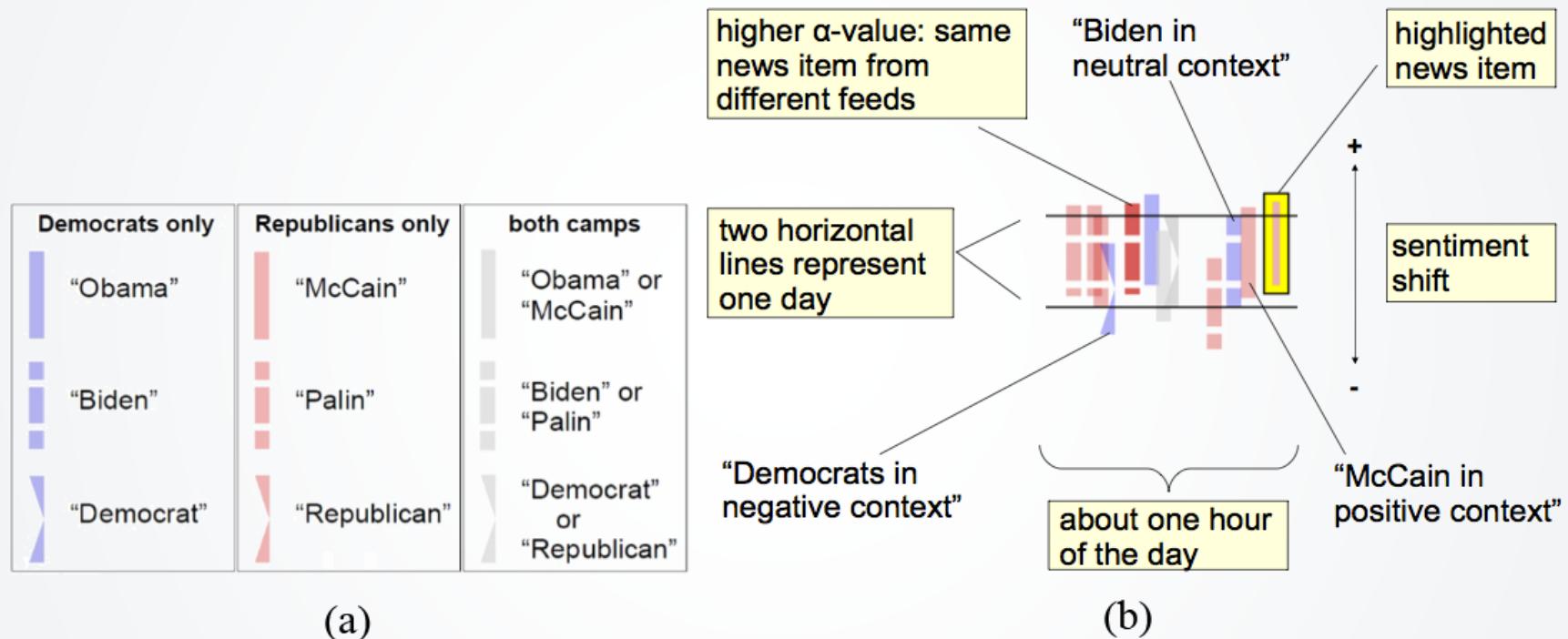


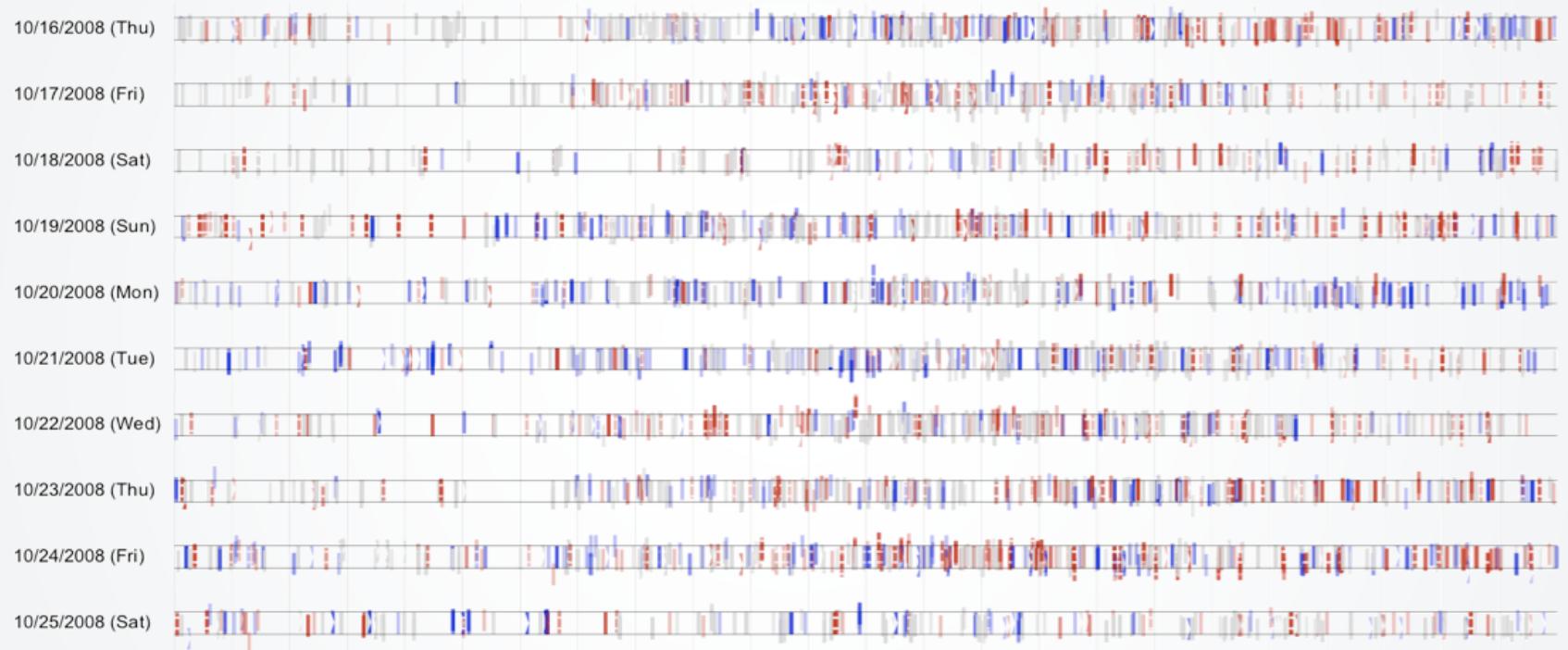
Matrix-based Customer Feedback Visualization

- Horizontal: features
- Vertical: models of printers

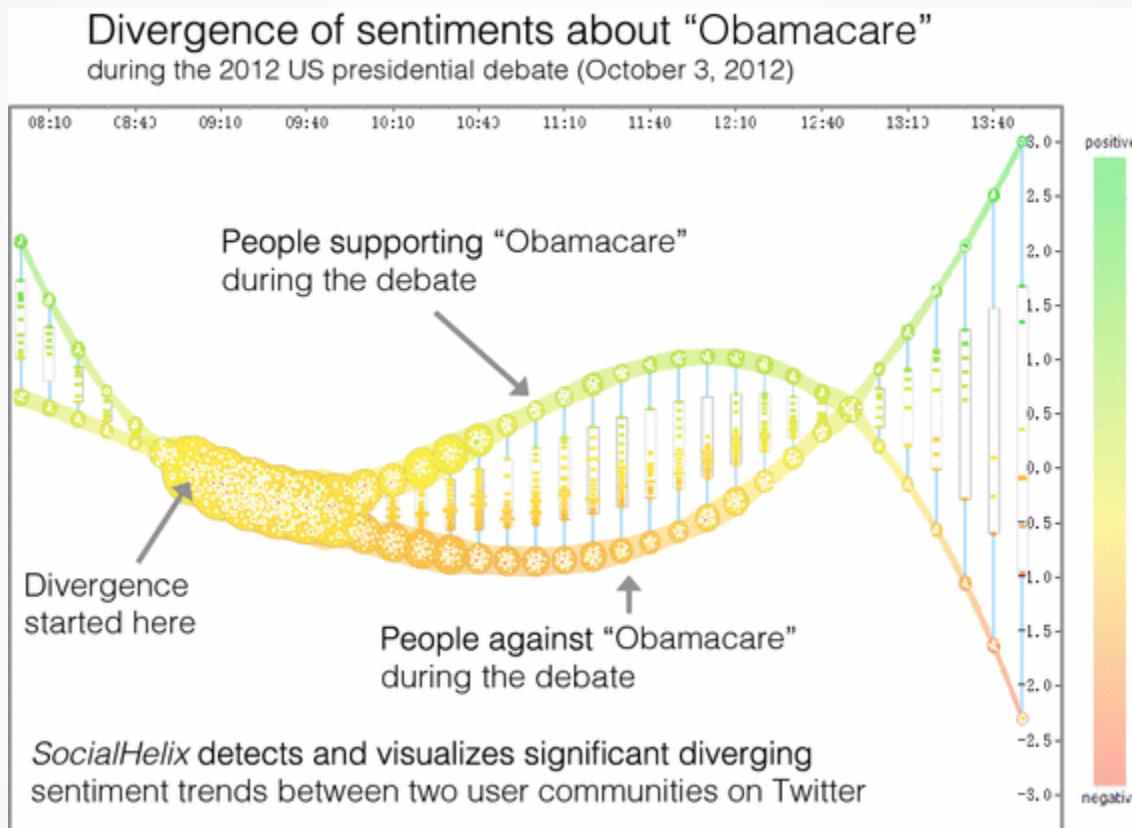


President Election: Opinions in News





SocialHelix



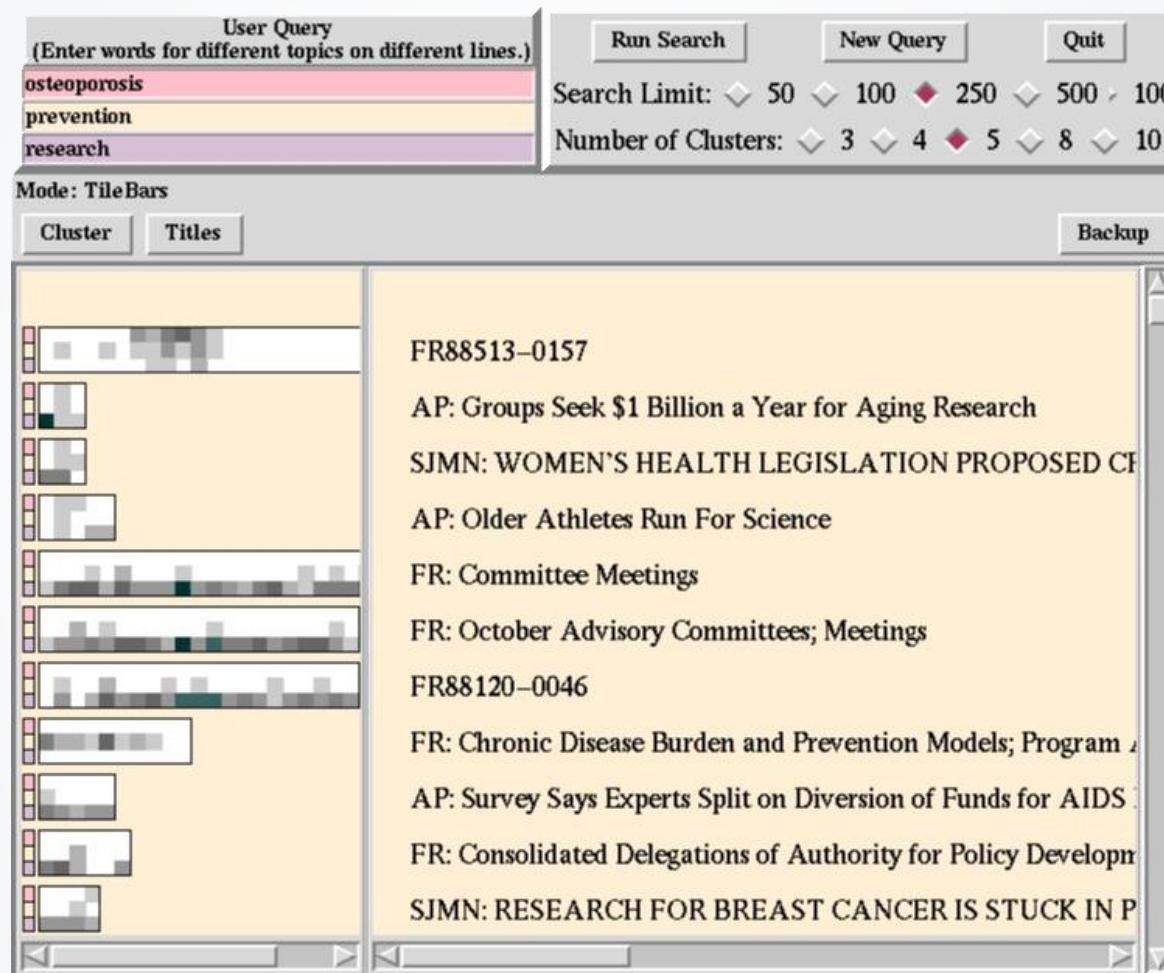
Visualizing Document Content

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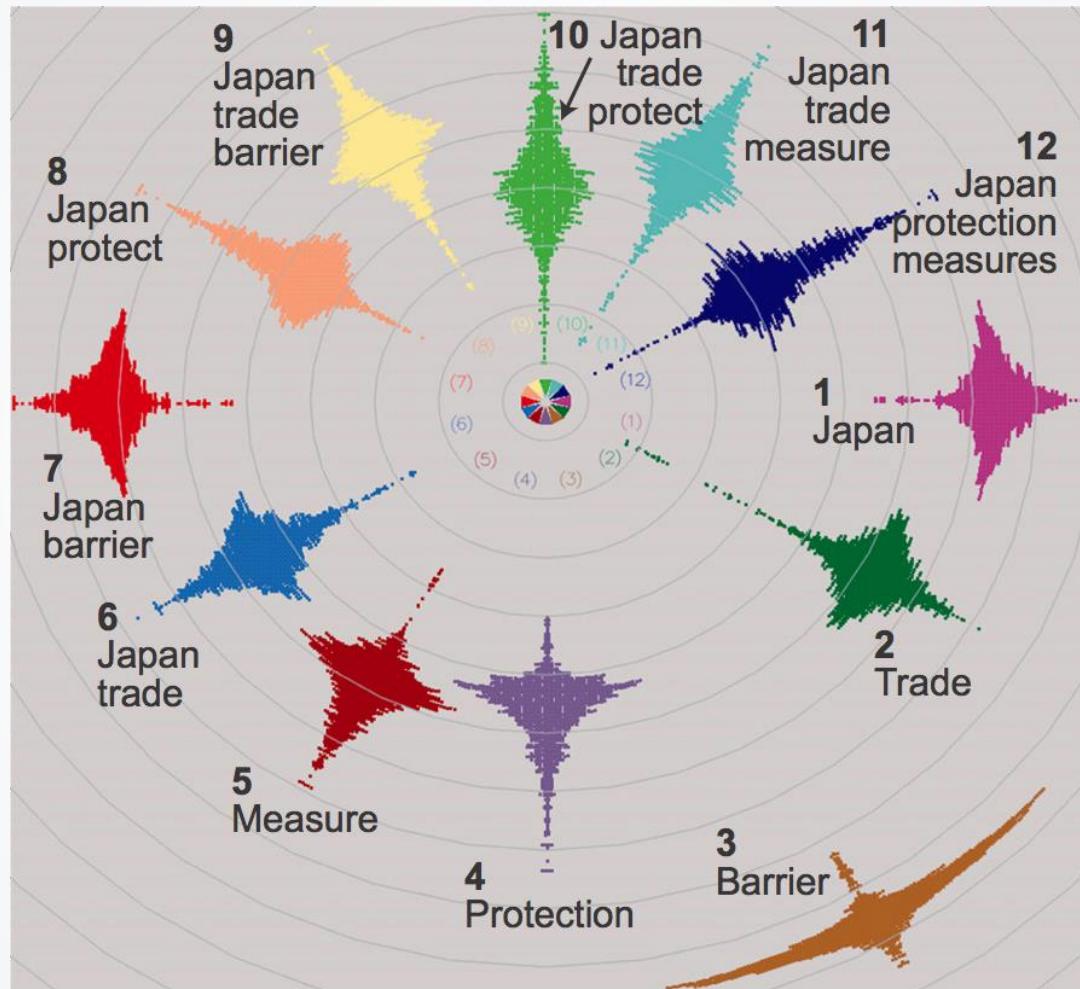
Query Visualization

- Visual-guided search/querying:
 - Understand search result
 - Discover distribution patterns in results
- How to apply visualization:
 - Similarities of queries itself or search results
 - Words in queries
 - ...

TileBar

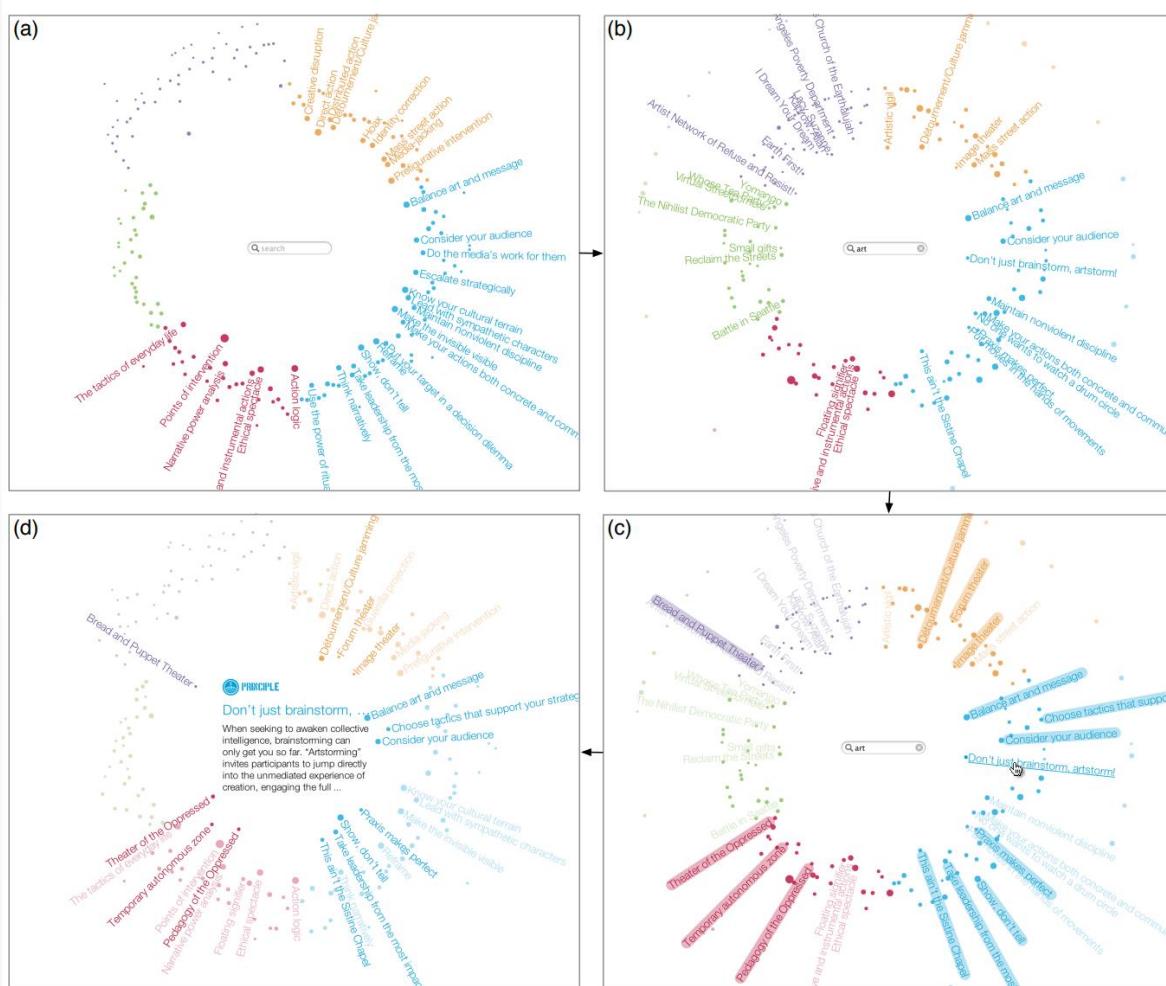


Sparkler



Susan Havre et al. Interactive Visualization of Multiple Query Results (IEEE INFOVIS 2001)

Monadic Exploration



<http://explore.beautifultrouble.org/#100177:00000>

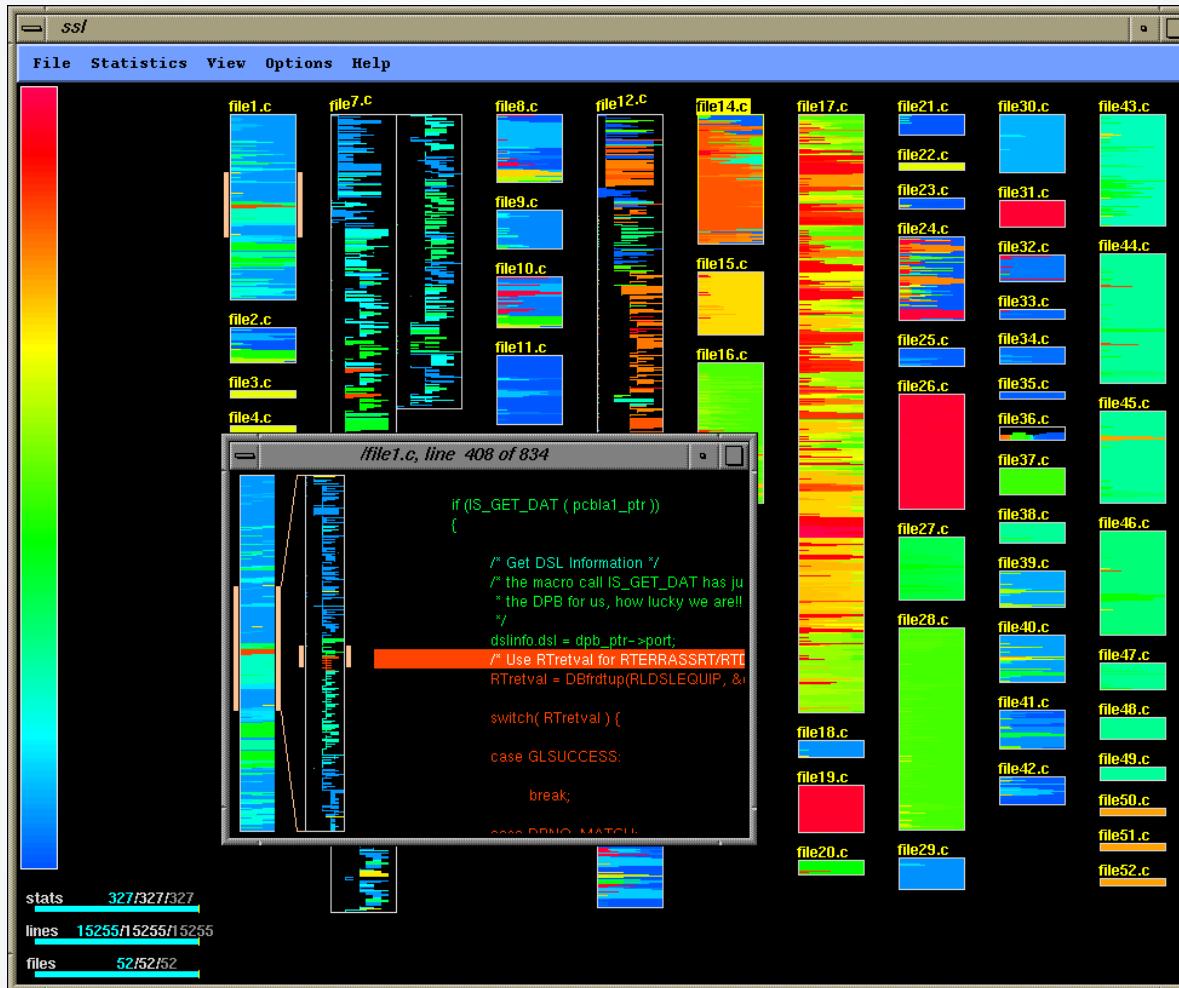
Visualizing Document Content

- Keyword-based Visualization
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- Opinion Analysis
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- Software Visualization

Software Visualization

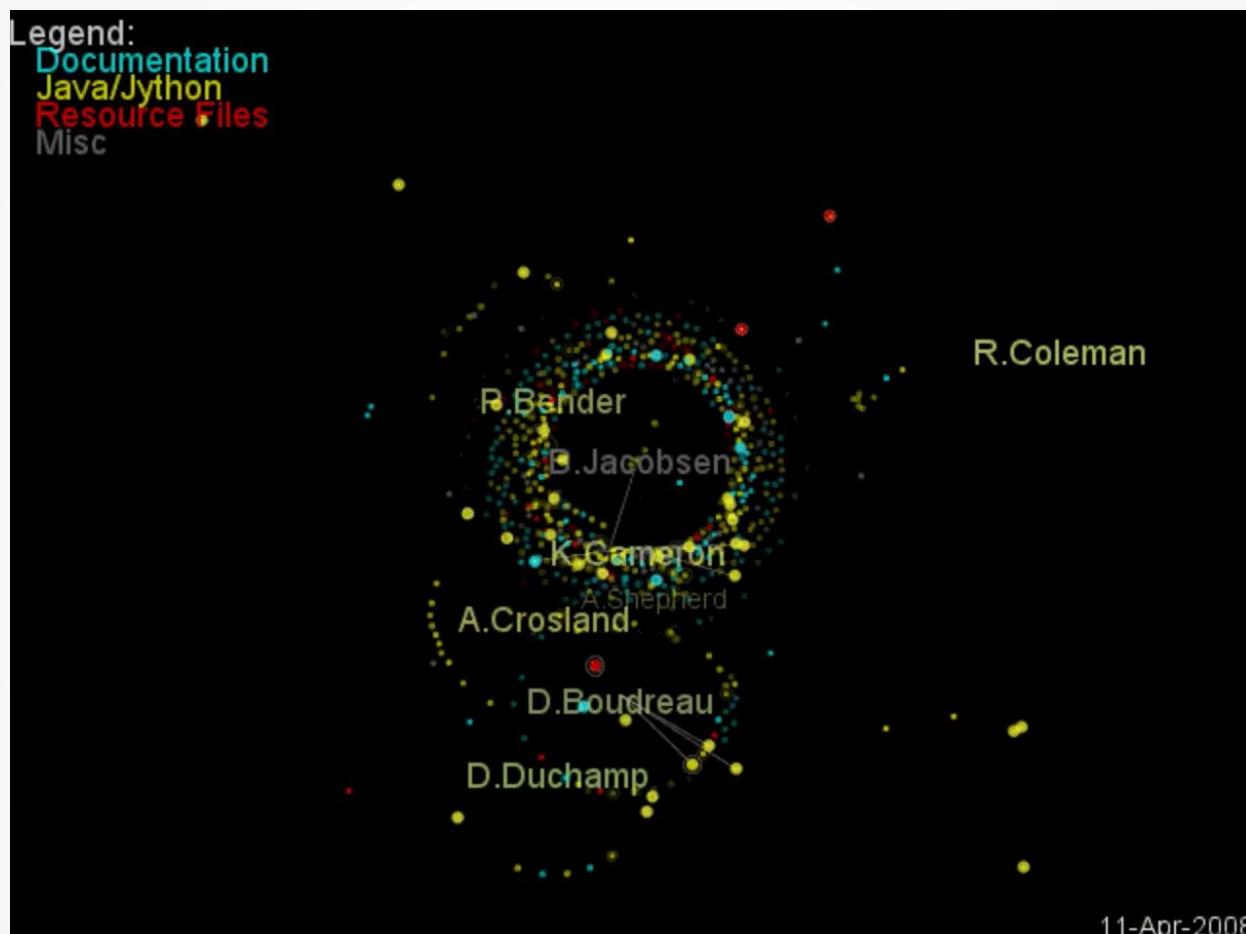
- Source codes can be regarded as a special type of text
- Levels of Software Visualization:
 - Source files
 - Structure of functions/modules, and relations between them

SeeSoft



S.C. Eick et al. Seesoft-a tool for visualizing line oriented software statistics. (IEEE TSE 1992)

CodeSwarm



优酷

豆瓣代码仓库提交记录

Text Visualization

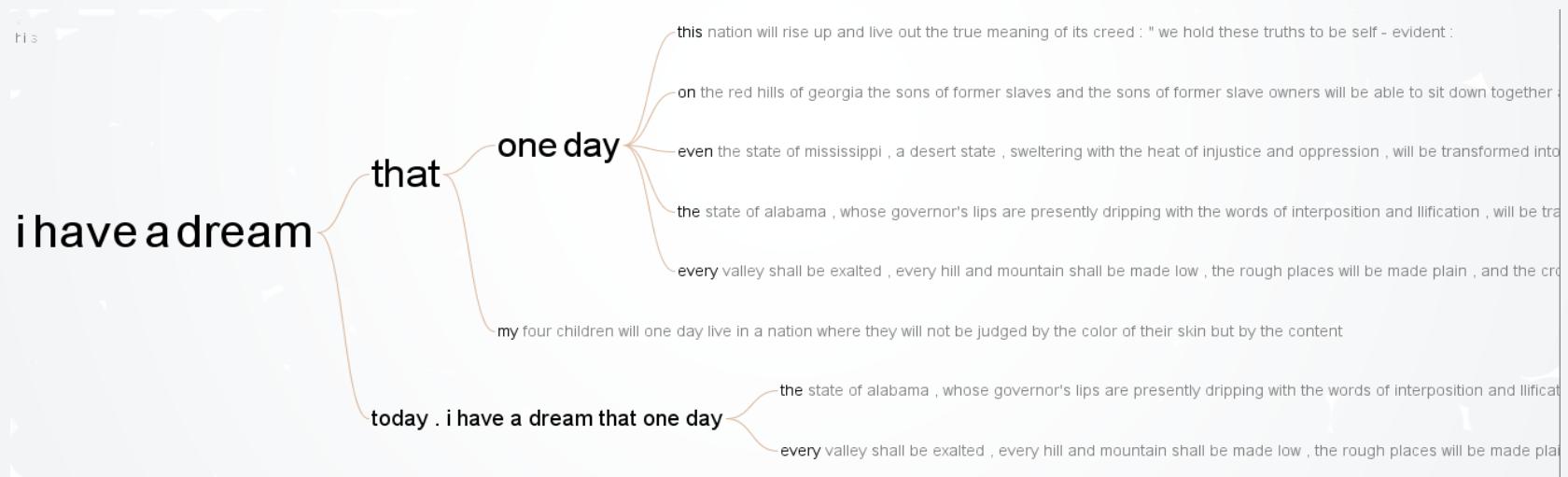
- Categorized based on features
 - Visualizing Document Content
 - Visualizing Document Relations
 - Multi-level Document Visualization

Visualizing Document Relations

- Relations in a document collection
 - References (paper)
 - Hyperlinks (web pages)
 - Similarity and Hierarchy
- Methods:
 - Graph Layout
 - Tree Layout

Wordnet

- Similar to Trie-tree
- Size of a word -> word frequency

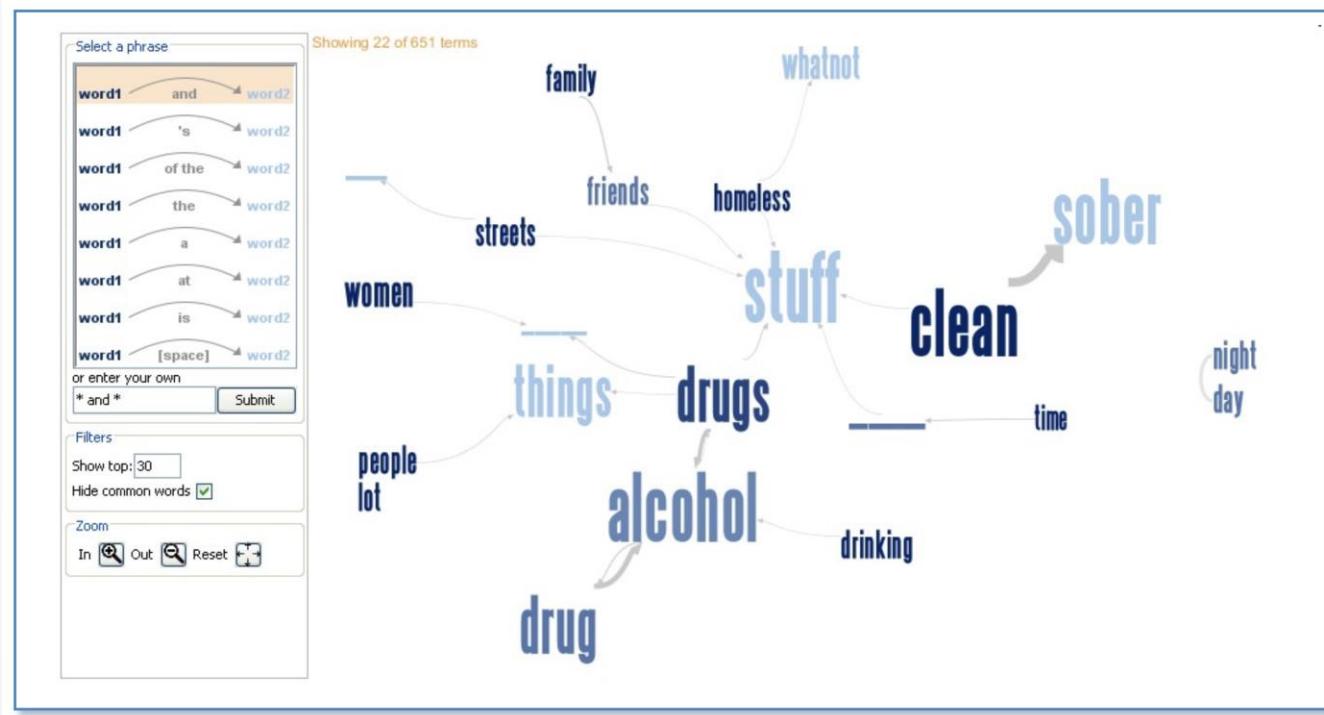


All of the sentences starting with “I” in the speech “I have a dream”

Wattenberg M and Viégas F B. The word tree, an interactive visual concordance. (IEEE TVCG 2008)

PhraseNet

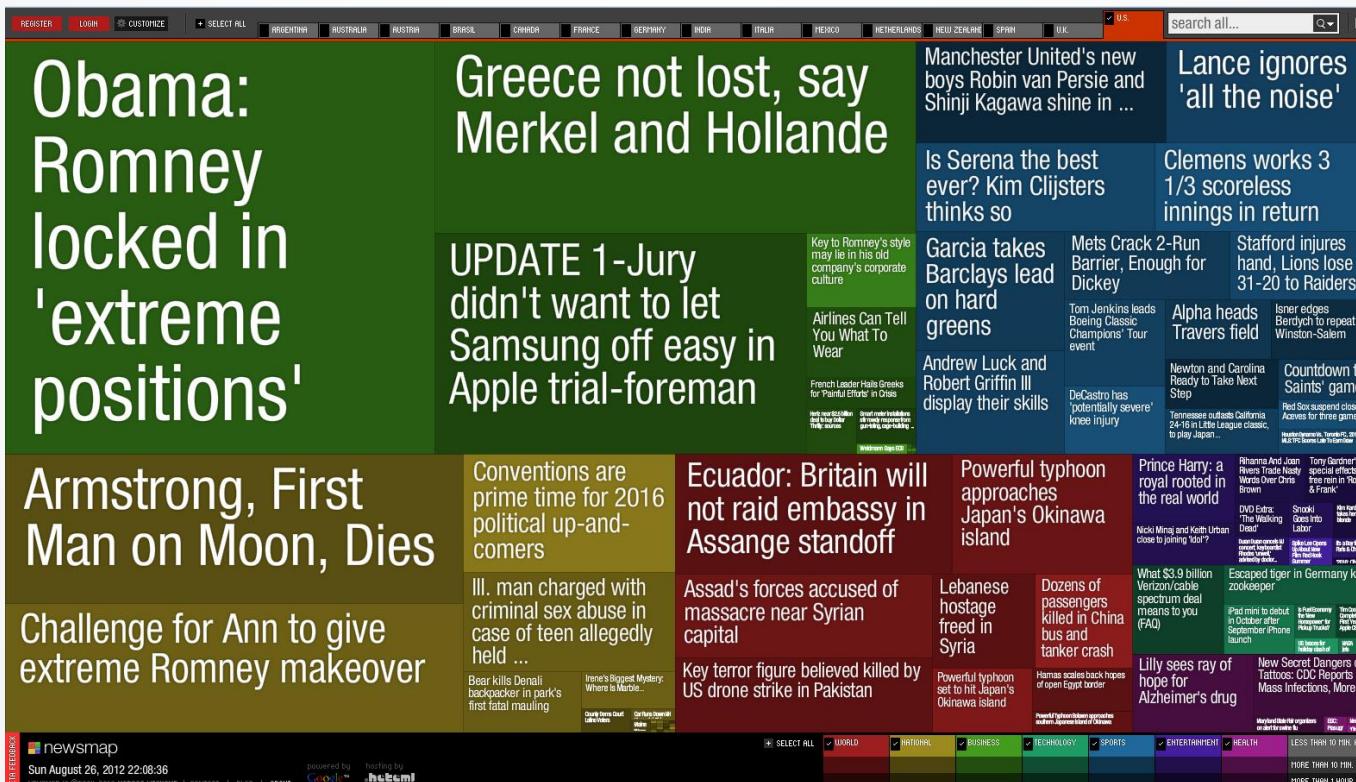
- Relation of “A the B” by node-link view



Van Ham F et al. Mapping text with phrase nets. (IEEE TVCG 2009)

Newsmap

- Show similarities by treemap



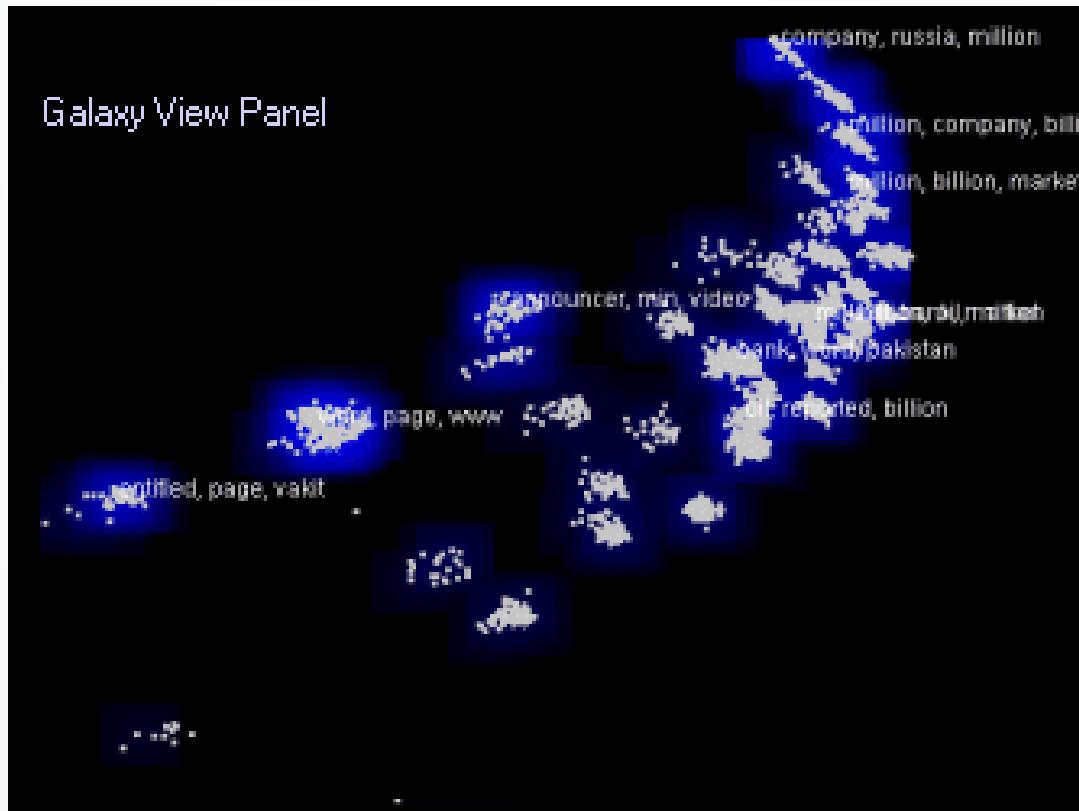
<http://newsmap.jp/>

Document Collection Visualization

- Visualize relations between documents in a collection
- Method: Multidimensional Projection

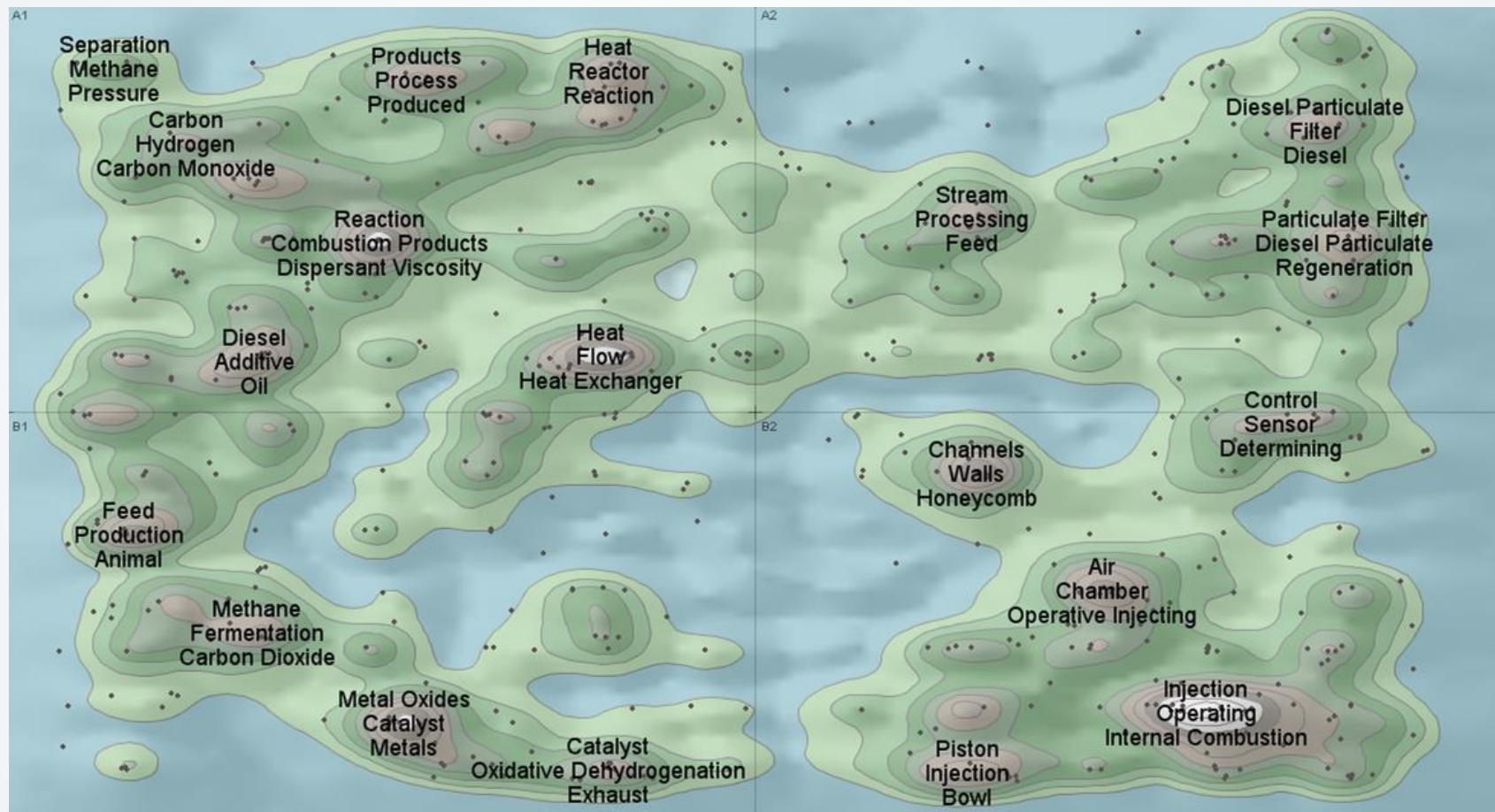
GalaxyView

- MDS based on document similarities



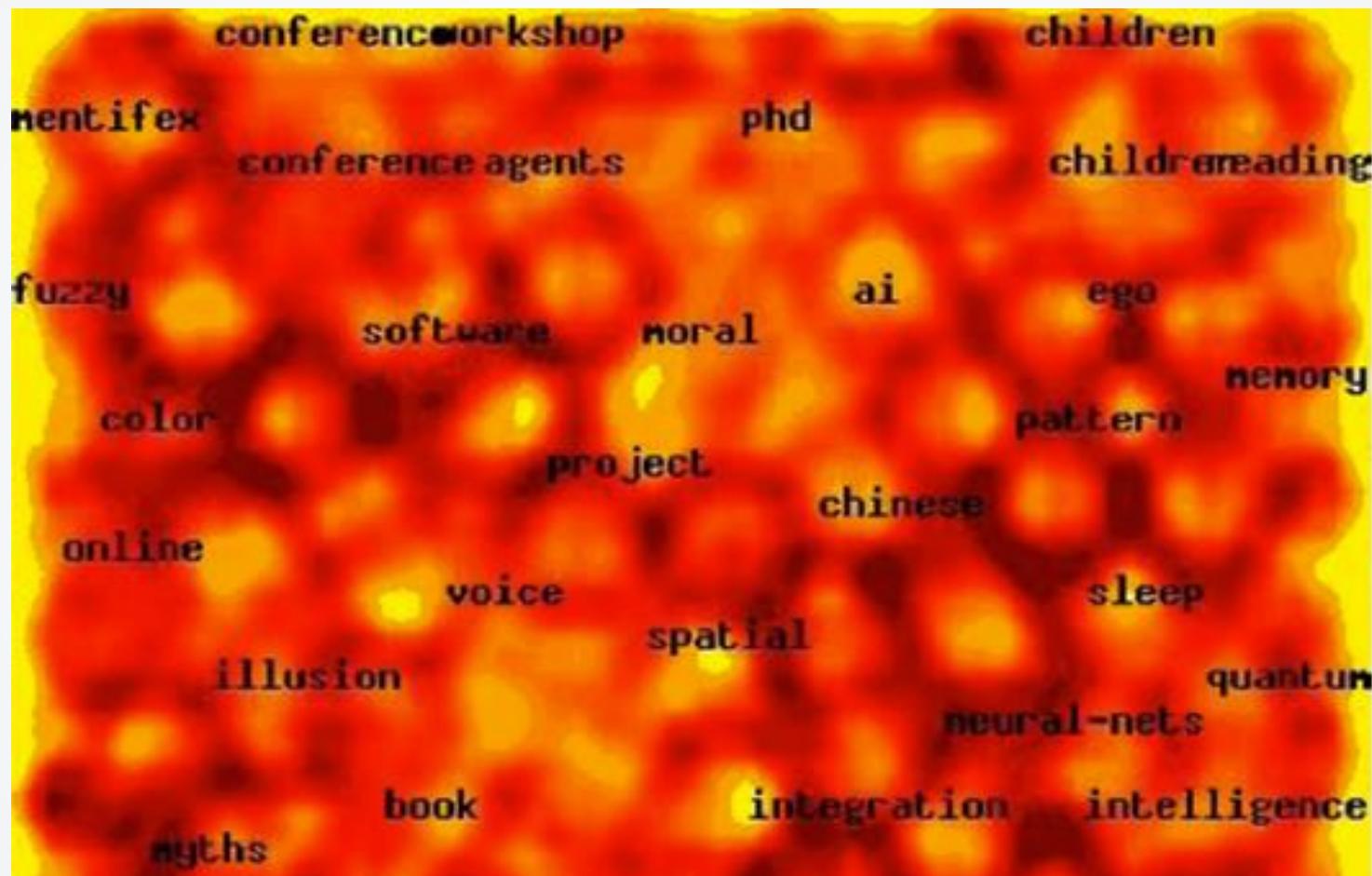
Wise J A. The ecological approach to text visualization.
(Journal of the Association for Information Science and Technology 1999)

ThemeScape



Wise J A. The ecological approach to text visualization.
(Journal of the Association for Information Science and Technology 1999)

SOM Projection



Jigsaw

- Developed by Georgia Tech Information Interface Lab
- Document collection visualization tool
- Help finding potential relations:
 - People - people
 - Event - event

Jigsaw

(a)

The public is invited to attend the **Sunday** session of the "Nights of Champagne and Tropical Fish" at the Miami Beach Convention Center to celebrate the finest in drink and marine life. Highlighting the evening's activities will be the mega-auction of rare bottles of champagne and exotic species of freshwater fish, some in alluring combinations.

"**Saturday night** was invitation-only, **Sunday** is open to the public," reports Arthur Swordane, operations manager of the show for its sponsor, **Global Ways** importers. "We pair a Veuve Clicquot Grand Dame Rose with a large Jardini Arowana right off the bat on **Sunday** ...watch for it."

Saturday night festivities brought out such notables as socialite **Luella Vedric** and musician r'Bert, who were special guests of **Global Ways** owner **Madhi Kim**. It is said both are looking to add to their current tropical fish collections, as well as their wine cellars.

(b)

animal animals CITES dinner endangered exotic
Luella Vedric mistreatment night people prevention r'Bear rights
Saturday species SPOMA **Sunday** tropical wildlife works

Documents 2 20030526-2_57 2 20031013_4 2 20040119-1_98 2 20040412-2_13

Summary: "We pair a Veuve Clicquot Grand Dame Rose with a large Jardini Arowana right off the bat on **Sunday** ...watch for it..." Saturday night festivities brought out such notables as socialite **Luella Vedric** and musician r'Bert, who were special guests of **Global Ways** owner **Madhi Kim**.

Source: Date: Apr 15, 2004

The public is invited to attend the **Sunday** session of the "Nights of Champagne and Tropical Fish" at the Miami Beach Convention Center to celebrate the finest in drink and marine life. Highlighting the evening's activities will be the mega-auction of rare bottles of champagne and exotic species of freshwater fish, some in alluring combinations.

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(c)

Word Tree View Edit Bookmarks < Back Forward > r'Bear 18 matches

r'Bear , told 's 's told added established his exotic animal sanctuary two years ago with the help of several wildlife foundations. explains as we drive past a large muddy construction area. plans to have a week-long open house once the animals are settled. say his time is now spent running a captive breeding program in Southern California to repopulate endangered species. tells us most of his animals are purchased from overseas sources, but occasionally his agent gets a call from someone looking to find a home for their ove was admitted to the University of California Medical Center last yesterday.

Showing 18 / 18 (100.000%) leaves in current branch, of 18 leaves in tree. Prune Percentage: 100% Prune to Window

Combining Computational Analyses and Interactive Visualization for Document Exploration and Sensemaking in Jigsaw

InfoVis / VAST Papers

Carsten Görg*, Zhicheng Liu§, Jaeyeon Kihm†
Jaegul Choo§, Haesun Park§, John Stasko§

*University of Colorado

§ Georgia Institute of Technology

†Cornell University

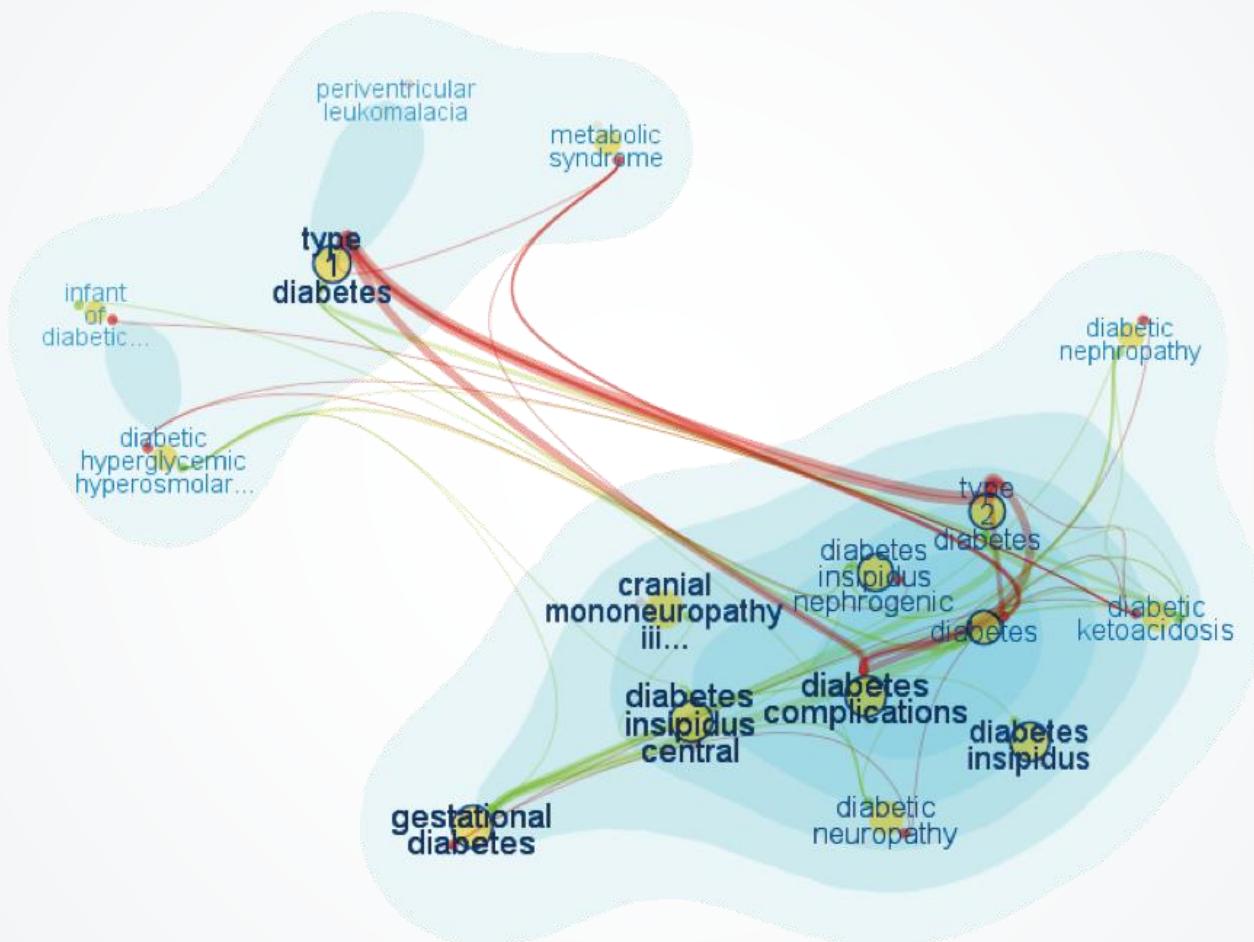
Text Visualization

- Categorized based on features
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 - Visualizing Document Relations
 - Multi-level Document Visualization

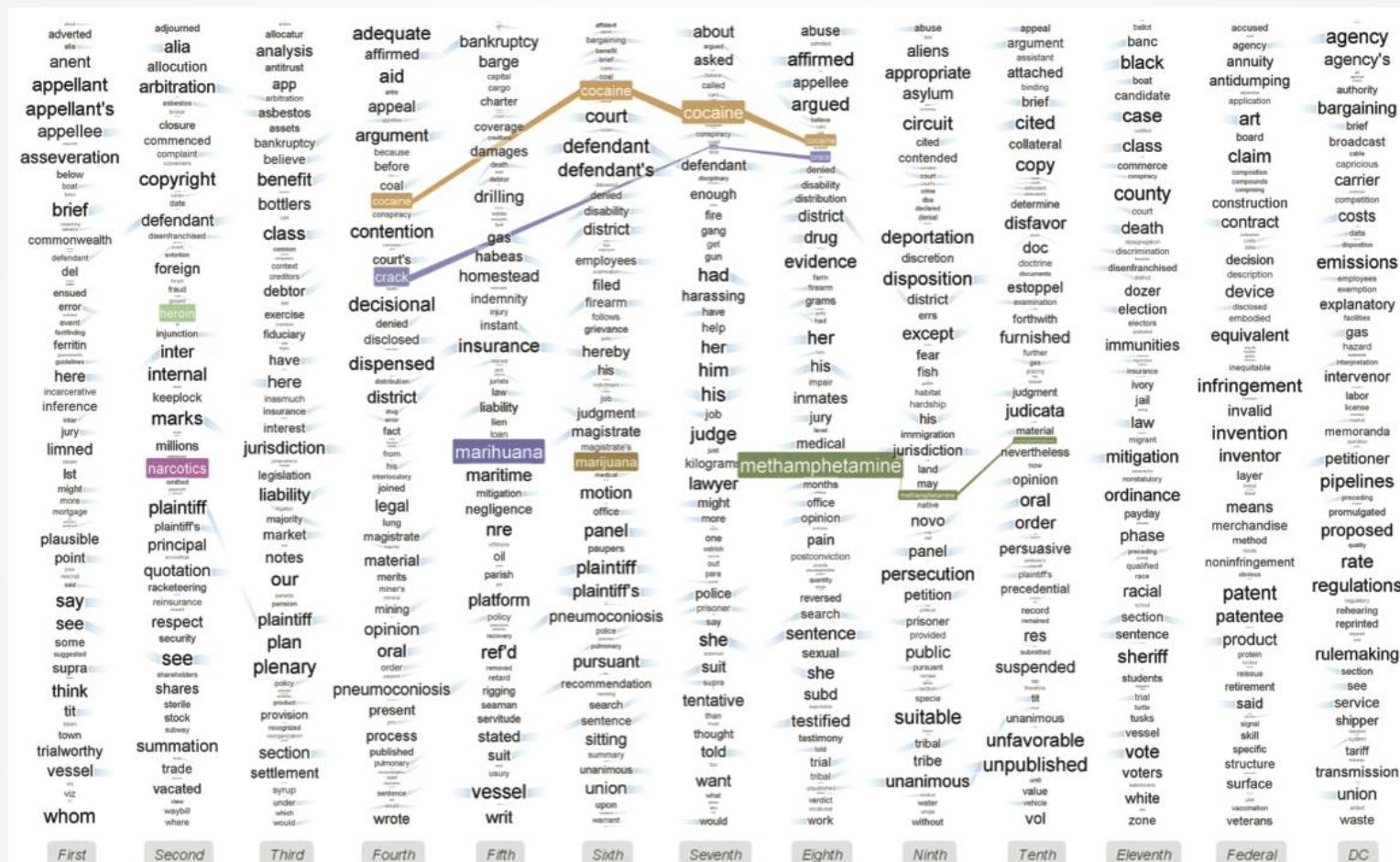
Multi-level Document Visualization

- Multi-level information
 - Context
 - Spatiotemporal Information
 - Author
 - ...
- Visual-guided approach to help discovering insights behind documents

FacetAtlas



Parallel Tag Cloud



Christopher Collins et al. Parallel Tag Clouds to explore and analyze faceted text corpora. (IEEE VAST 2009)

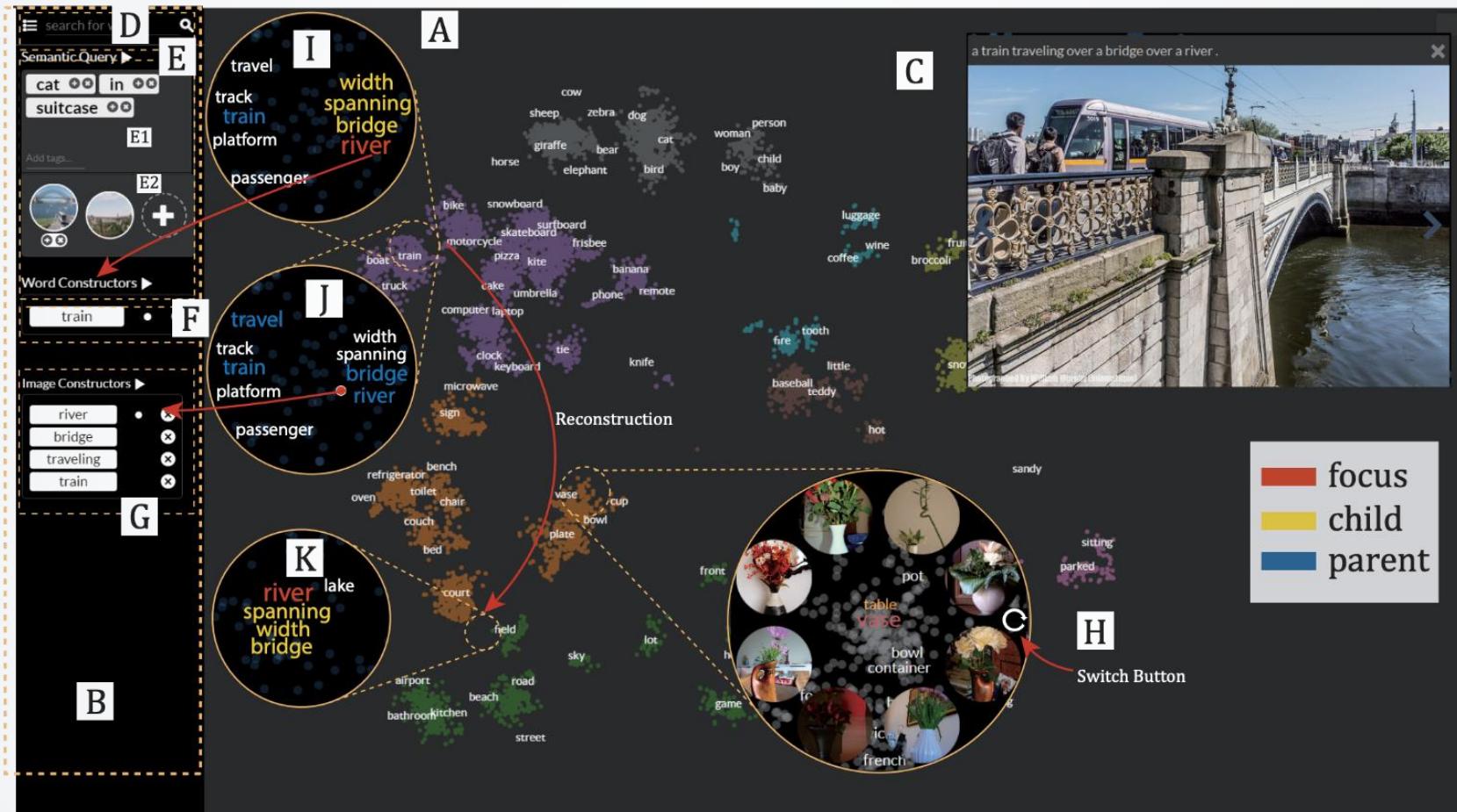
Parallel Tag Clouds to Explore and Analyze Faceted Text Corpora

Christopher Collins
Fernanda B. Viégas
Martin Wattenberg

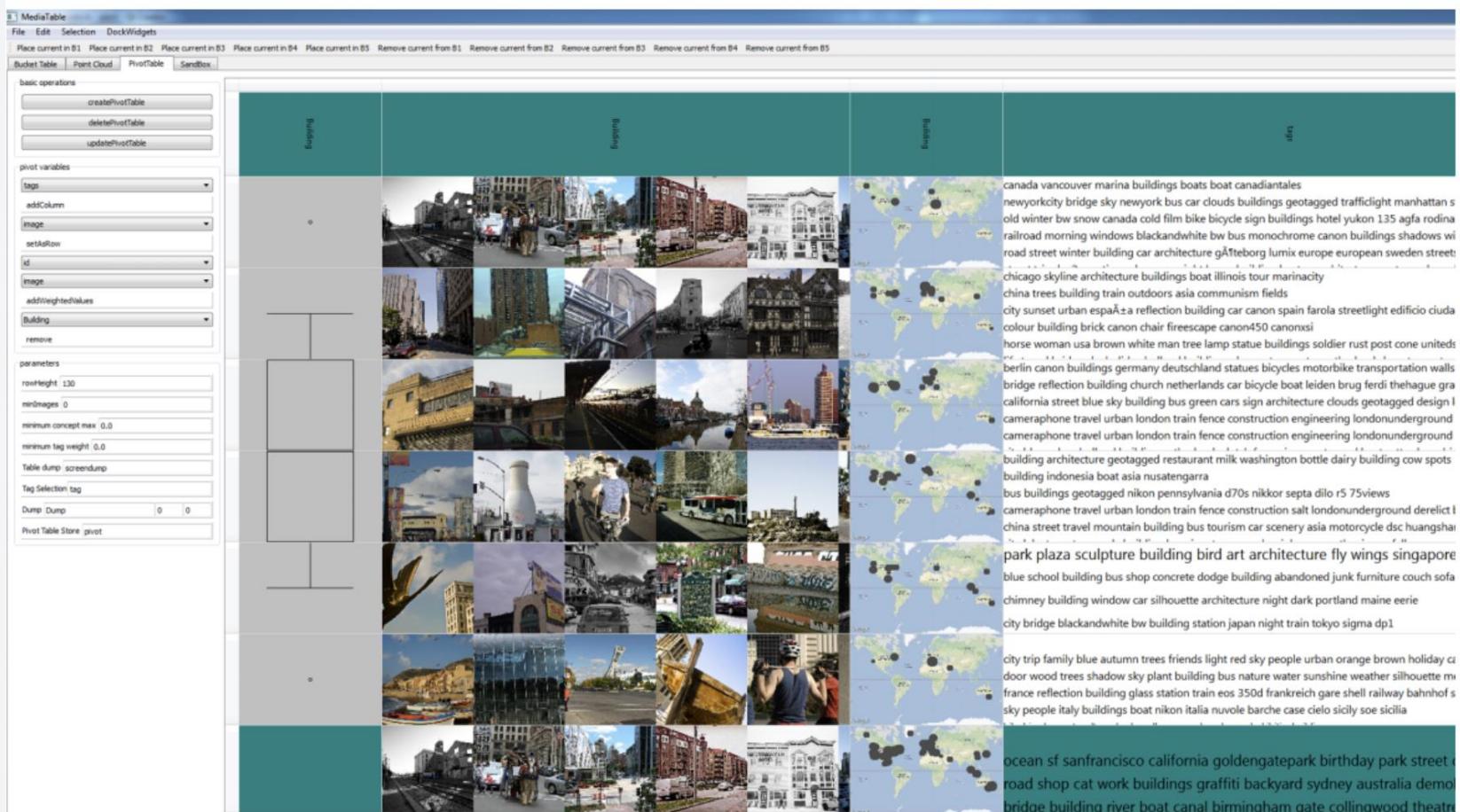
Multimedia Visualization



ImageVis

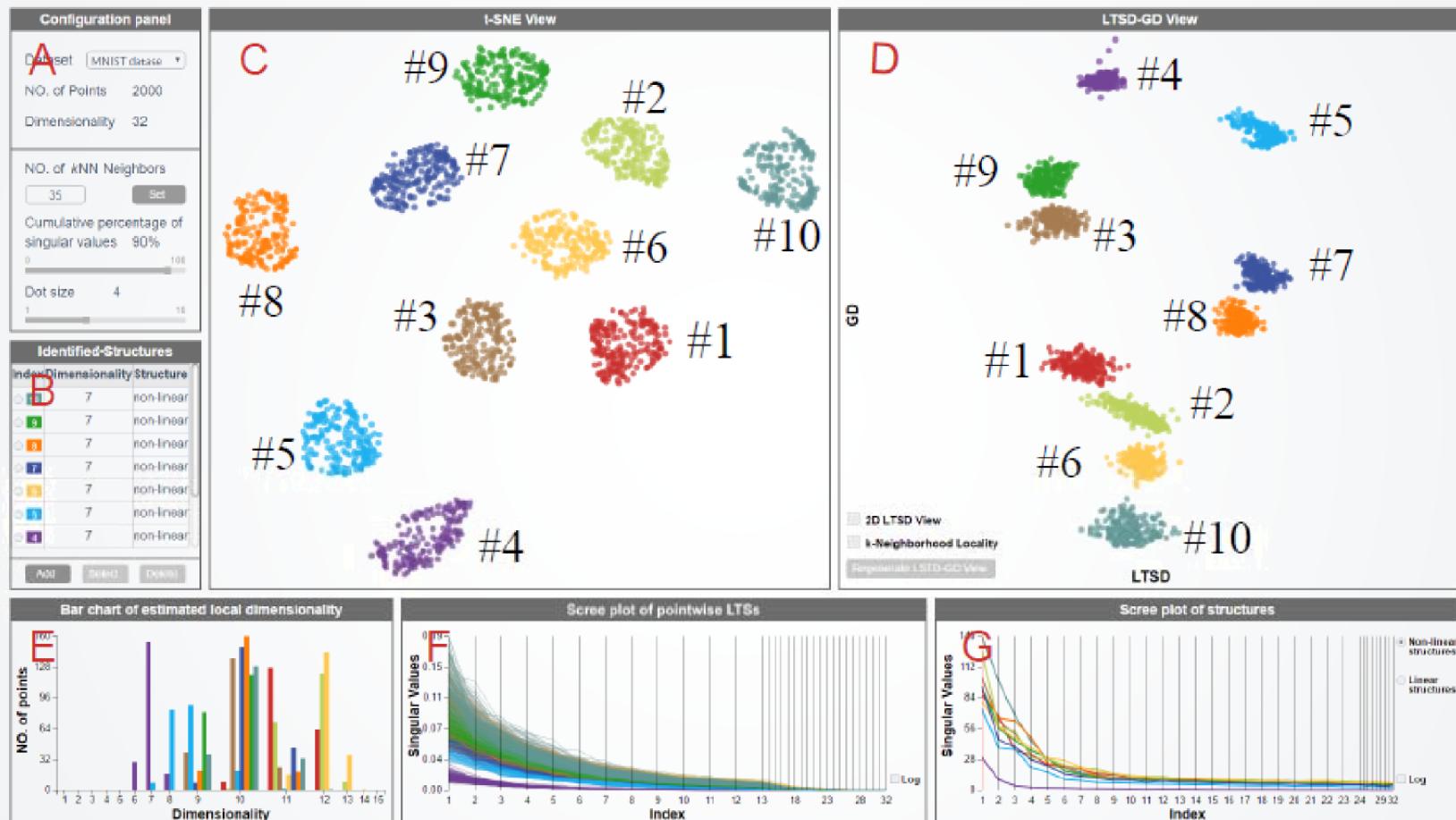


Multimedia Pivot Tables



Marcel Worring and Dennis Koelma. Insight in Image Collections by Multimedia Pivot Tables.
(ACM International Conference on Multimedia Retrieval 2015)

Multimedia Pivot Tables



Thanks