

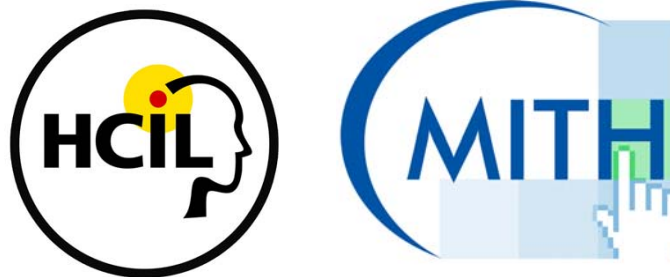
Exploring and Visualizing Patterns in Literary Text Collections with FeatureLens



Anthony Don, Catherine Plaisant, Tanya Clement
Elena Zheleva, Machon Gregory, Sureyya Tarka,
Celeste Paul, Ben Shneiderman

and others from the MONK project, in particular Loretta Auvil and Matt Kirschenbaum

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Supporting Literary Scholars

The MONK Project

Metadata Offer New Knowledge

Humanities scholars, computer scientists
and information specialists

University of Illinois, Urbana-Champaign

School of Library and Information Sciences
National Center for Supercomputing Applications

Northwestern University

Academic Technologies

University of Maryland

Human-Computer Interaction Laboratory
Maryland Institute for Technology in the Humanities

University of Alberta

Department of English

MacMaster University

Humanities Visualization

University of Nebraska, Lincoln

Center for Digital Research in the Humanities

Guiding Principles

Web-deliverable services
Visualizations as interface
State of the art text mining

18th and 19th Century

British and American Literature

Follow up of Nora Project

Presentation last year:

Exploring the erotics in Emily
Dickinson' letters with text mining
and visual interfaces

Motivating problem

- Thesis of Tanya Clement, PhD student from English Department
- Gertrude Stein's "*The Making of Americans*" (MoA)
- Study the use of repetition

	<i>Uncle Tom's Cabin</i>	<i>Moby Dick</i>	<i>The Making of Americans</i>
Total # words	190,906	220,254	↗ 517,207
Unique words	11,730	14,512	↘ 5,329

Sample paragraph

- [1086] Always from the beginning there was to me all living as repeating. This is now a description of my feeling. As I was saying listening to repeating is often irritating, always repeating is all of living, everything in a being is always repeating, more and more listening to repeating gives to me completed understanding.

Examples of “Literary” questions about *MoA*

How does linguistic and syntactic variation reflect, advance, or deter from the progression of the text’s more abstract features such as argument and narrative?

Do the changes in repetition correspond to the novel’s evolving theories about identity and representation? And how?

Sample paragraph

- [1086] Always from the beginning there was to me all living as repeating. This is now a description of my feeling. As I was saying listening to repeating is often irritating, always repeating is all of living, everything in a being is always repeating, more and more listening to repeating gives to me completed understanding.

Sounds

- [1086] Always from the beginning there was to me all living as repeating. This is now a description of my feeling. As I was saying listening to repeating is often irritating, always repeating is all of living, everything in a being is always repeating, more and more listening to repeating gives to me completed understanding.

Words

- [1086] Always from the beginning there was to me all living as repeating. This is now a description of my feeling. As I was saying listening to repeating is often irritating, always repeating is all of living, everything in a being is always repeating, more and more listening to repeating gives to me completed understanding.

Higher level concept

- [1086] **Always** from the beginning there was to me **all** living as repeating. This is now a description of my feeling. As I was saying listening to repeating is often irritating, **always** repeating is **all** of living, **everything** in a being is **always** repeating, more and more listening to repeating gives to me **completed** understanding.

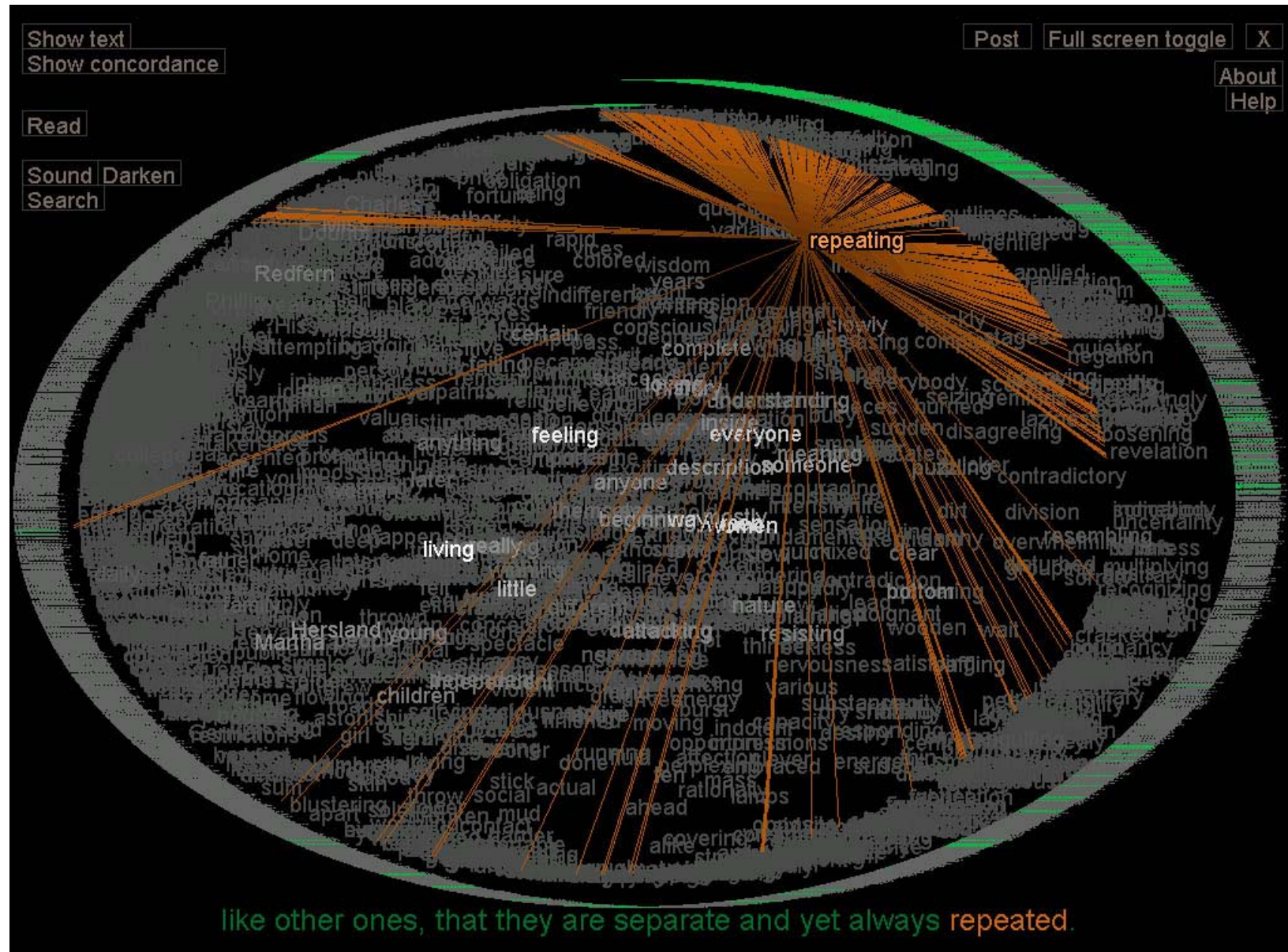
Ngrams (sets of consecutive words)

- [1086] Always from the beginning there was to me all living as repeating. This is now a description of my feeling. As I was saying **listening to repeating** is often irritating, **always repeating** is all of living, everything in a being is **always repeating**, more and more **listening to repeating** gives to me completed understanding.

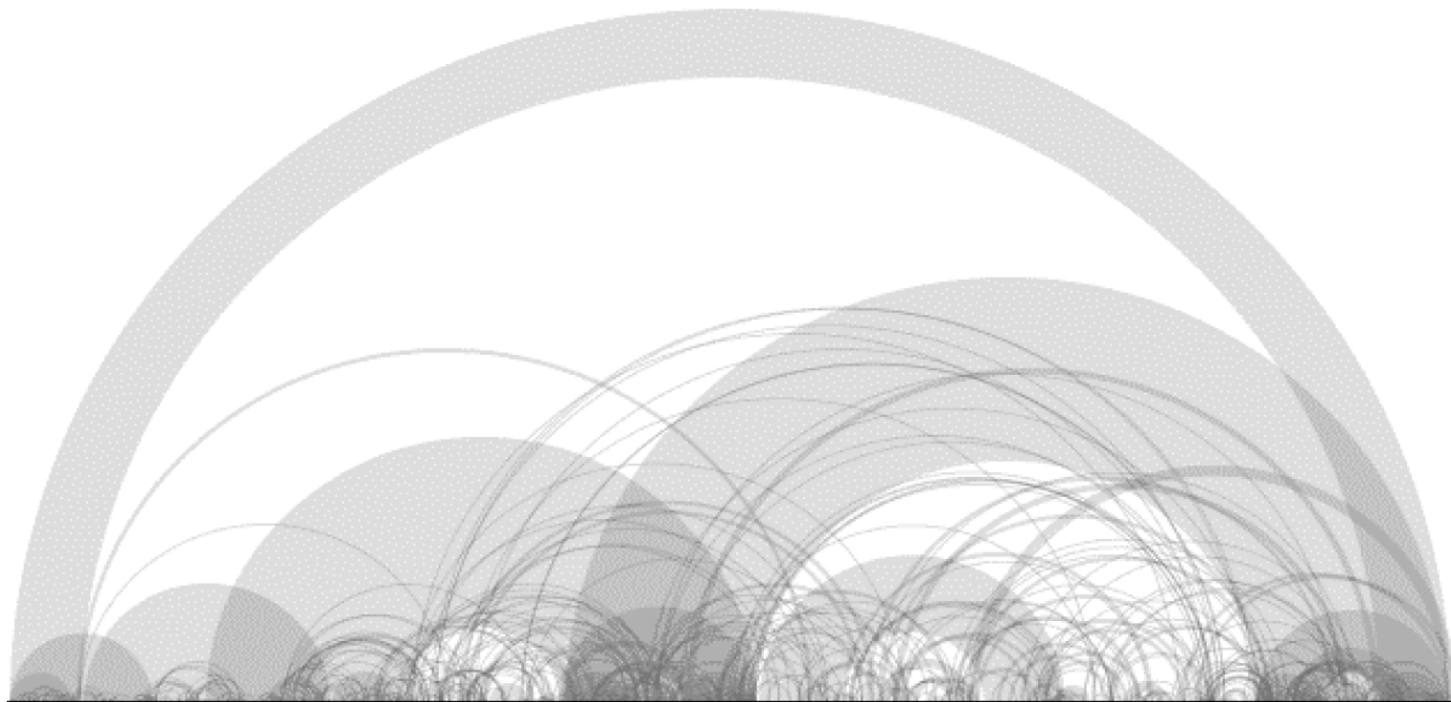
Questions we try to address

- **What text features are highly repeated in the text?**
 - Frequent words
 - Frequent n-grams (consecutive words)
 - Frequent patterns of n-grams (more “fuzzy” matches)
- **How do they change over time (i.e. along the text)?**
 - **Locate** features in text (overview + reading)
 - **Compare** features
 - Study the **shape of change**
 - Find features that exhibit **specific shapes** (e.g. spike)

Trying existing tools – Text Arc

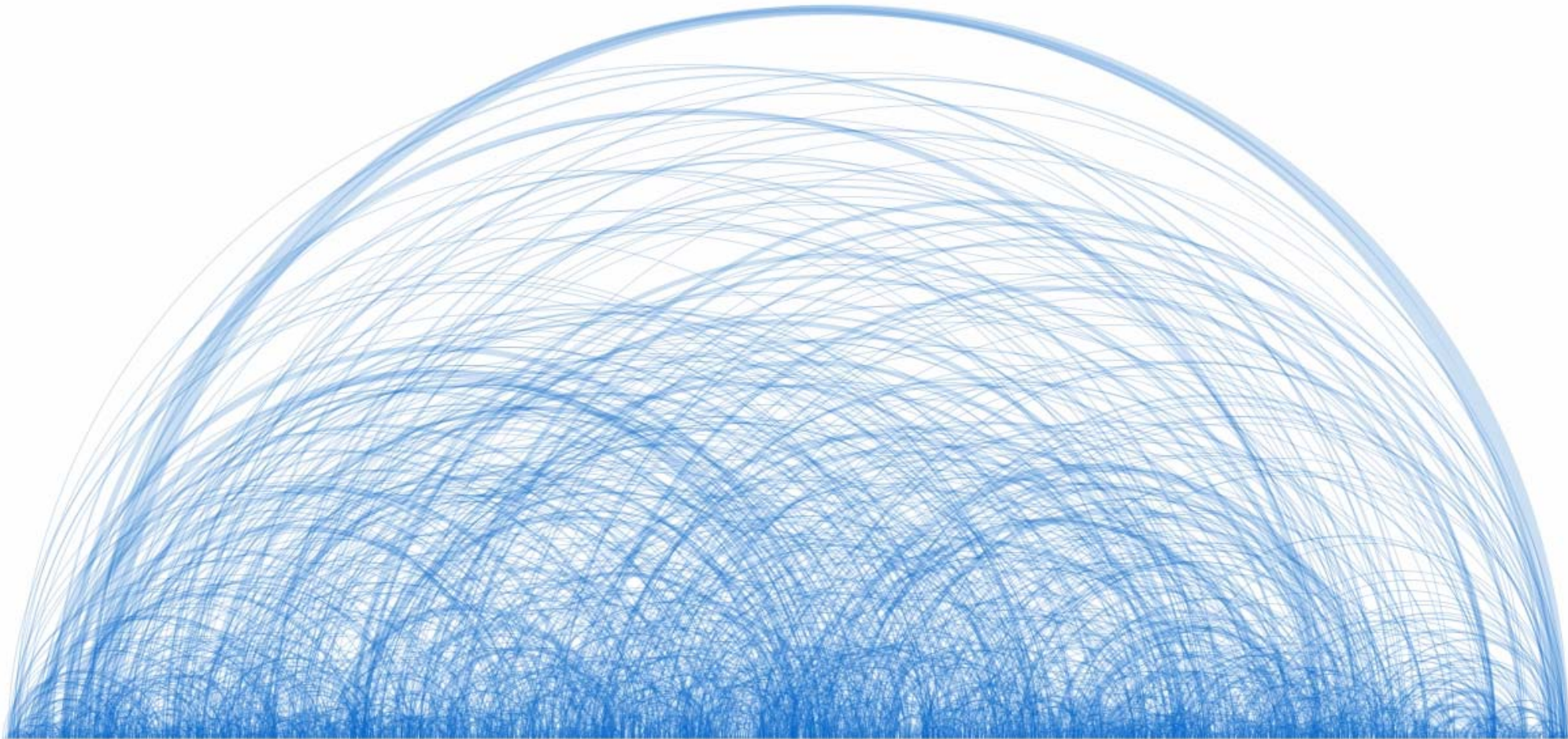


Trying existing tools – Arc Diagrams



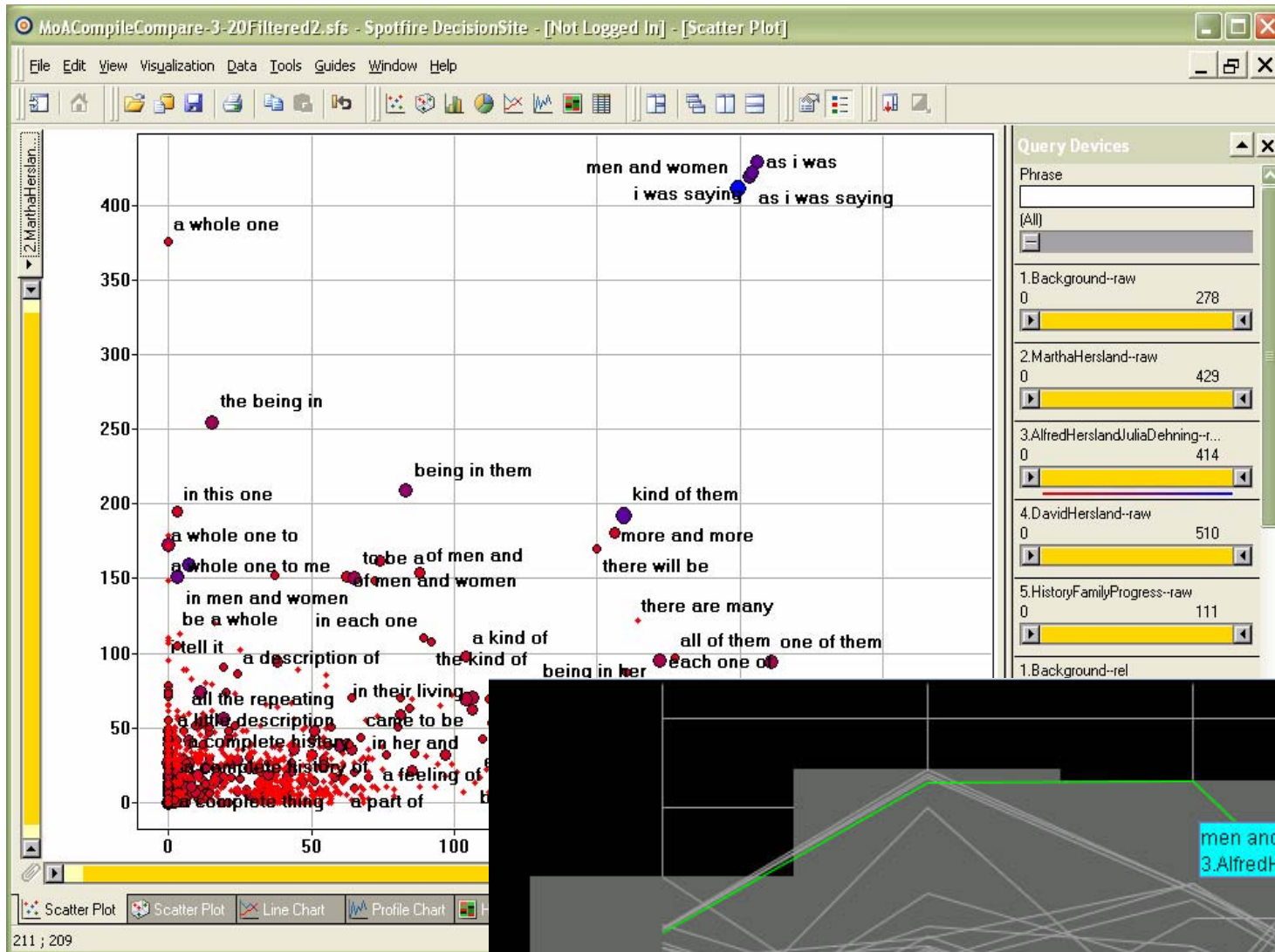
Arc Diagram of *Für Elise*

Trying existing tools – Arc Diagrams



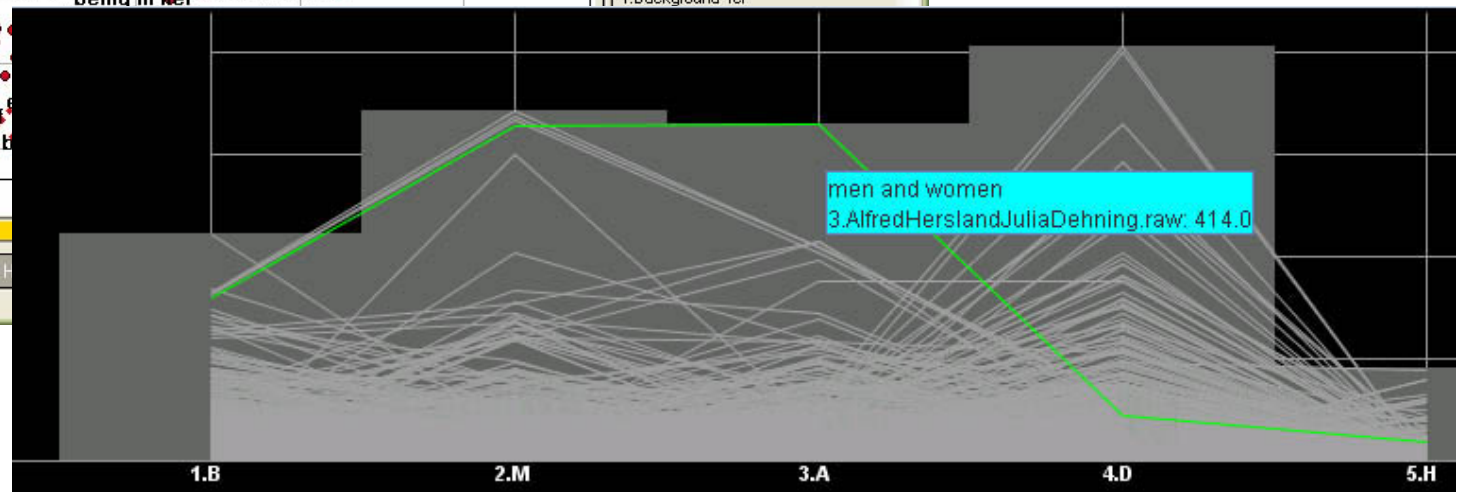
Arc Diagram of one page of *MoA*

Trying existing tools



SpotFire

TimeSearcher

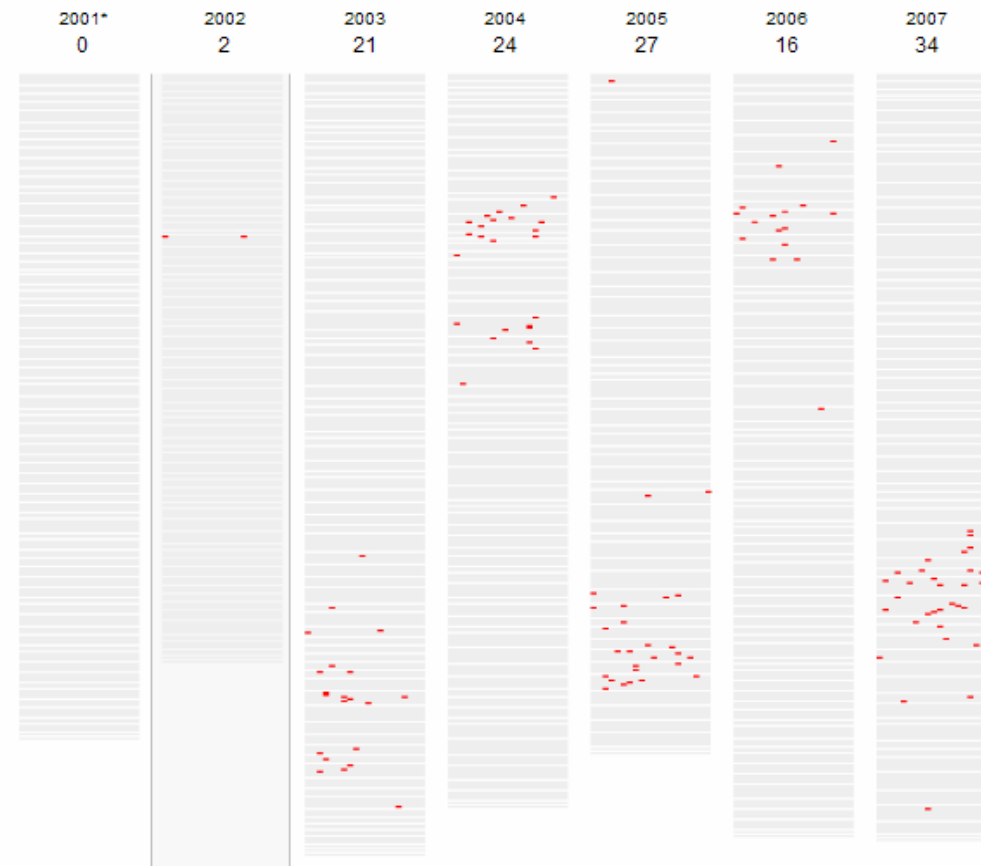


The 2007 State of the Union Address

Over the years, President Bush's State of the Union address has averaged almost 5,000 words each, meaning the the President has delivered over 34,000 words. Some words appear frequently while others appear only sporadically. Use the tools below to analyze what Mr. Bush has said.

 or choose a word here.

Use of the phrase "Iraq" in past State of the Union Addresses



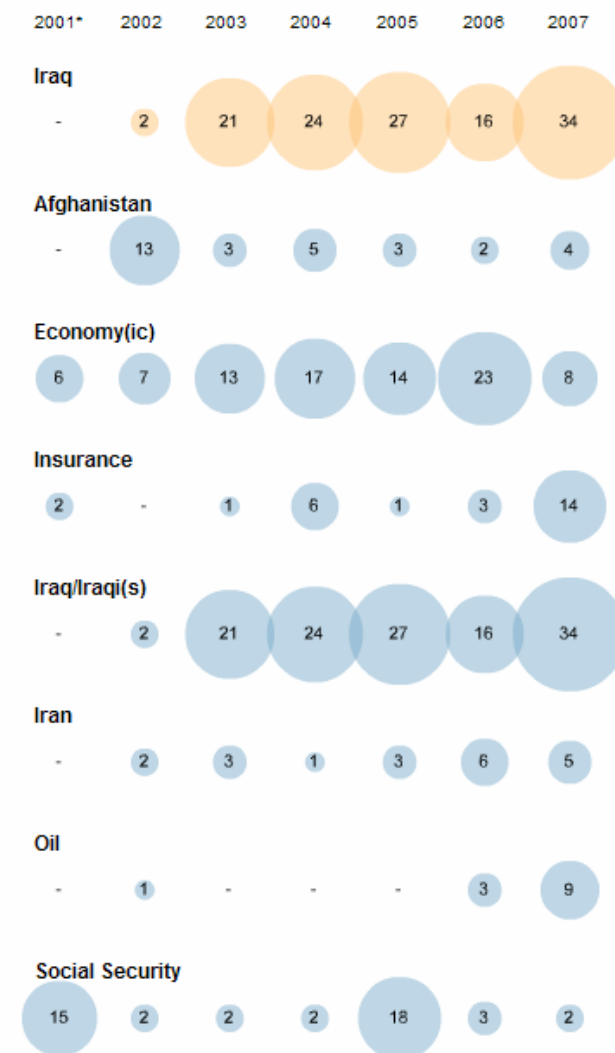
The word in context

IRAQ continues to flaunt its hostility toward America and to support terror. The Iraqi regime has plotted to develop anthrax, and nerve gas, and nuclear weapons for over a decade. This is a regime that has already used poison gas to murder thousands of its own citizens -- leaving the bodies of mothers huddled over their dead children. This is a regime that agreed to international inspections -- then kicked out the inspectors. This is a regime that has something to hide from the civilized world.

-- 2002 (Paragraph 20 of 67)

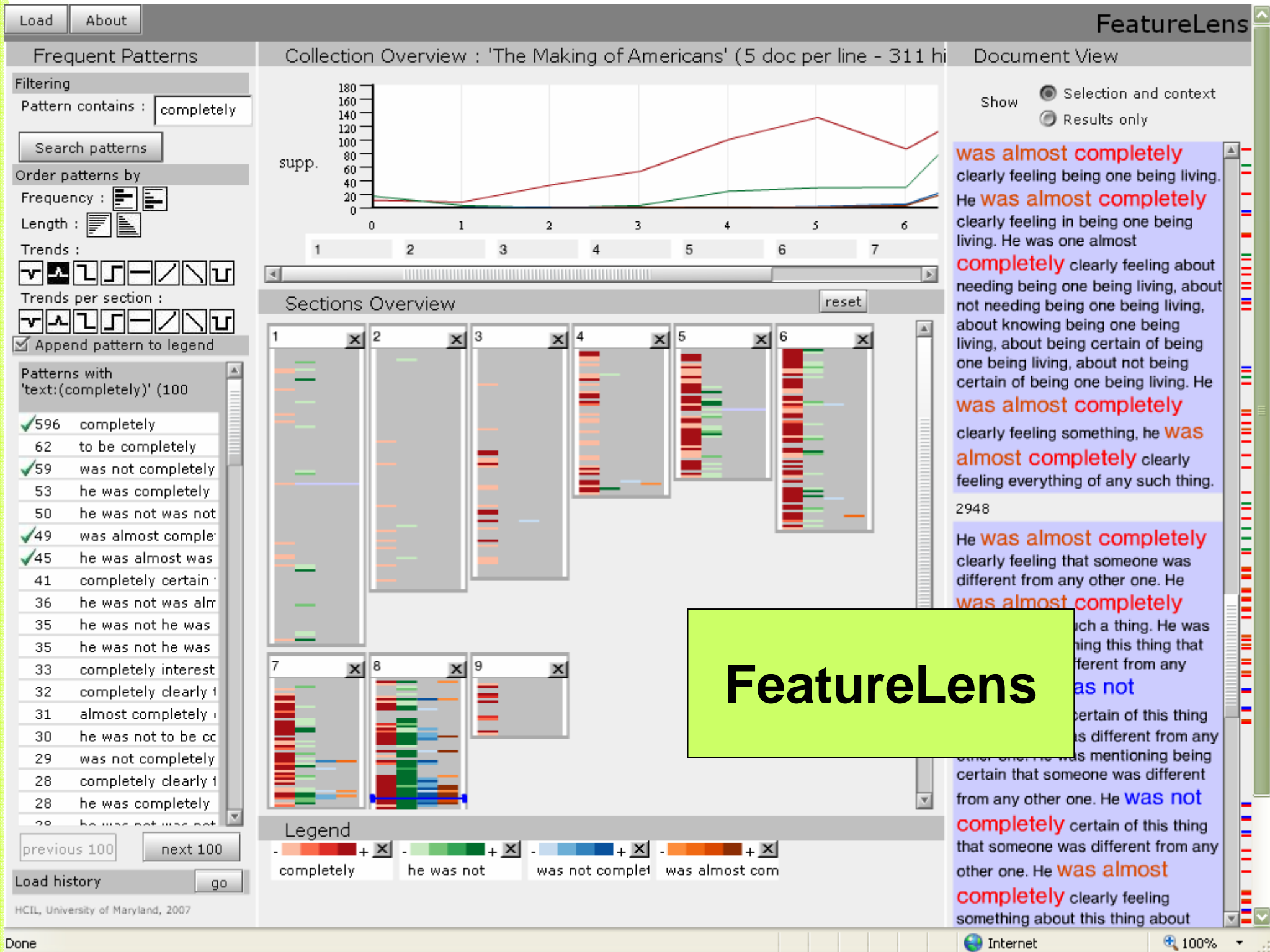
Next Instance of 'Iraq'

Compared with other words



* As a newly elected president, Mr. Bush did not deliver a formal State of the Union address in 2001. His Feb. 27 speech to a joint session of Congress was analogous to the State of the Union, but without the title.

Ben Werschkul/The New York Times



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About

FeatureLens



Frequent Patterns



Filtering









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






Search patterns

Order patterns by

Frequency :  

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Collection Overview

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☐ Results only

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About

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Frequent Patterns



Filtering









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







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Collection Overview

Sections Overview

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Settings

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The State of the Union

The State of the Union

Gamer Theory

The Making of Americans

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Frequent Patterns

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Collection Overview : 'The State of the Union' (1 doc per line - 0 highlight)

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Document View

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☒ Selection and context





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Frequent Patterns

Filtering

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Patterns by decreasing frequency (100 patterns -)

307	applause
189	america
131	people
101	world
99	country
84	nation
78	american
77	tonight
77	americans
75	security
74	congress
68	government
65	make
64	years
62	work
60	freedom
57	great
56	united
54	good

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Collection Overview : 'The State of the Union' (1 doc per line - 0 highlight)

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Sections Overview

2001-1

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Legend

Document View

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- ☒ Selection and context
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Frequent Patterns

Filtering

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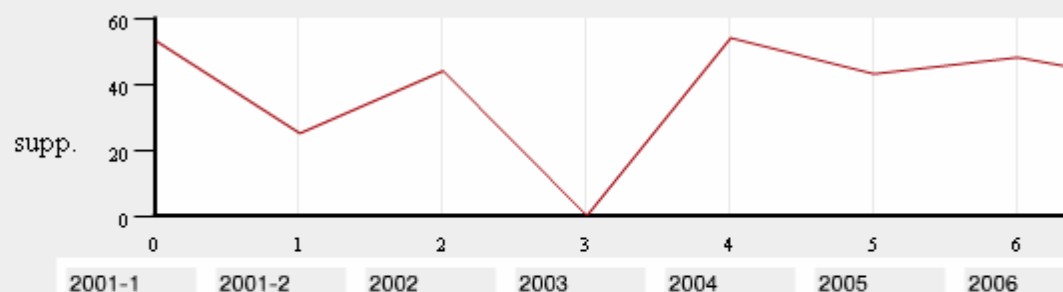
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Patterns by decreasing frequency (100 patterns -)

✓307 applause
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74 congress
68 government
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64 years
62 work
60 freedom
57 great
56 united
54 good

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Collection Overview : 'The State of the Union' (1 doc per line - 313 high



Sections Overview



Legend

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applause

Document View

Show

- ☒ Selection and context
☐ Results only

00

THE PRESIDENT: Mr. Speaker, Mr. Vice President, members of Congress: It's a great privilege to be here to outline a new budget and a new approach for governing our great country. I thank you for your invitation to speak here tonight. I know Congress had to formally invite me, and it could have been a close vote. (Laughter.) So, Mr. Vice President, I appreciate you being here to break the tie. (Laughter.)

01

I want to thank so many of you who have accepted my invitation to come to the White House to discuss important issues. We're off to a good start. I will continue to meet with you and ask for your input. You have been kind and candid, and I thank you for making a new President feel welcome.

(Applause.)

02

The last time I visited the Capitol, I came to take an oath on the steps of this building. I pledged to honor our Constitution and laws.

(Applause.) And I asked you to join me in setting a tone of civility and respect in Washington.

(Applause.)

03





I hope America is noticing the difference, because we're making progress. Together, we are

Frequent Patterns

Filtering

Pattern contains :

Order patterns by

Frequency :  Length :  

Trends :



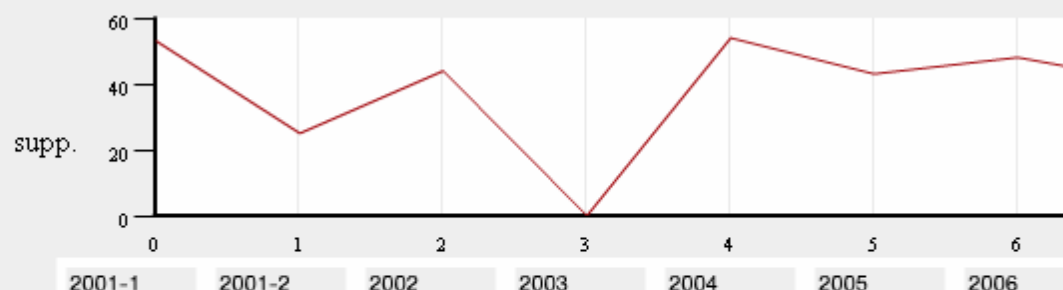
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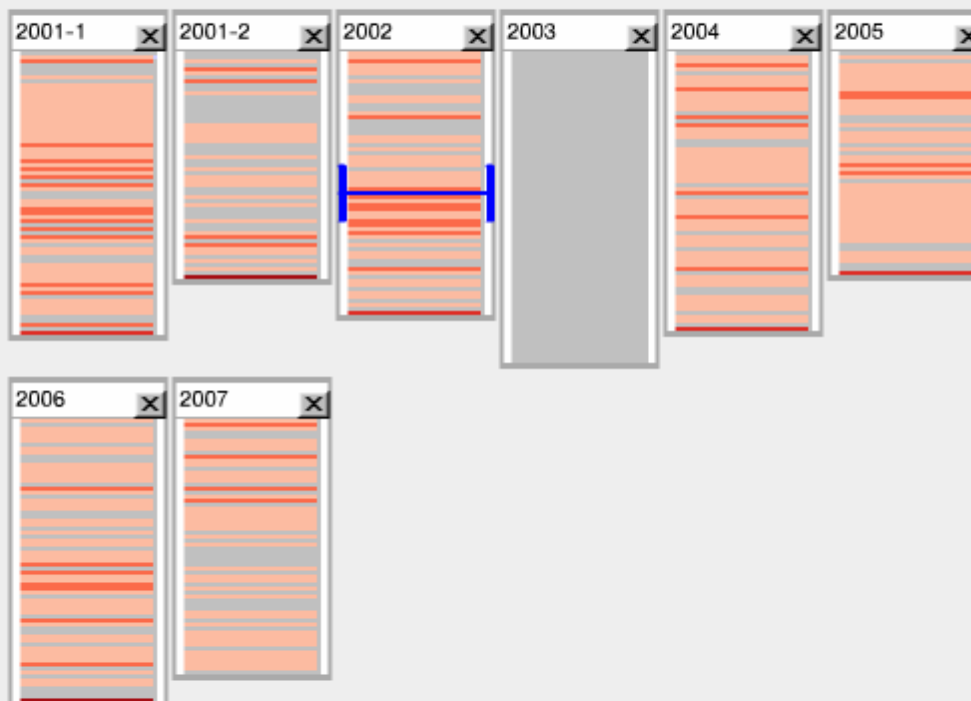
Patterns by decreasing frequency (100 patterns -)

✓ 307 applause
189 america
131 people
101 world
99 country
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60 freedom
57 great
56 united
54 good

Collection Overview : 'The State of the Union' (1 doc per line - 313 high)



Sections Overview



Legend

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applause

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(Applause.)

34

Americans who have lost their jobs need our help and I support extending unemployment benefits and direct assistance for health care coverage. (Applause.) Yet, American workers want more than unemployment checks -- they want a steady paycheck. (Applause.) When America works, America prospers, so my economic security plan can be summed up in one word: jobs. (Applause.)

35

Good jobs begin with good schools, and here we've made a fine start. (Applause.) Republicans and Democrats worked together to achieve historic education reform so that no child is left behind. I was proud to work with members of both parties: Chairman John Boehner and Congressman George Miller. (Applause.) Senator Judd Gregg. (Applause.) And I was so proud of our work, I even had nice things to say about my friend, Ted Kennedy. (Laughter and applause.) I know the folks at the Crawford coffee shop couldn't believe I'd say such a thing - (laughter) -- but our work on this bill shows what is possible if we set aside posturing and focus on results. (Applause.)





36

Frequent Patterns

Filtering

Pattern contains :

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Trends per section :

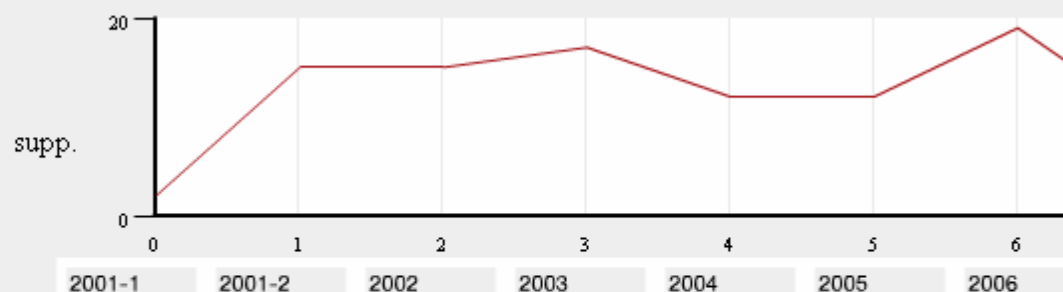
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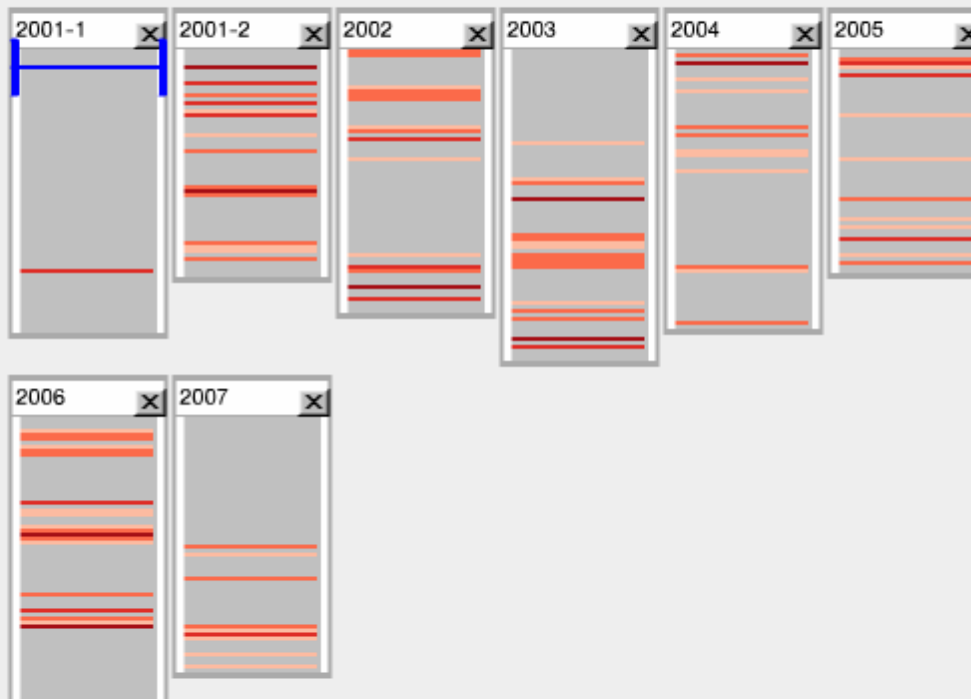
✓307	applause
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57	great
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Collection Overview : 'The State of the Union' (1 doc per line - 101 high)



Sections Overview



Legend


- world + 

Document View

Show

- ☒ Selection and context
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02

The last time I visited the Capitol, I came to take an oath on the steps of this building. I pledged to honor our Constitution and laws. (Applause.) And I asked you to join me in setting a tone of civility and respect in Washington. (Applause.)

03

I hope America is noticing the difference, because we're making progress. Together, we are changing the tone in the Nation's Capital. And this spirit of respect and cooperation is vital, because, in the end, we will be judged not only by what we say or how we say it, we will be judged by what we're able to

04

America today is a nation with great challenges, but greater resources. An artist using statistics as a brush could paint two very different pictures of our country. One would have warning signs: increasing layoffs, rising energy prices, too many failing schools, persistent poverty, the stubborn vestiges of racism. Another picture would be full of blessings: a balanced budget, big surpluses, a military that is second to none, a country at peace with its neighbors, technology that is revolutionizing the **world**, and our greatest strength -- concerned citizens who care for our country and care for each other.

05





Frequent Patterns

Filtering

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Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

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84 nation
78 american
77 tonight
77 americans
✓75 security
74 congress
68 government
65 make
64 years
62 work
60 freedom
57 great
56 united
54 good
53 citizens
53 children
52 time
52 terrorists
51 states
✓50 economy
50 terror

previous 100

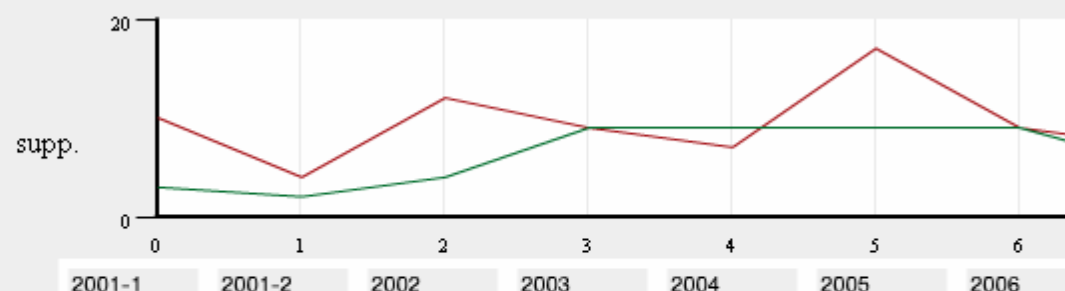
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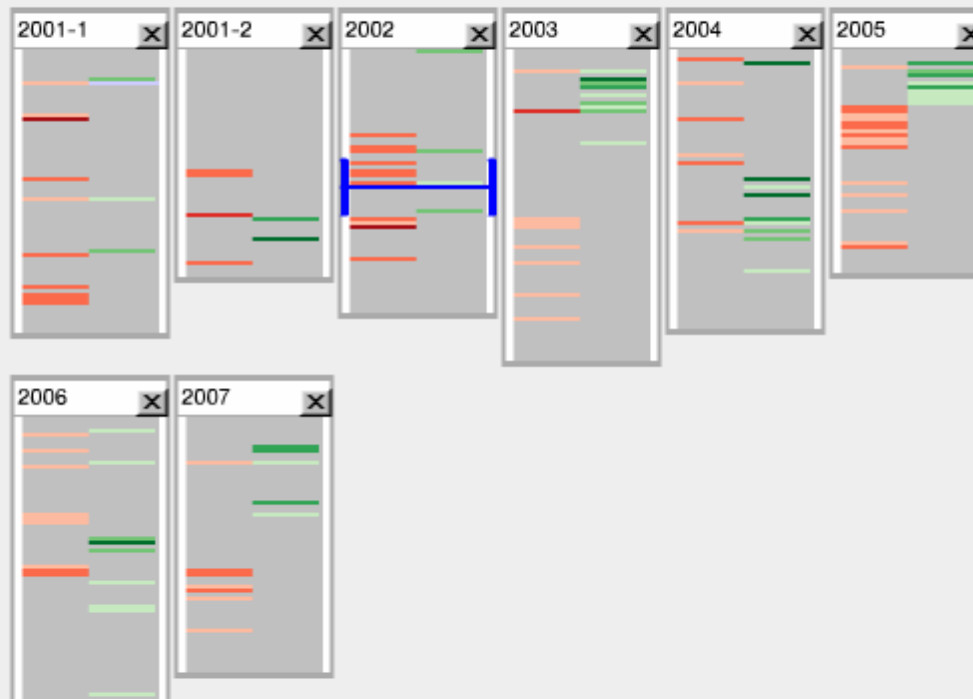
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


Sections Overview

reset



Legend

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security economy

Document View

Show

- ☒ Selection and context
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likely saved nearly 200 lives. And tonight we welcome and thank flight attendants Hermis Moutardier and Christina Jones. (Applause.)

33

Once we have funded our national **security** and our homeland **security**, the final great priority of my budget is economic **security** for the American people. (Applause.) To achieve these great national objectives -- to win the war, protect the homeland, and revitalize our **economy** -- our budget will run a deficit that will be small and short-term, so long as Congress restrains spending and acts in a fiscally responsible manner. (Applause.) We have clear priorities and we must act at home with the same purpose and resolve we have shown overseas: We'll prevail in the war, and we will defeat this recession. (Applause.)

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Americans who have lost their jobs need our help and I support extending unemployment benefits and direct assistance for health care coverage. (Applause.) Yet, American workers want more than unemployment checks -- they want a steady paycheck. (Applause.) When America works, America prospers, so my economic **security** plan can be summed up in one word: jobs. (Applause.)

35



Frequent Patterns



Filtering

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Search patterns

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- 84 nation
- 78 american
- 77 tonight
- 77 americans
- ✓75 security
- 74 congress
- 68 government
- 65 make
- 64 years
- 62 work
- 60 freedom
- 57 great
- 56 united
- 54 good
- 53 citizens
- 53 children
- 52 time
- 52 terrorists
- 51 states
- ✓50 economy
- 50 terror

previous 100

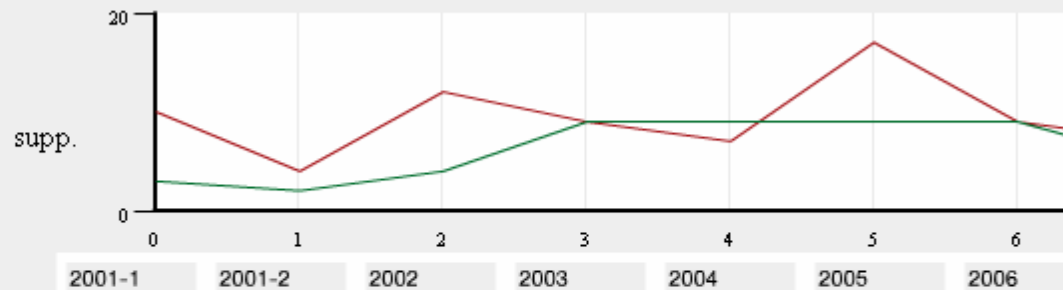
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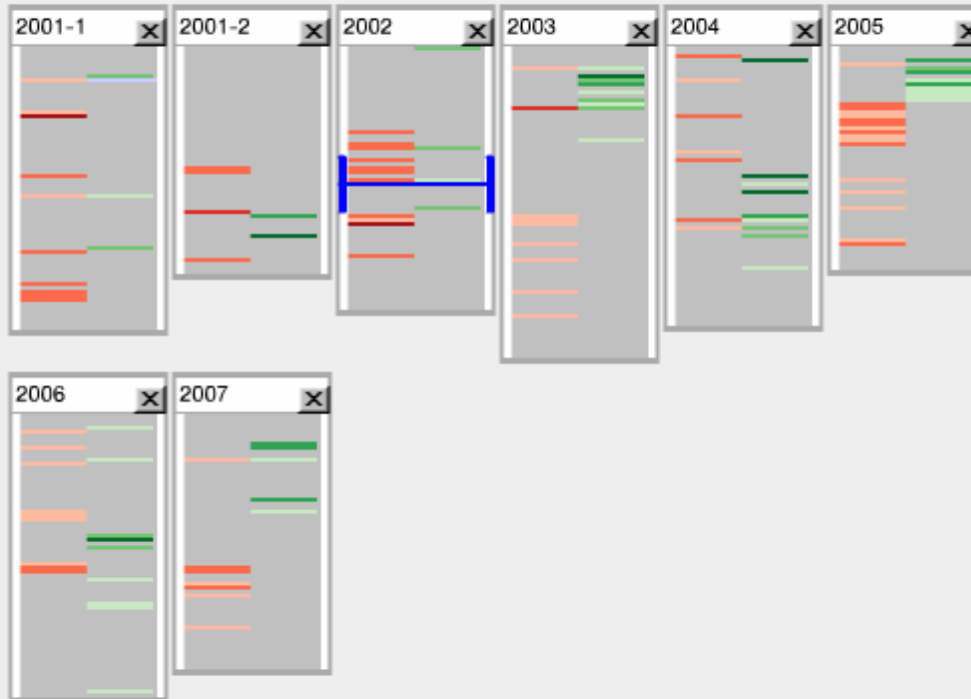
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Legend

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Frequent Patterns

Filtering

Pattern contains : security

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(security)' (18)

- ✓75 security
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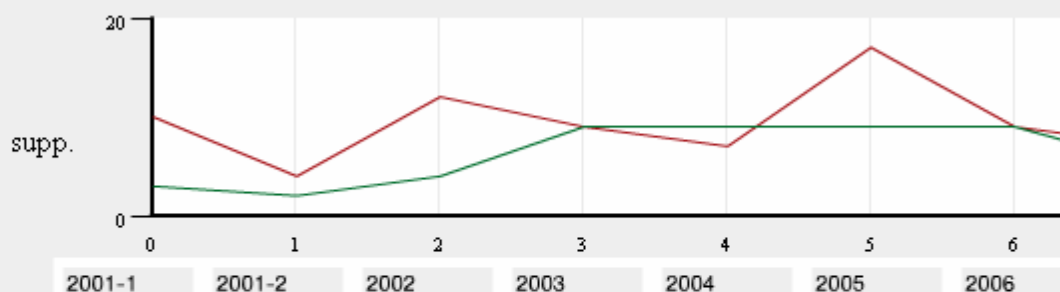
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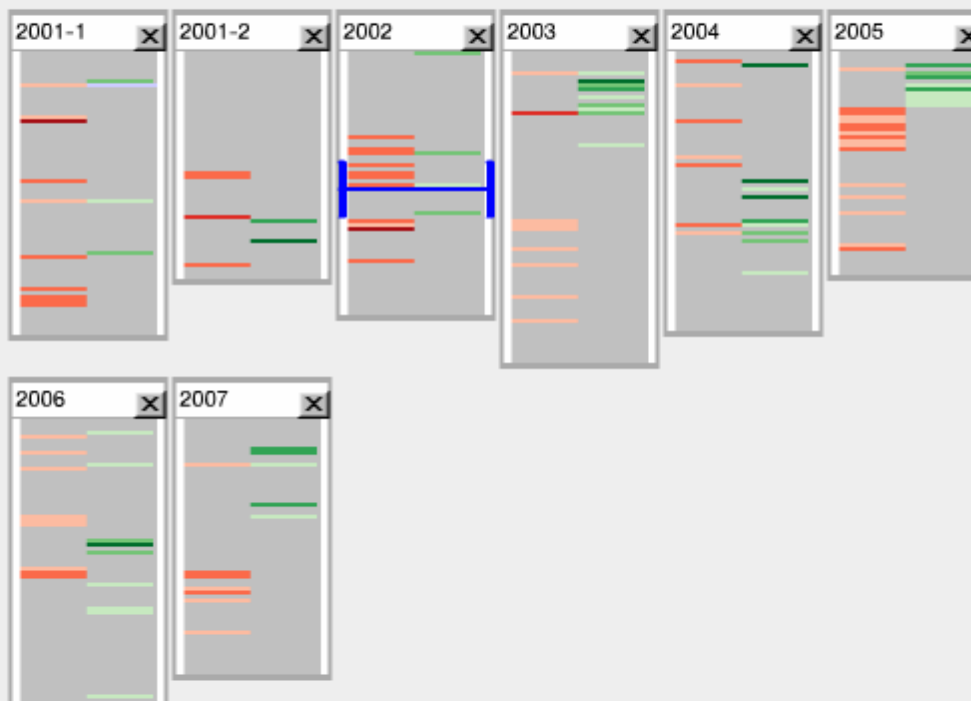
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



Sections Overview

reset



Legend

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security economy

Document View

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
Frequent Patterns



Filtering

Pattern contains : security

Search patterns

Order patterns by

Frequency :  

Length :  

Trends :



Trends per section :



☒ Append pattern to legend

Patterns with
'text:(security)' (18)

- ✓75 security
- 6 of social security
- 6 social security bene
- 6 social security and
- 5 the security of
- 4 social security appl
- 4 the social security
- 3 save social security
- 3 save social security
- 3 security of our
- 3 the security of sec
- 3 freedom and securi
- 3 of homeland securi
- 3 social security, mo
- 3 and social security
- 3 security and medic
- 3 and medicare and :
- 3 for social security

previous 100

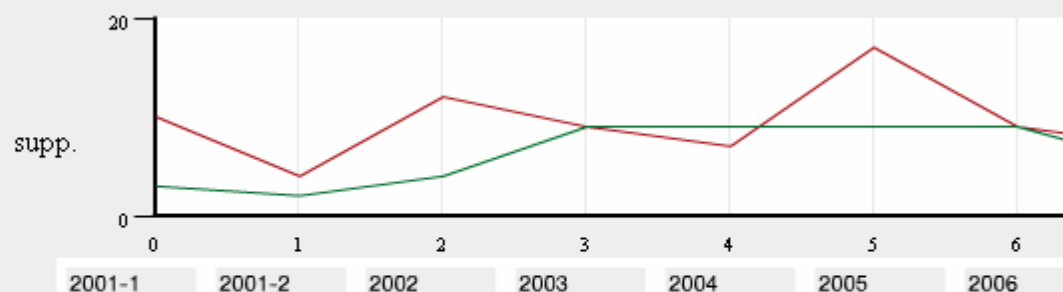
next 100

Load history

go

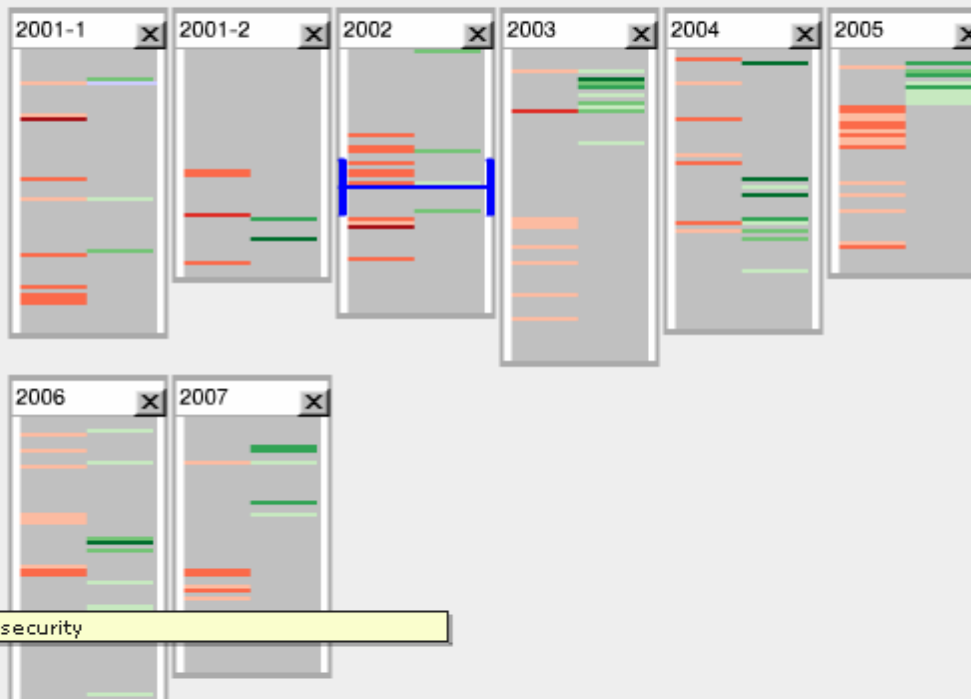
HCIL, University of Maryland, 2007

Collection Overview : 'The State of the Union' (1 doc per line - 117 high






Sections Overview

reset



Legend

-  +  + 
security economy

Document View

Show ☒ Selection and context
☐ Results only

likely saved nearly 200 lives. And tonight we welcome and thank flight attendants Hermis Moutardier and Christina Jones. (Applause.)

33

Once we have funded our national **security** and our homeland **security**, the final great priority of my budget is economic **security** for the American people. (Applause.) To achieve these great national objectives -- to win the war, protect the homeland, and revitalize our **economy** -- our budget will run a deficit that will be small and short-term, so long as Congress restrains spending and acts in a fiscally responsible manner. (Applause.) We have clear priorities and we must act at home with the same purpose and resolve we have shown overseas: We'll prevail in the war, and we will defeat this recession. (Applause.)

34

Americans who have lost their jobs need our help and I support extending unemployment benefits and direct assistance for health care coverage. (Applause.) Yet, American workers want more than unemployment checks -- they want a steady paycheck. (Applause.) When America works, America prospers, so my economic **security** plan can be summed up in one word: jobs. (Applause.)

35





Frequent Patterns

Filtering

Pattern contains : security

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(security)' (18)

- ✓75 security
- 6 of social security
- 6 social security bene
- 6 social security and
- 5 the security of
- 4 social security appl
- 4 the social security
- 3 save social security
- 3 save social security
- 3 security of our
- 3 the security of secu
- 3 freedom and securi
- 3 of homeland securi
- 3 social security med
- 3 and social security
- 3 secu social security medicare
- 3 and medicare and s
- 3 for social security

previous 100

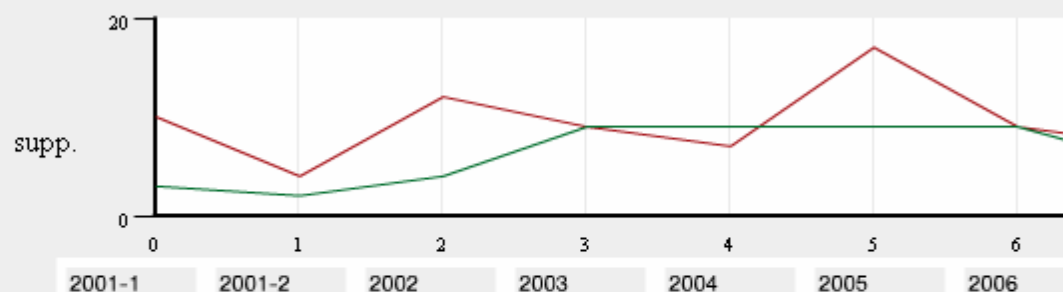
next 100

Load history

go

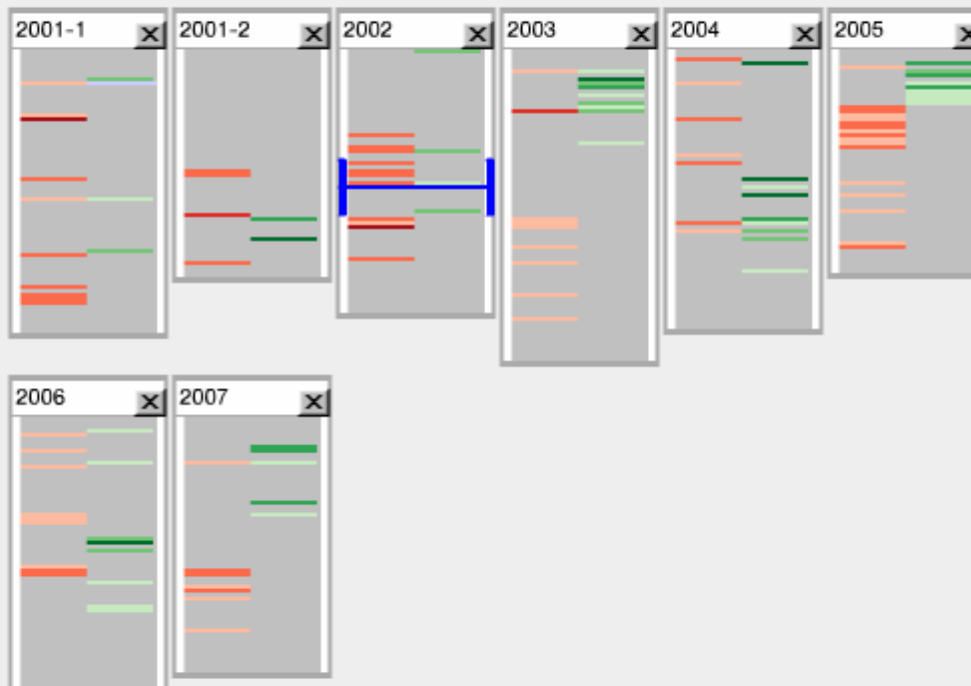
HCIL, University of Maryland, 2007

Collection Overview : 'The State of the Union' (1 doc per line - 117 high









Sections Overview

reset



Legend

-  +  +   +  + 

security economy

Document View

Show

- ☒ Selection and context
☐ Results only

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Frequent Patterns

Filtering

Pattern contains : weapons

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☐ Append pattern to legendPatterns with
'text:(weapons)' (6)

- ✓ 37 weapons
- 14 weapons of mass
- ✓ 12 weapons of mass o
- 3 weapons of mass o
- 3 weapons of mass th
- 3 of mass destruction

previous 100

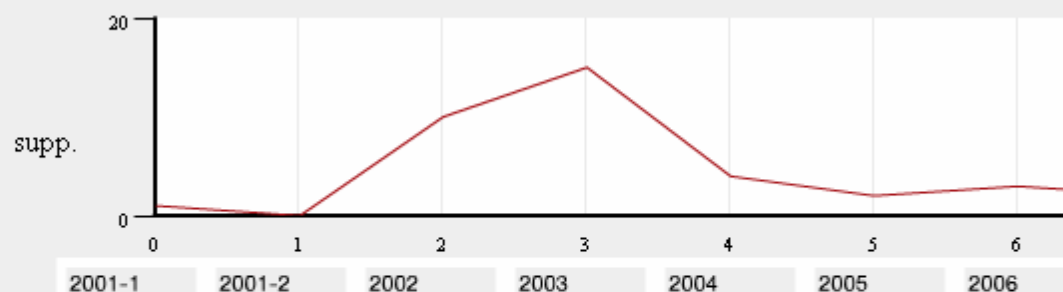
next 100

Load history

go

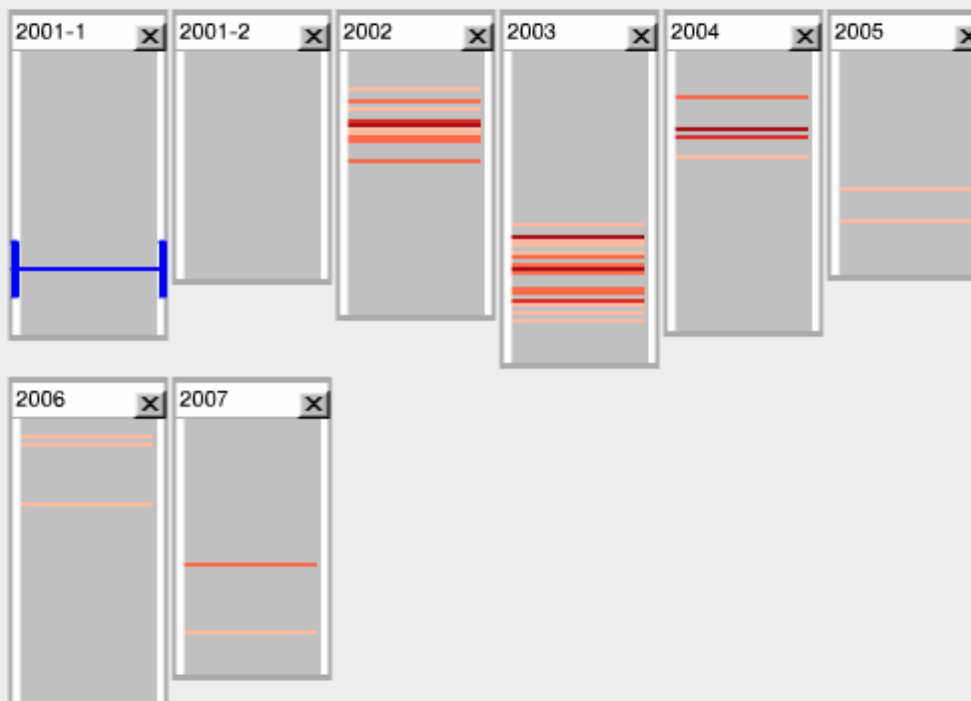
HCIL, University of Maryland, 2007

Collection Overview : 'The State of the Union' (1 doc per line - 37 highlights)



Sections Overview

reset



Legend

 - + 
weapons

Document View

Show

- ☒ Selection and context
- ☐ Results only

we will work with our allies and friends to be a force for good and a champion of freedom. We will work for free markets, free trade and freedom from oppression. Nations making progress toward freedom will find America is their friend. We will promote our values. We will promote the peace. And we need a strong military to keep the peace.

53

But our military was shaped to confront the challenges of the past. So I've asked the Secretary of Defense to review America's Armed Forces and prepare to transform them to meet emerging threats. My budget makes a down payment on the research and development that will be required. Yet, in our broader transformation effort, we must put strategy first, then spending. Our defense vision will drive our defense budget, not the other way around. (Applause.)

54

Our nation also needs a clear strategy to confront the threats of the 21st century -- threats that are more widespread and less certain. They range from terrorists who threaten with bombs to tyrants in rogue nations intent upon developing **weapons** of mass destruction. To protect our own people, our allies and friends, we must develop and we must deploy effective missile defenses. (Applause.)

55





Frequent Patterns

Filtering

Pattern contains : weapons

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

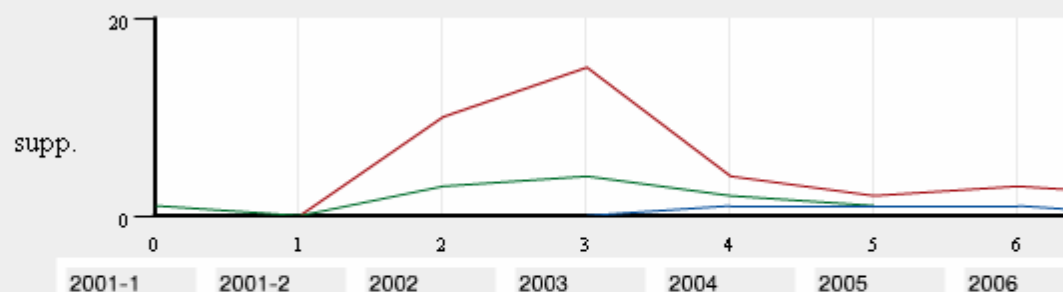
☒ Append pattern to legendPatterns with
'text:(weapons)' (6)

- ✓37 weapons
- 14 weapons of mass
- ✓12 weapons of mass o
- ✓3 weapons of mass o
- 3 weapons of mass of mass destruction
- 3 of m

Example :

weapons of mass destruction. Some of these regimes have been pretty quiet since September the 11th. But we know their true nature. North Korea is a regime arming with missiles and **weapons of mass destruction**, while starving its citizens.

Collection Overview : 'The State of the Union' (1 doc per line - 37 highlights)



Sections Overview

reset



Legend

-  +  +  +   

weapons weapons of mas weapons of mas

Document View

Show

- ☒ Selection and context
- ☐ Results only

champion of freedom. We will work for free markets, free trade and freedom from oppression. Nations making progress toward freedom will find America is their friend. We will promote our values. We will promote the peace. And we need a strong military to keep the peace.

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55

previous 100

next 100

Load history

go





Frequent Patterns

Filtering

Pattern contains : weapons

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



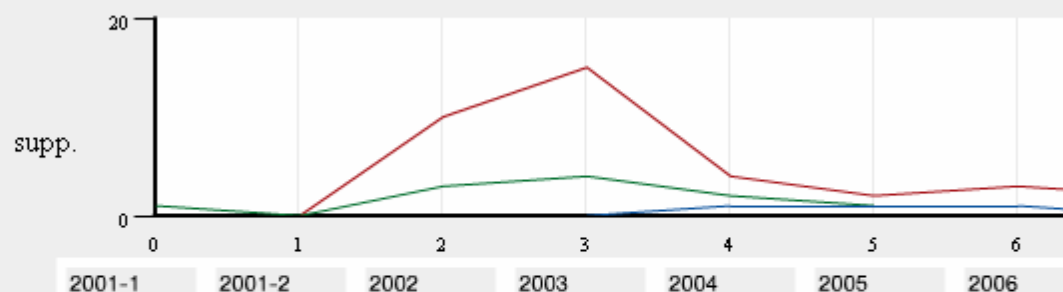
Trends per section :

☒ Append pattern to legendPatterns with
'text:(weapons)' (6)

- ✓37 weapons
- 14 weapons of mass
- ✓12 weapons of mass o
- ✓3 weapons of mass o
- 3 weapons of mass th
- 3 of mass weapons of mass of mass murder

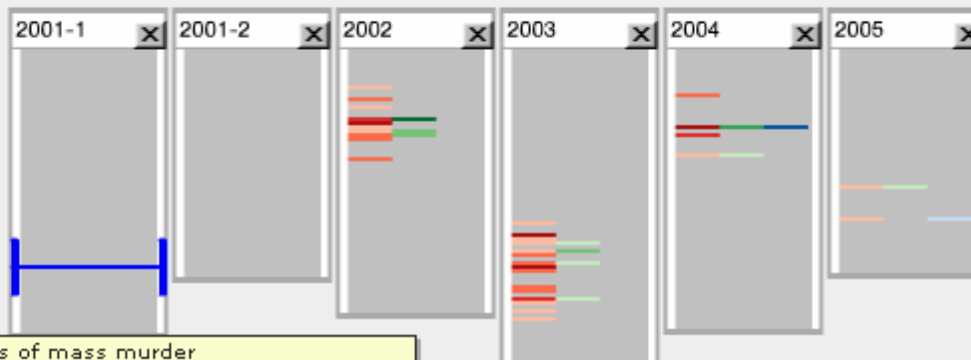
Example :
weapons of mass destruction programs, including a uranium enrichment project for nuclear weapons. Colonel Qadhafi correctly judged that his country would be better off and far more secure without **weapons of mass murder**. (Applause.)

Collection Overview : 'The State of the Union' (1 doc per line - 37 highlights)



Sections Overview

reset



Legend

-  +  +  +   
weapons weapons of mas weapons of mas

Document View

Show ☒ Selection and context
☐ Results only

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previous 100

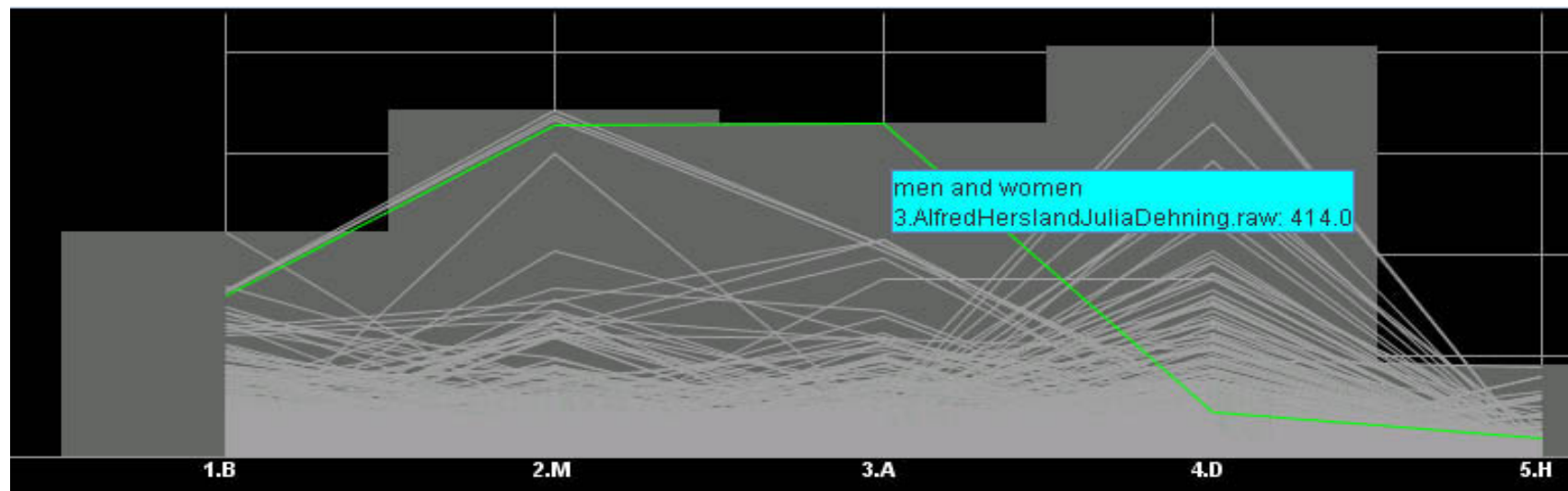
next 100

Load history

go

Trends in distributions

- Given a set of distributions

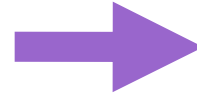


How to select 'interesting' ones ?

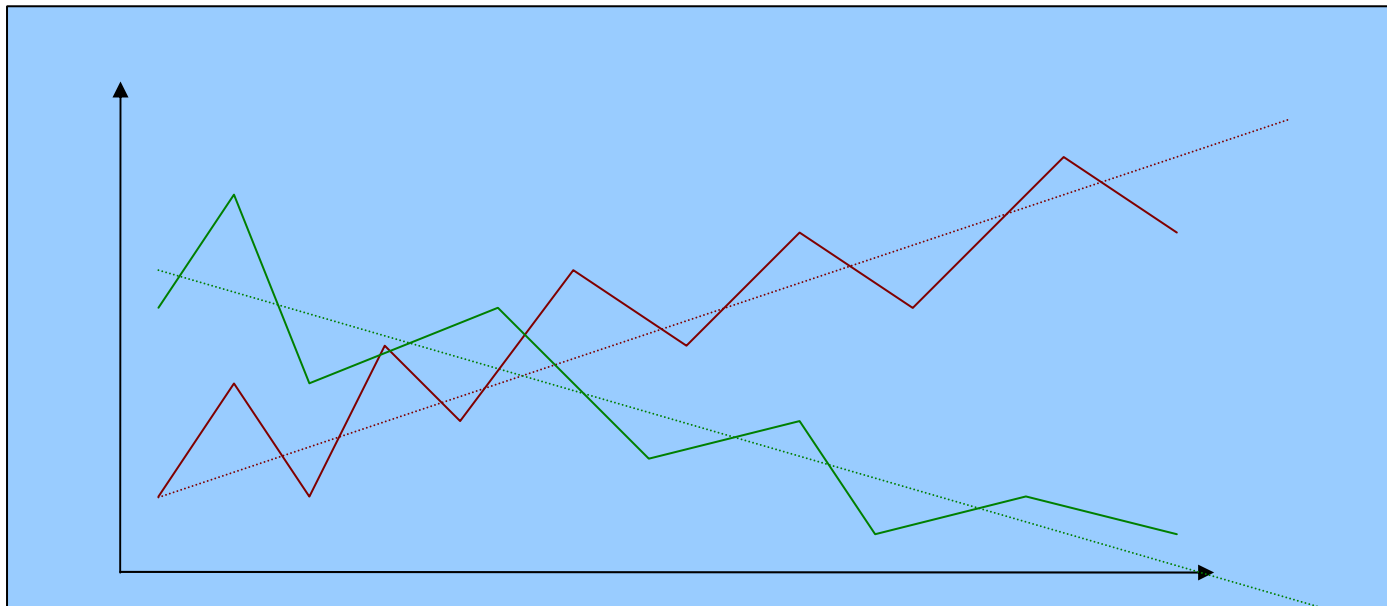
Trends in distributions

- Define metrics on distributions and rank features accordingly

– *increase/decrease*

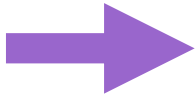


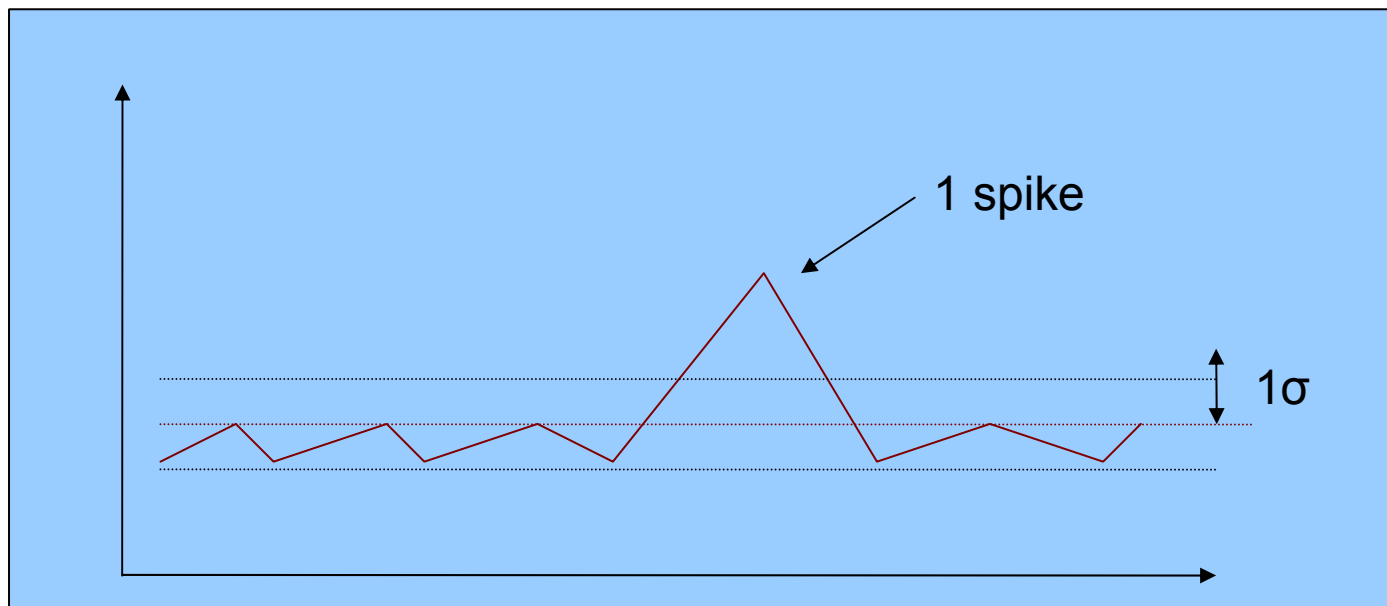
topics evolution



Trends in distributions

- Define metrics on distributions and rank features accordingly

– *spikes/sinks*  *specific events*



Frequent Patterns

Filtering

Pattern contains :

Search patterns

Order patterns by

Frequency :

Length :

Trends :



Trends per section :



☐ Append pattern to legend

Patterns with spikes (100 patterns - page 1/30)

313	applause
192	america
131	people
16	hussein
16	saddam
31	law
75	security
11	hopeful
101	world
24	lead
8	that saddam hussei
55	good
29	social
56	united
37	weapons
29	jobs
78	american
99	country
84	nation

previous 100

next 100

Load history

go

HCIL, University of Maryland, 2007

Collection Overview : 'The State of the Union' (1 doc per line - 0 highlight)

supp.



2001-1

2001-2

2002

2003

2004

2005

2006

Sections Overview

reset

2001-1

2001-2

2002

2003

2004

2005

2006

2007

Legend

Document View

Show

- ☒ Selection and context
☐ Results only

Frequent Patterns

Filtering

Pattern contains :

Order patterns by

Frequency : ☐ ☐Length : ☐ ☐

Trends :

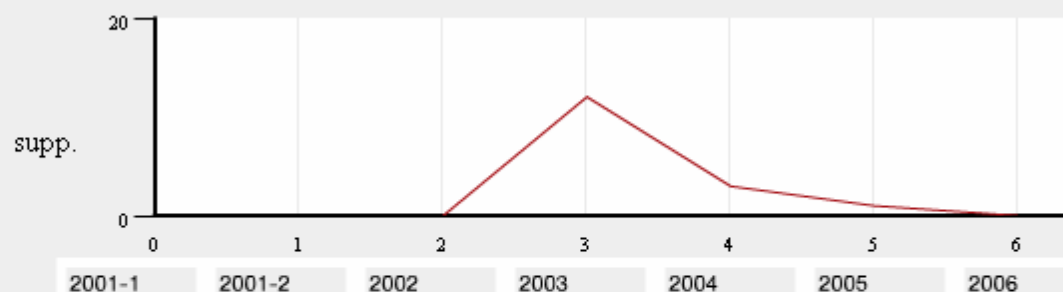


Trends per section :

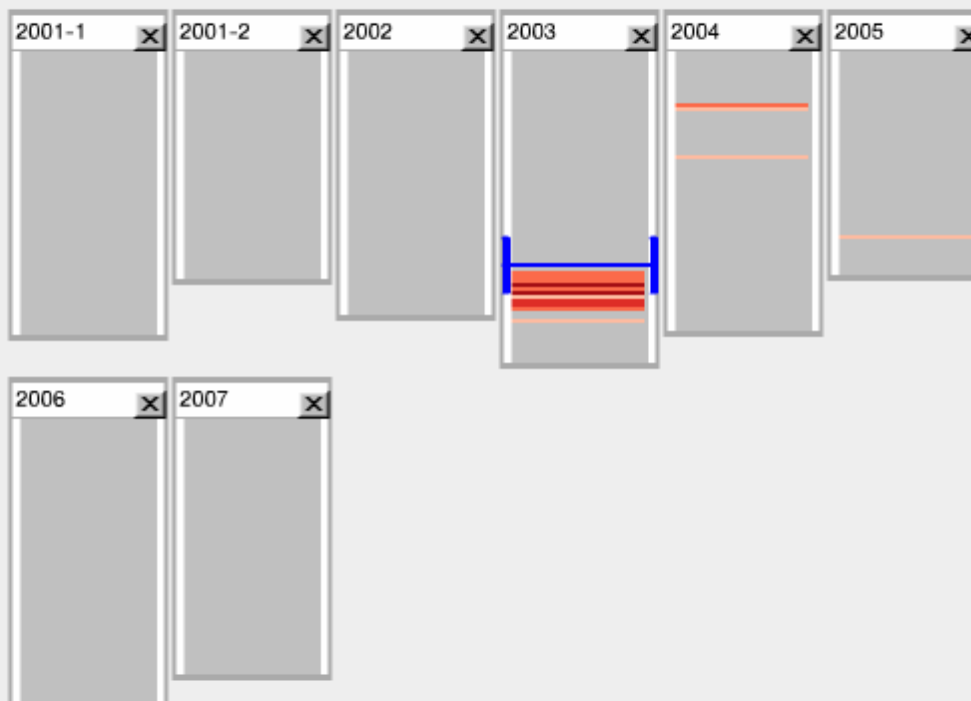
☐ Append pattern to legendPatterns with spikes (100
patterns - page 1/30)

313	applause
192	america
131	people
✓16	hussein
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31	law
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37	weapons
29	jobs
78	american
99	country
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Collection Overview : 'The State of the Union' (1 doc per line - 16 highlig



Sections Overview



Legend

-  +
hussein

Document View

Show

- ☒ Selection and context
☐ Results only

when it turns away from its nuclear ambitions.

52

Our Nation and the world must learn the lessons of the Korean peninsula, and not allow an even greater threat to rise up in Iraq. A brutal dictator, with a history of reckless aggression...with ties to terrorism...with great potential wealth...will not be permitted to dominate a vital region and threaten the United States.

53

Twelve years ago, Saddam Hussein faced the prospect of being the last casualty in a war he had started and lost. To spare himself, he agreed to disarm of all weapons of mass destruction. For the next 12 years, he systematically violated that agreement. He pursued chemical, biological, and nuclear weapons even while inspectors were in his country. Nothing to date has restrained him from his pursuit of these weapons - not economic sanctions, not isolation from the civilized world, not even cruise missile strikes on his military facilities. Almost three months ago, the United Nations Security Council gave Saddam Hussein his final chance to disarm. He has shown instead his utter contempt for the United Nations, and for the opinion of the world.

54

Frequent Patterns

Filtering

Pattern contains :

Order patterns by

Frequency : ☐ ☐Length : ☐ ☐

Trends :



Trends per section :

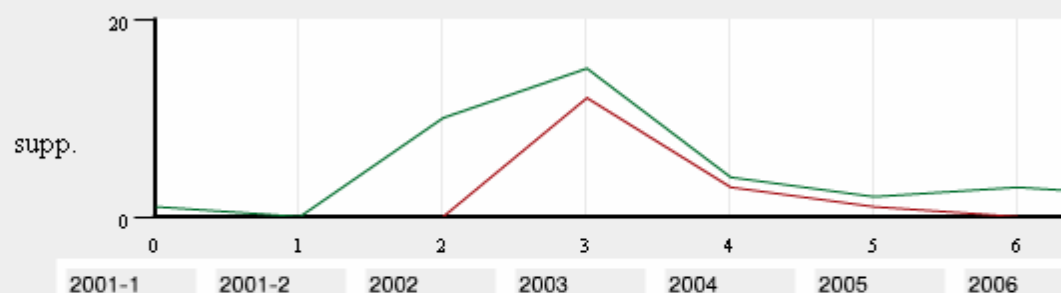
☒ Append pattern to legendPatterns with spikes (100
patterns - page 1/30)

313	applause
192	america
131	people
✓16	hussein
16	saddam
31	law
75	security
11	hopeful
101	world
24	lead
8	that saddam hussei
55	good
29	social
56	united
✓37	weapons
29	jobs
78	american
99	country
84	nation

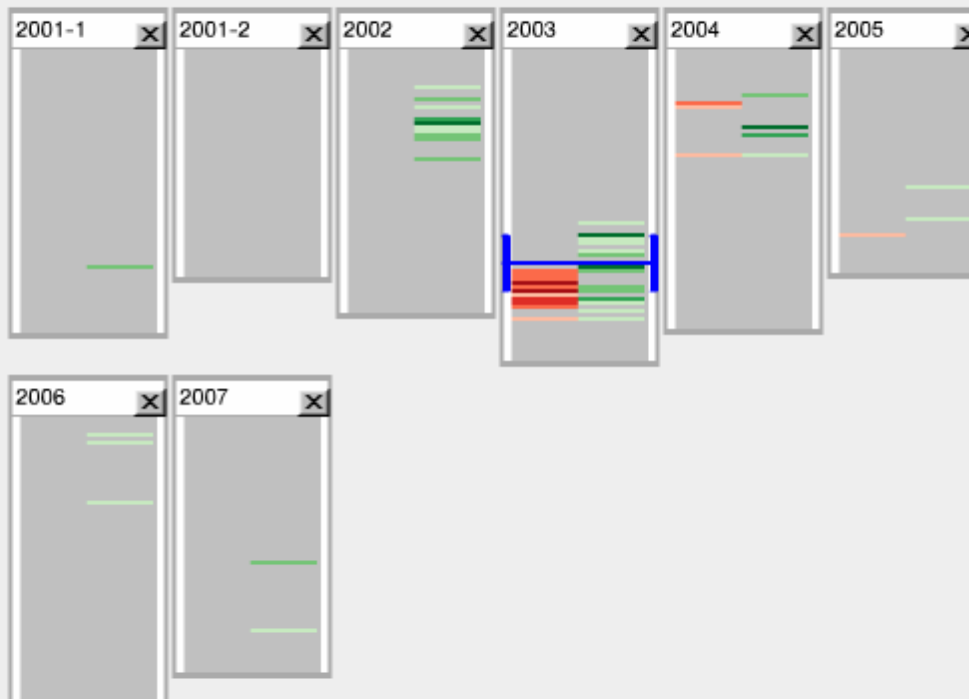
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Collection Overview : 'The State of the Union' (1 doc per line - 45 highlig

Document View



Sections Overview



Legend

- +

hussein weapons

Show ☒ Selection and context
☐ Results only

ambitions.

52

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



54

Frequent Patterns

Filtering

Pattern contains :

Order patterns by

Frequency :  Length :  

Trends :

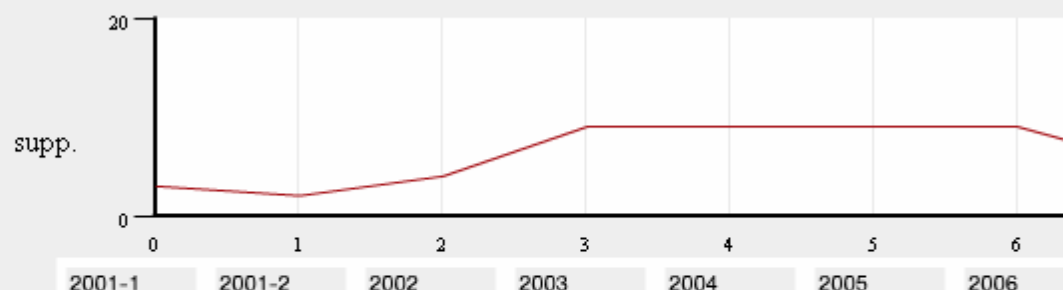


Trends per section :

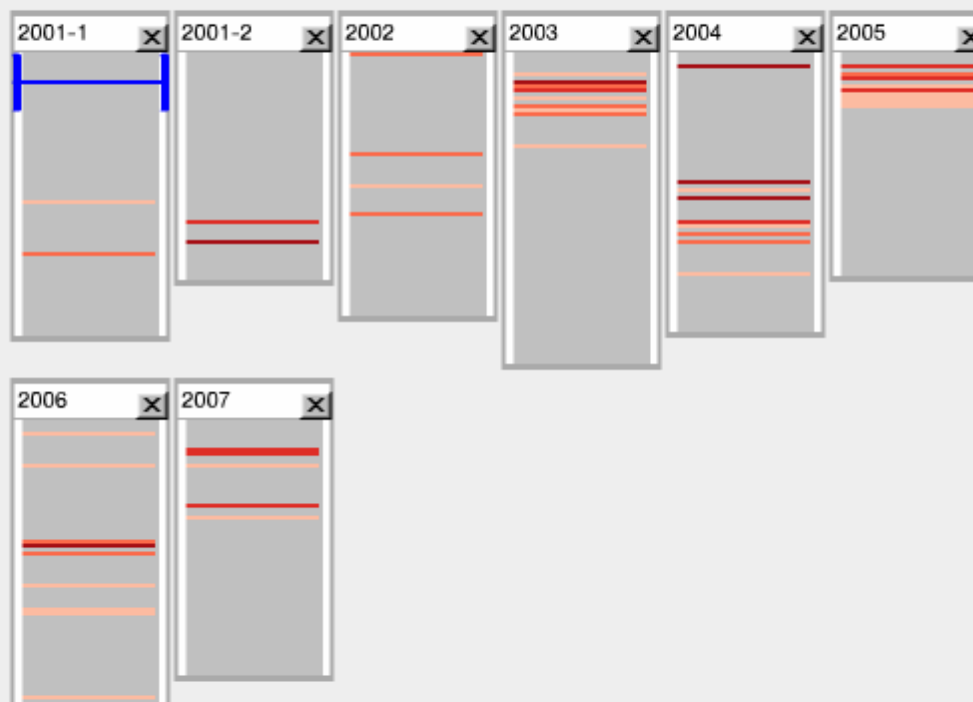
☐ Append pattern to legendPatterns by increase (100
patterns - page 1/18)

44	iraq
74	congress
192	america
313	applause
21	middle
13	requires
23	iraqi
21	east
19	build
28	goal
18	democracy
18	enemy
38	men
✓ 50	economy
56	united
131	people
32	fight
24	lead
68	government

Collection Overview : 'The State of the Union' (1 doc per line - 50 highlights)



Sections Overview



Legend

-  + 
economy

Document View

Show

- ☒ Selection and context
☐ Results only

neighbors, technology that is revolutionizing the world, and our greatest strength -- concerned citizens who care for our country and care for each other.

05

Neither picture is complete in and of itself. And tonight I challenge and invite Congress to work with me to use the resources of one picture to repaint the other; to direct the advantages of our time to solve the problems of our people. Some of these resources will come from government. Some, but not all.

06

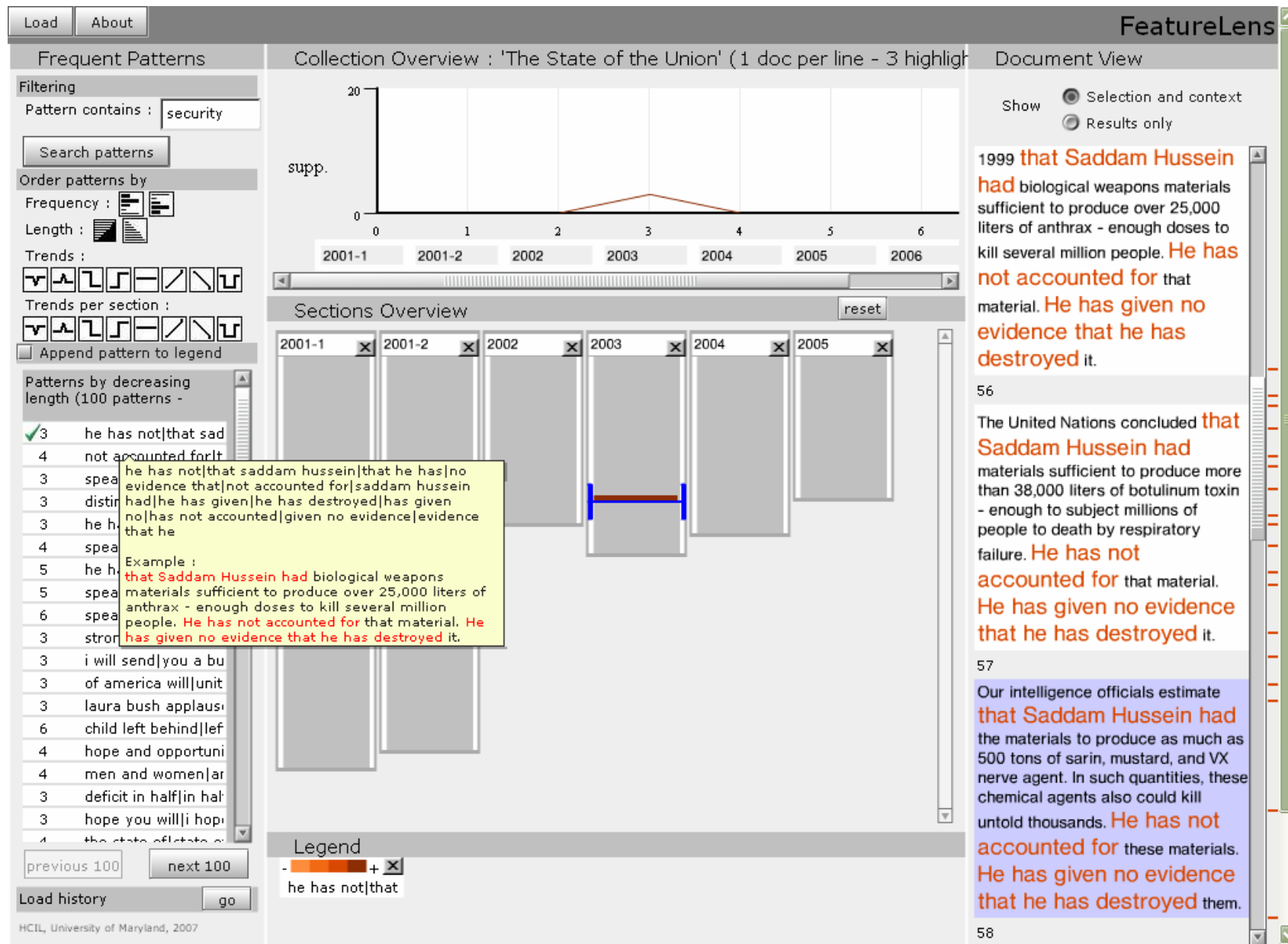
Year after year in Washington, budget debates seem to come down to an old, tired argument: on one side, those who want more government, regardless of the cost; on the other, those who want less government, regardless of the need. We should leave those arguments to the last century, and chart a different course. (Applause.)





07

















Government has a role, and an important role. Yet, too much government crowds out initiative and hard work, private charity and the private **economy**. Our new governing vision says government should be active, but limited; engaged, but not overbearing. And my budget is based on that philosophy.

08

Long patterns



Frequency :  
Length :  

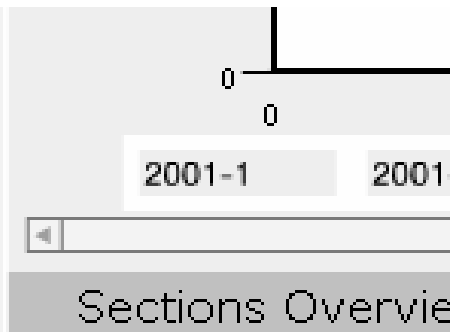
Trends :        
Trends per section :        

☐ Append pattern to legend

Patterns by decreasing length (100 patterns - page 1/31)

- ✓3 he has not|that saddam hussein
- ✓4 not accounted for|that saddam h
- 3 speaker he has not|that saddam hussein|that he has|no
- 3 distingu had|he has given|he has destroyed|has given
- 3 he has gi no|has not accounted|given no evidence|evidence
- 4 speaker that he
- 5 he has gi Example :
- 5 speaker that Saddam Hussein had biological weapons
- 6 speaker materials sufficient to produce over 25,000 liters of
- 3 stronger anthrax - enough doses to kill several million
- 3 i will send|you a budde|t|will sen people. He has not accounted for that material. He

Example :
that Saddam Hussein had biological weapons materials sufficient to produce over 25,000 liters of anthrax - enough doses to kill several million people. He has not accounted for that material. He has given no evidence that he has destroyed it.



Sections Overview	
2001-1	2001-2

55

The United Nations concluded in 1999 that Saddam Hussein had biological weapons materials sufficient to produce over 25,000 liters of anthrax - enough doses to kill several million people. He has not accounted for that material. He has given no evidence that he has destroyed it.

56

The United Nations concluded that Saddam Hussein had materials sufficient to produce more than 38,000 liters of botulinum toxin - enough to subject millions of people to death by respiratory failure. He has not accounted for that material. He has given no evidence that he has destroyed it.

57

Our intelligence officials estimate that Saddam Hussein had the materials to produce as much as 500 tons of sarin, mustard, and VX nerve agent. In such quantities, these chemical agents also could kill untold thousands. He has not accounted for these materials. He has given no evidence that he has destroyed them.

58

U.S. intelligence indicates that Saddam Hussein had upwards of 30,000 munitions capable of delivering chemical agents. Inspectors recently turned up 16 of them, despite Iraq's recent declaration denying their existence. Saddam Hussein has not accounted for the remaining 29,984 of these prohibited munitions. He has given no evidence that he has destroyed them.

59

From three Iraqi defectors we know that Iraq, in the late 1990s, had several mobile biological weapons labs. These are designed to produce germ warfare

- n-grams (n consecutive words)

exact 10-gram

Doc 1

My fellow citizens,I will improve security in our country

Doc 2

My fellow citizens,I will improve security in our country

Doc 3

My fellow citizens,I will improve security in our country

Catches exact matches

- Frequent sets of small n-grams

Pattern of four 3-grams

fellow citizens I / citizens I will / I will improve / in our country

Doc 1

My fellow citizens,I will improve social welfare in our country





Doc 2

















My fellow citizens,I will improve medical aid in our country

Doc 3

Dear fellow citizens,I will improve security in our country

Catches “fuzzier” matches

Frequency :  
Length :  

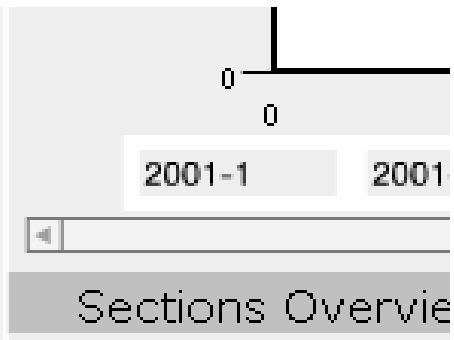
Trends :        
Trends per section :        

☐ Append pattern to legend

Patterns by decreasing length (100 patterns - page 1/31)

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- 3 he has gi no|has not accounted|given no evidence|evidence
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Evaluation strategy

- **Ongoing longitudinal case study**
 - Tanya Clement and « *The Making of Americans* »
- **Pilot user study with 8 users**
 - 3 tasks then free exploration (30 min)
 - think aloud protocol - gather insights about text and + functionality used
 - User rated insights found for interest (1-5 scale).





Frequent Patterns

Filtering

Pattern contains : children

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(children)' (100)

- ☒ 524 children
- 55 the hersland childre
- 45 the three children
- 31 three hersland chilc
- 31 three hersland chilc
- 29 of the hersland the
- 26 of the three three h
- 26 of the three three h
- 25 of the children
- 24 to his children
- 22 the children and
- 21 children and the
- 21 of his children
- 21 of the three the thr
- 20 and the children
- 19 and her children
- 19 all three of the hers
- 19 living in the the her
- 18 his children and

previous 100

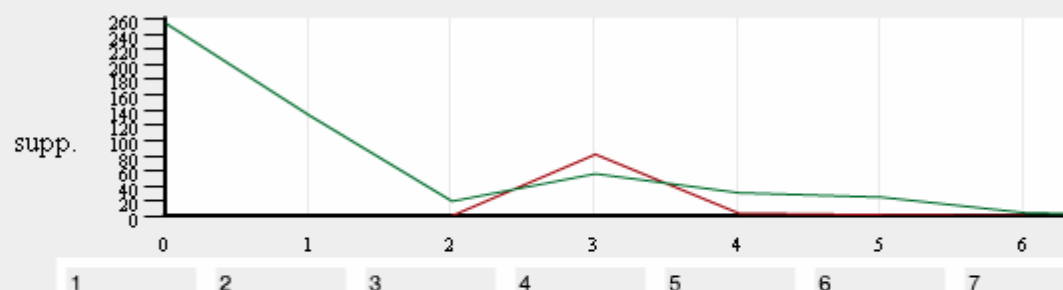
next 100

Load history

go

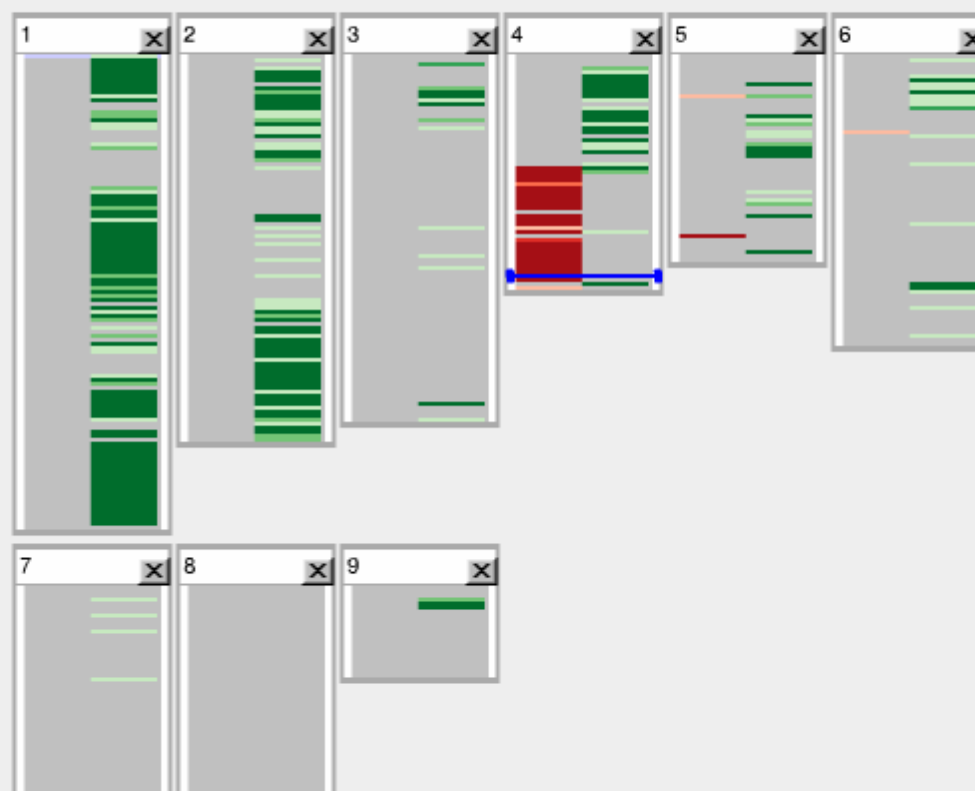
HCIL, University of Maryland, 2007

Collection Overview : 'The Making of Americans' (5 doc per line - 263 h




Sections Overview

reset



Legend

-  +  + 

redfern children

Document View

Show ☒ Selection and context
☐ Results only

was working to make some women understand something and many laughed at her and always she was full of desiring and always she was never understanding in desiring. When there was the end of her living with **Redfern** her brother Alfred was just coming to his marrying Julia Dehning. Martha was then travelling and studying and then she came back to be with her father and her mother was weakening then and later she was dead and Mr.

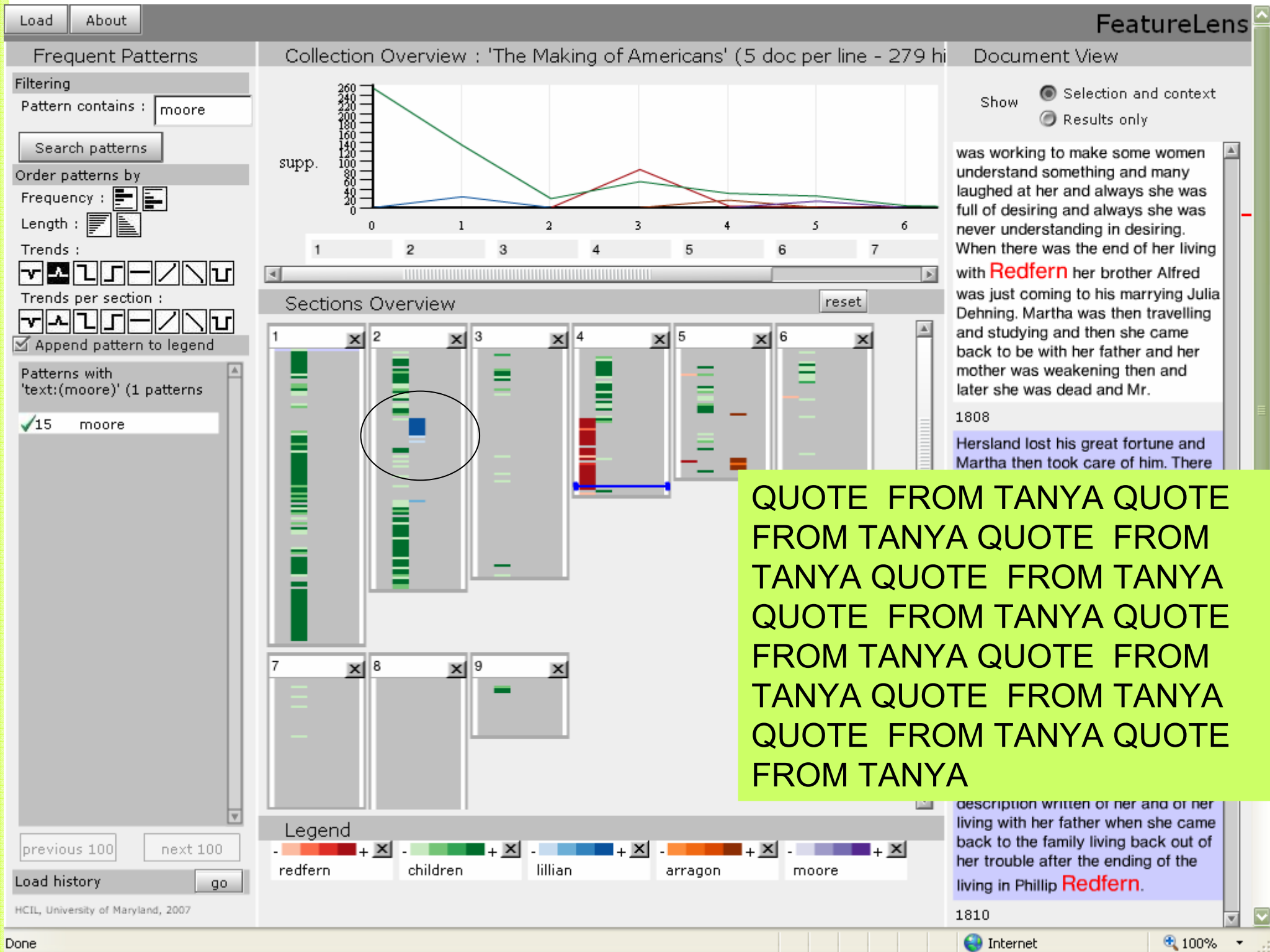
1808

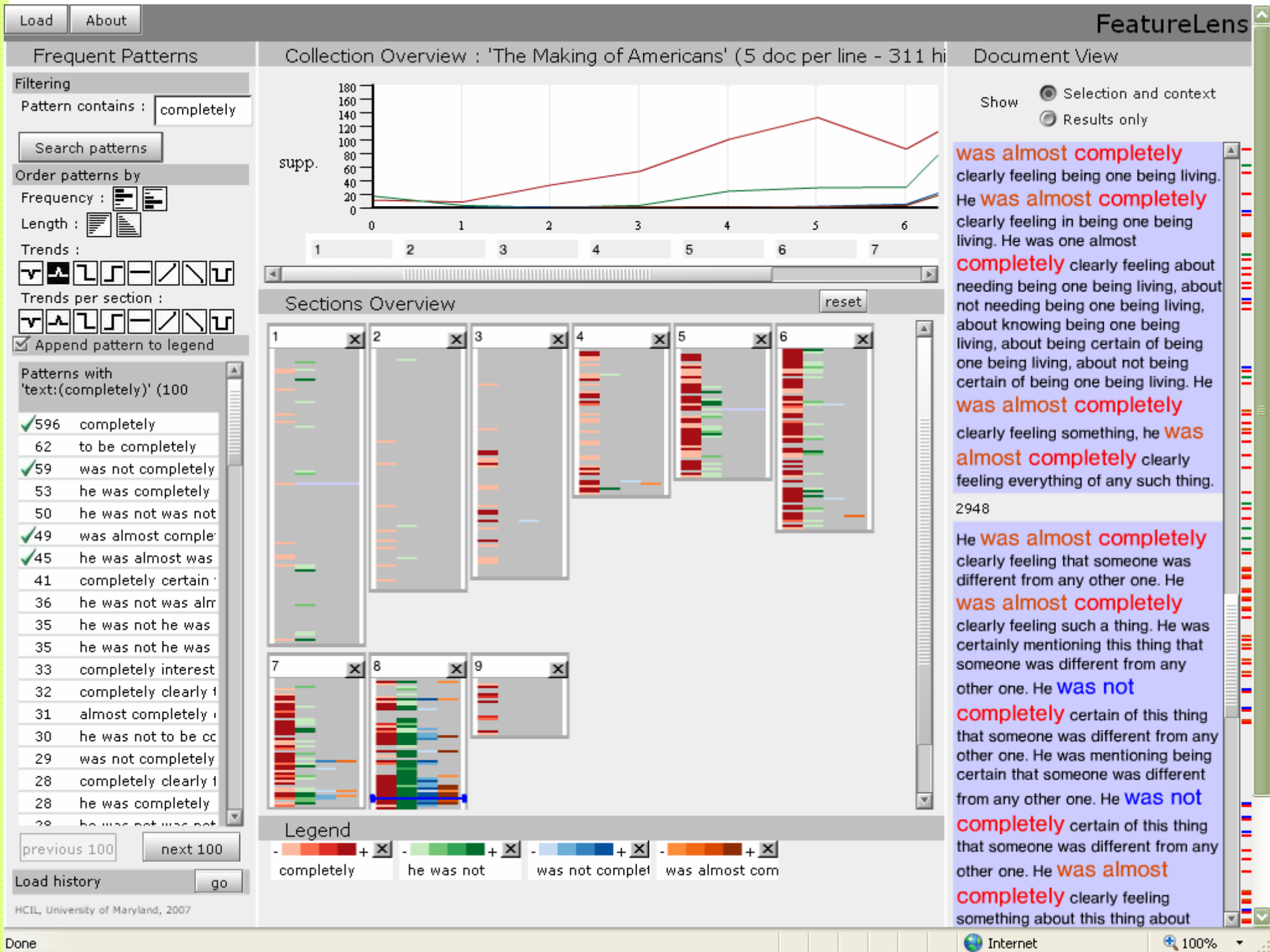
Hersland lost his great fortune and Martha then took care of him. There will be now a little more description of her and then of her with him. There will be a little more description of her written in the history of the ending of the living in her father, in the history of the later living of her brother Alfred Hersland, in the history of her brother David Hersland. More description of her will be part of the history of the ending of the existing of the Hersland family. There will be very much history of this ending of all of them of the Hersland family written later.

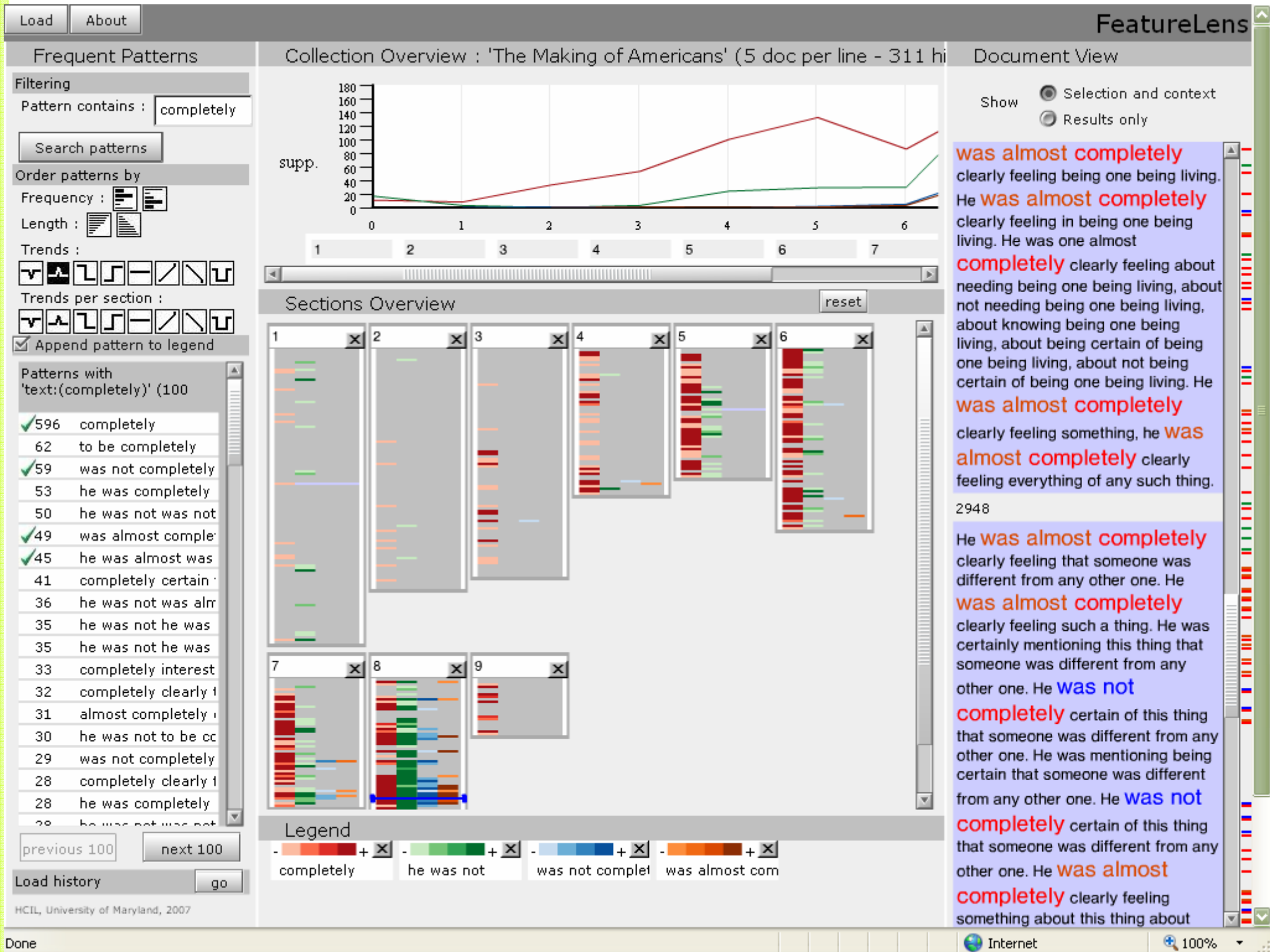
1809

There will be now a little more description written of her and of her living with her father when she came back to the family living back out of her trouble after the ending of the living in Phillip **Redfern**.

1810







Collections tested

- Making of the Americans
 - 8 sections, ~ 3000 paragraphs
- State of the union
 - 7 years of speeches
- HCIL Tech Reports
 - 20 years of lists of abstracts
- Other book: Gamer Theory

Implementation

- Open Lazlo for client user interface
 - Zero install access
- T2K (Text-to-Knowledge) for text mining
 - Thanks to Loretta Auvil's team at NSCA
 - Pre-processing
- Ruby and MySQL for the backend part
- Open Source

Questions we addressed

- **What text features are highly repeated in the text?**
 - Frequent words
 - Frequent patterns of n-grams
- **How do they change over time?**
 - Locate features in text (overview + reading)
 - Comparisons
 - Study the shape of change
 - Find features that exhibit specific shapes (e.g. spike)

Next

- **What text features are highly repeated in the text?**

- Frequent words
- Frequent patterns of n-grams

***Stemming?
Stop words?***

- **How do they change over time?**

- Locate features in text (overview + reading)
- Comparisons
- Study the shape of change
- Find features that exhibit specific shapes (e.g. spike)

***Part of speech?
Phonemes?***

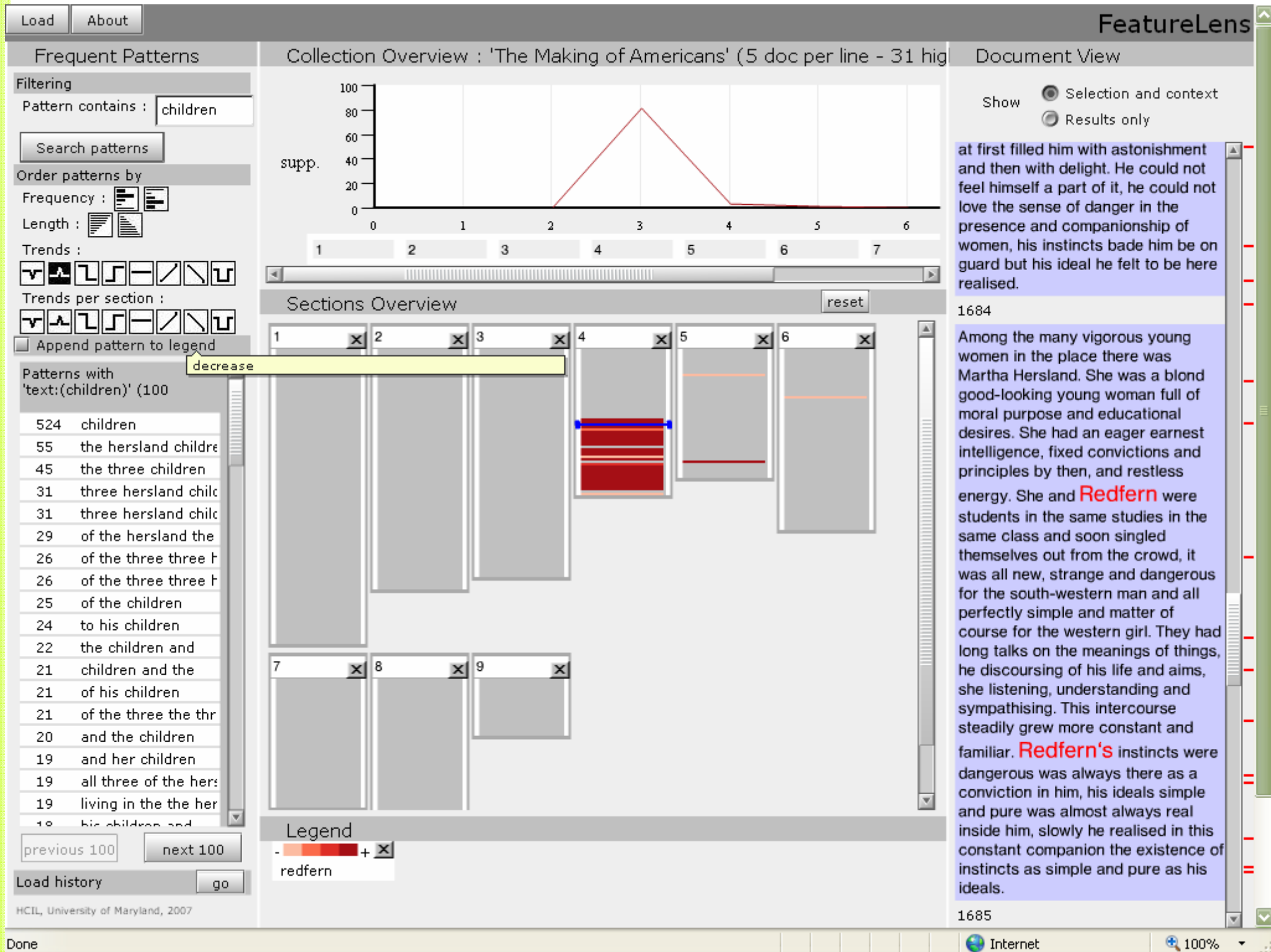
Thank you

- **Text mining results can be made easier to interpret**
- **Repeating is everywhere**
- **Technical Report HCIL 2007-08**
- **Talk to Tanya at the demo**

Anthony Don, Catherine Plaisant, Tanya Clement
Elena Zheleva, Machon Gregory, Sureyya Tarka,
Celeste Paul, Ben Shneiderman

and others from the MONK project, in particular Loretta Auvil and Matt Kirschenbaum

Support from the Andrew W. Mellon Foundation





Frequent Patterns

Filtering

Pattern contains : lillian

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with 'text:(lillian)'
(1 patterns - page 1/1)

✓23 lillian

previous 100

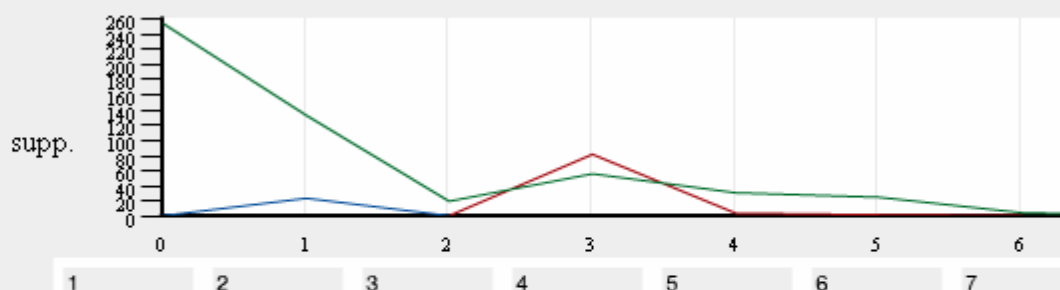
next 100

Load history

go

HCIL, University of Maryland, 2007

Collection Overview : 'The Making of Americans' (5 doc per line - 271 h)



Sections Overview

reset



Legend

-  +  + 

redfern children lillian

Document View

Show

- ☒ Selection and context
- ☐ Results only

was working to make some women understand something and many laughed at her and always she was full of desiring and always she was never understanding in desiring. When there was the end of her living with **Redfern** her brother Alfred was just coming to his marrying Julia Dehning. Martha was then travelling and studying and then she came back to be with her father and her mother was weakening then and later she was dead and Mr.

1808

Hersland lost his great fortune and Martha then took care of him. There will be now a little more description of her and then of her with him. There will be a little more description of her written in the history of the ending of the living in her father, in the history of the later living of her brother Alfred Hersland, in the history of her brother David Hersland. More description of her will be part of the history of the ending of the existing of the Hersland family. There will be very much history of this ending of all of them of the Hersland family written later.

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1810





Frequent Patterns

Filtering

Pattern contains : arragon

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(arragon)' (1 patterns)

✓16 arragon

previous 100

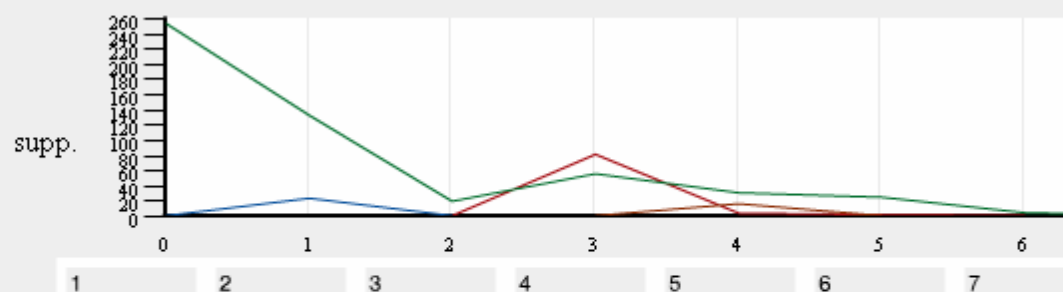
next 100

Load history

go

HCIL, University of Maryland, 2007

Collection Overview : 'The Making of Americans' (5 doc per line - 276 h)







Sections Overview

reset



Legend

-  +  -  - 

redfern children lillian arragon

Document View

Show

- ☒ Selection and context
- ☐ Results only

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1810





Frequent Patterns

Filtering

Pattern contains : moore

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(moore)' (1 patterns)

✓15 moore

previous 100

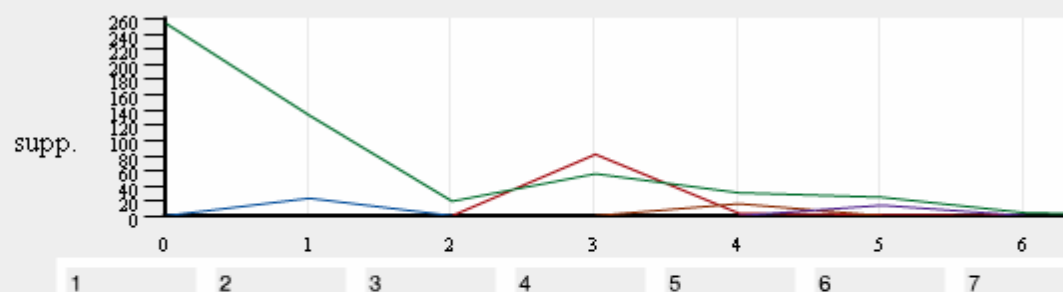
next 100

Load history

go

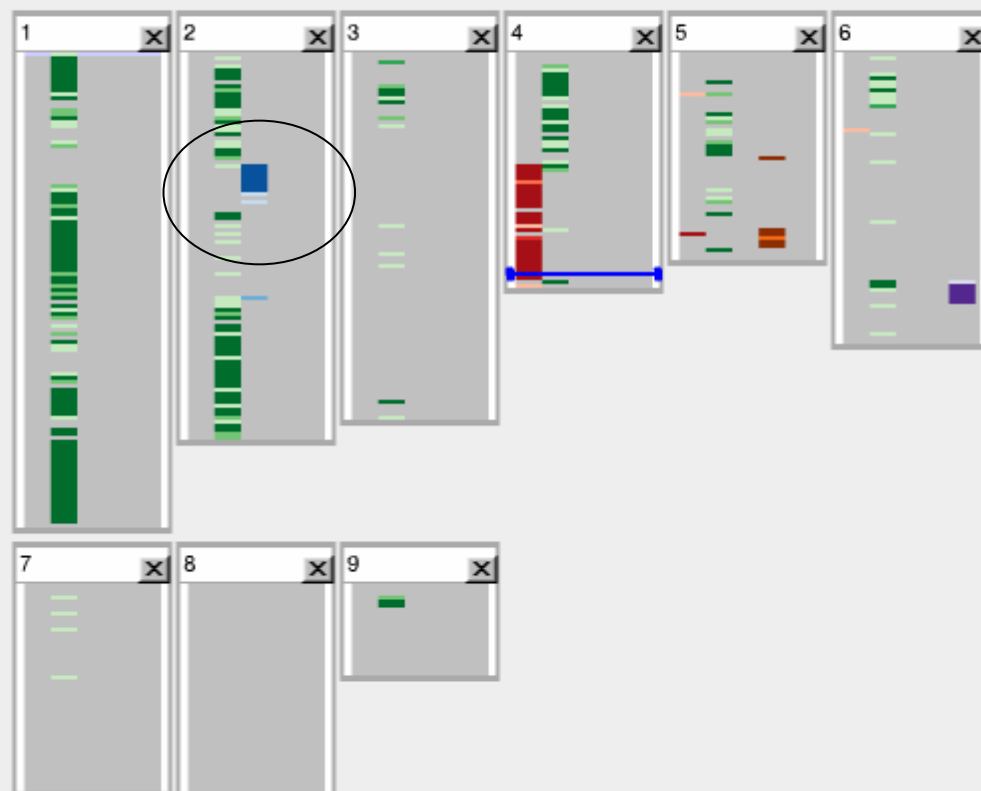
HCIL, University of Maryland, 2007

Collection Overview : 'The Making of Americans' (5 doc per line - 279 h)



Sections Overview

reset



Legend

-  +  -  +  -  +  -  +  -  + 

redfern children lillian arragon moore

Document View

Show

- ☒ Selection and context
☐ Results only

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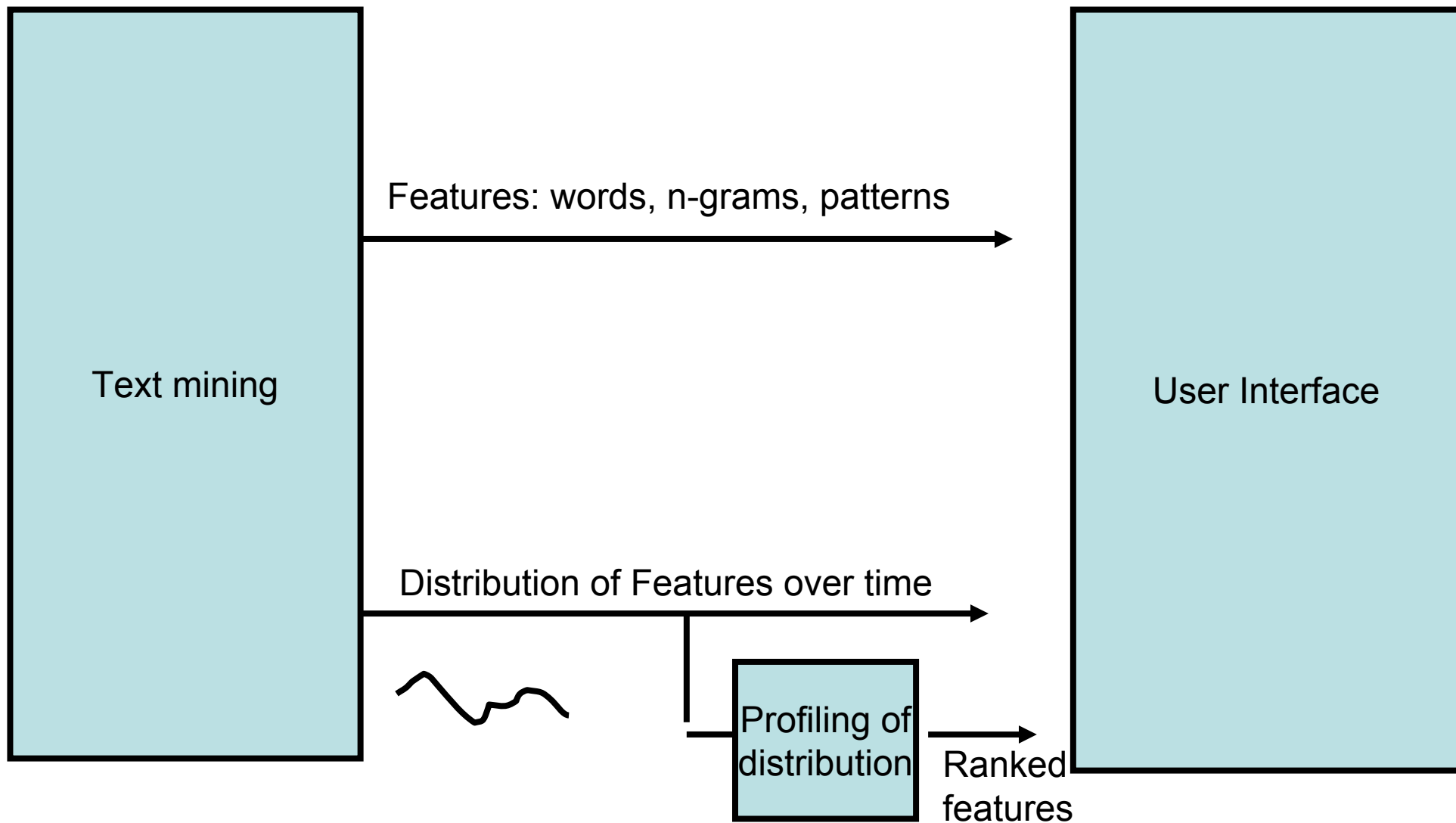
1808

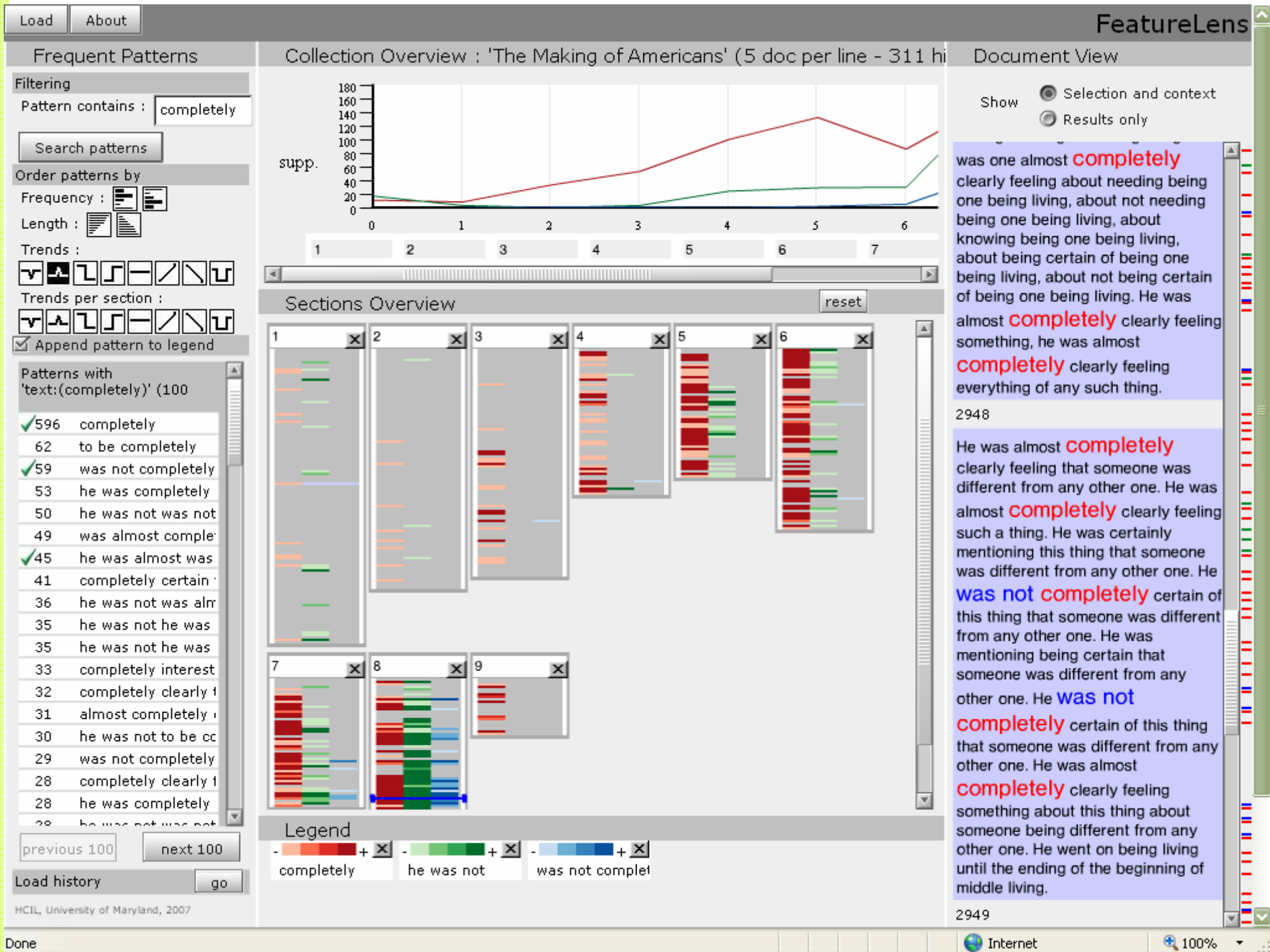
Hersland lost his great fortune and Martha then took care of him. There will be now a little more description of her and then of her with him. There will be a little more description of her written in the history of the ending of the living in her father, in the history of the later living of her brother Alfred Hersland, in the history of her brother David Hersland. More description of her will be part of the history of the ending of the existing of the Hersland family. There will be very much history of this ending of all of them of the Hersland family written later.

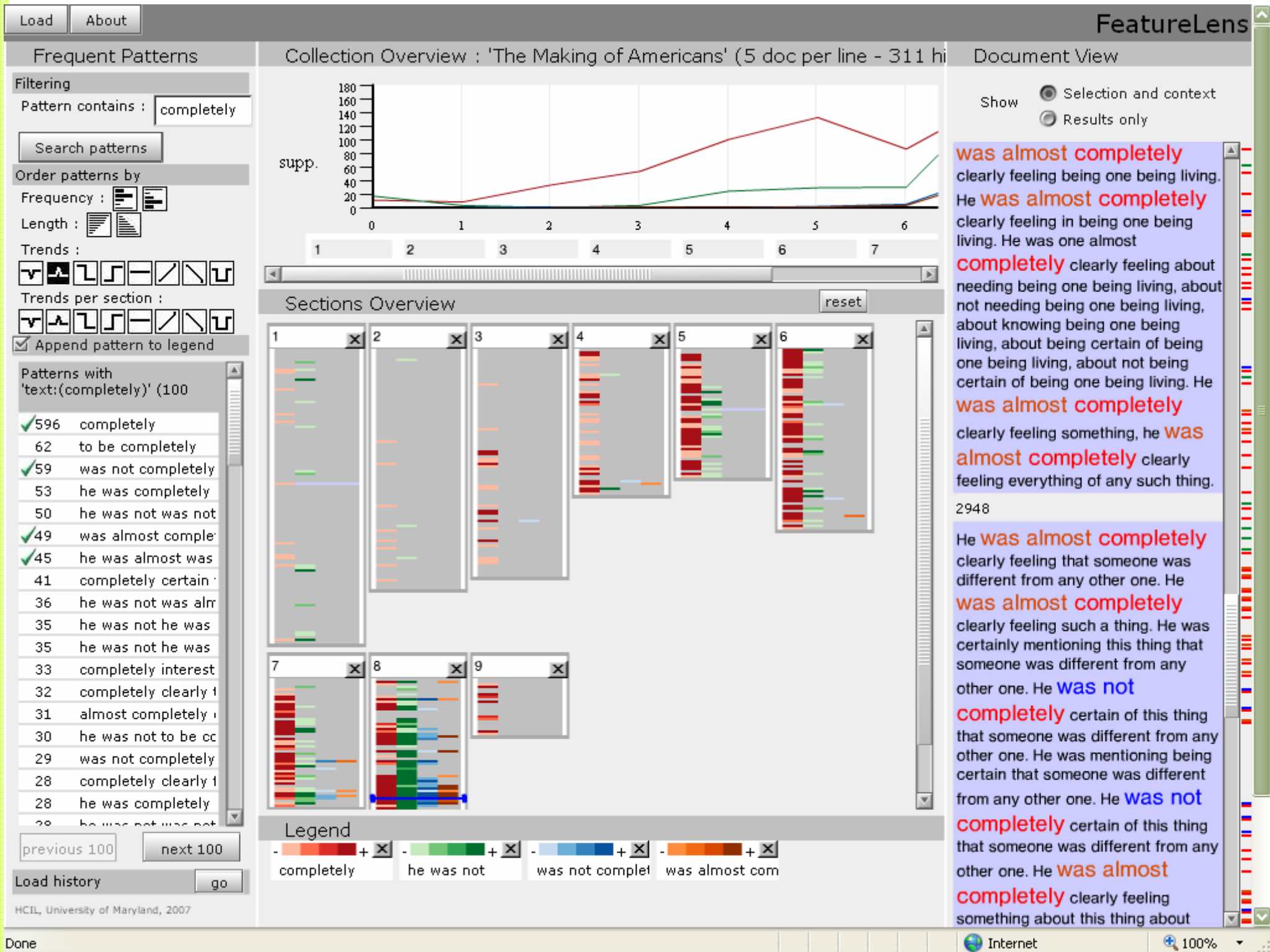
1809

There will be now a little more description written of her and of her living with her father when she came back to the family living back out of her trouble after the ending of the living in Phillip Redfern.

1810











Frequent Patterns

Filtering

Pattern contains : arragon

Search patterns

Order patterns by

Frequency :  Length :  

Trends :



Trends per section :

☒ Append pattern to legendPatterns with
'text:(arragon)' (1 patterns)

✓16 arragon

previous 100

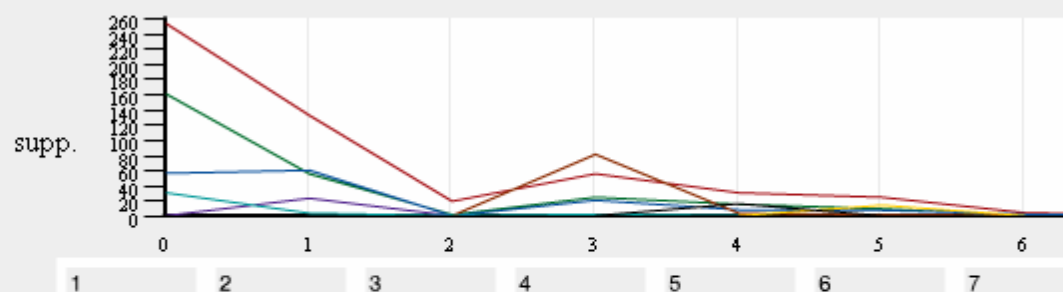
next 100

Load history

go

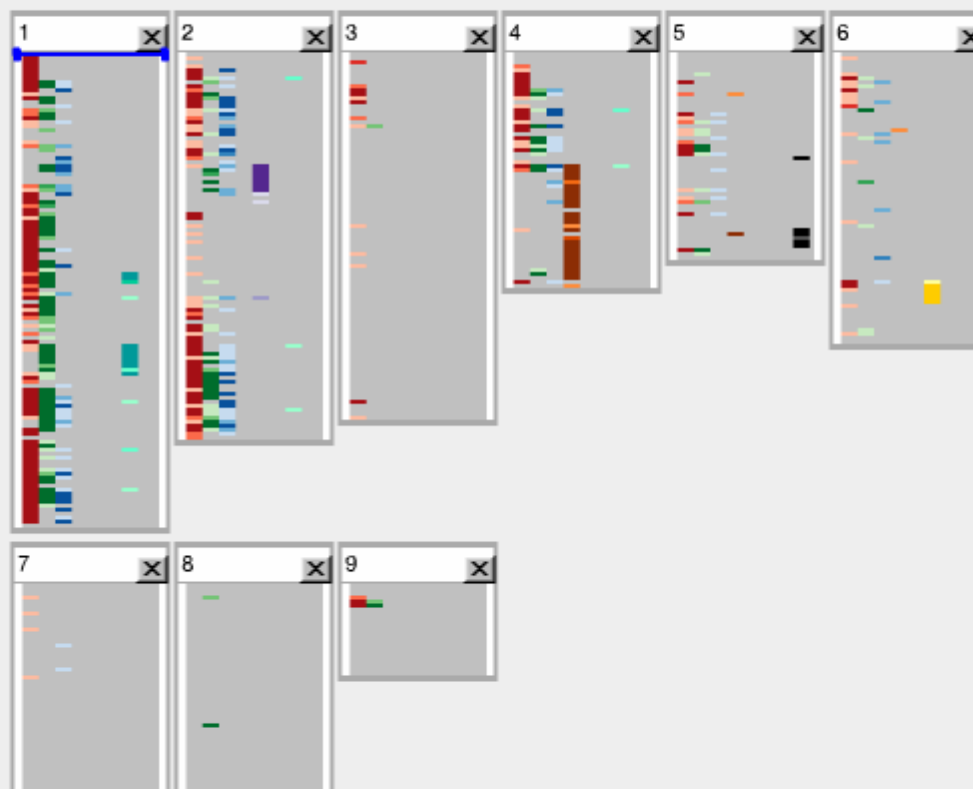
HCIL, University of Maryland, 2007

Collection Overview : 'The Making of Americans' (5 doc per line - 320 h

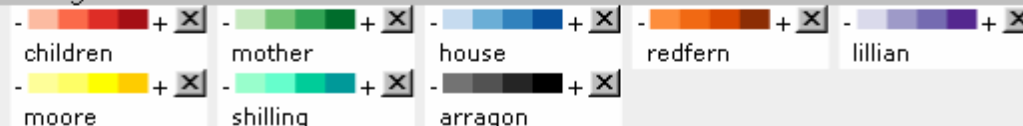


Sections Overview

reset



Legend



Document View

Show ☒ Selection and context
☐ Results only

1

Once an angry man dragged his father along the ground through his own orchard. "Stop!" cried the groaning old man at last, "Stop! I did not drag my father beyond this tree."

2

It is hard living down the tempers we are born with. We all begin well, for in our youth there is nothing we are more intolerant of than our own sins writ large in others and we fight them fiercely in ourselves; but we grow old and we see that these our sins are of all sins the really harmless ones to own, nay that they give a charm to any character, and so our struggle with them dies away.

3

It has always seemed to me a rare privilege, this, of being an American, a real American, one whose tradition it has taken scarcely sixty years to create. We need only realise our parents, remember our grandparents and know ourselves and our history is complete.

4

The old people in a new world, the new people made out of the old, that is the story that I mean to tell, for that is what really is and what I really know.

5

Some of the fathers we must realise so that we can tell our story really, were little boys then, and they came

Frequent Patterns

Filtering

Pattern contains :

Order patterns by

Frequency :

Length :

Trends :

Trends per section :

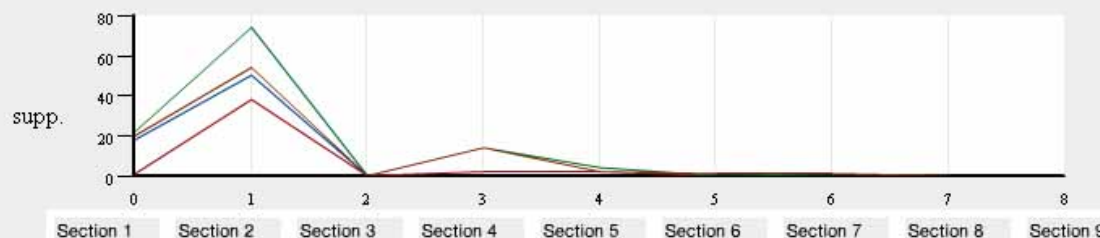
☒ Append pattern to legend

Patterns with 'text:(governess)' (12 patterns - page 1/1)

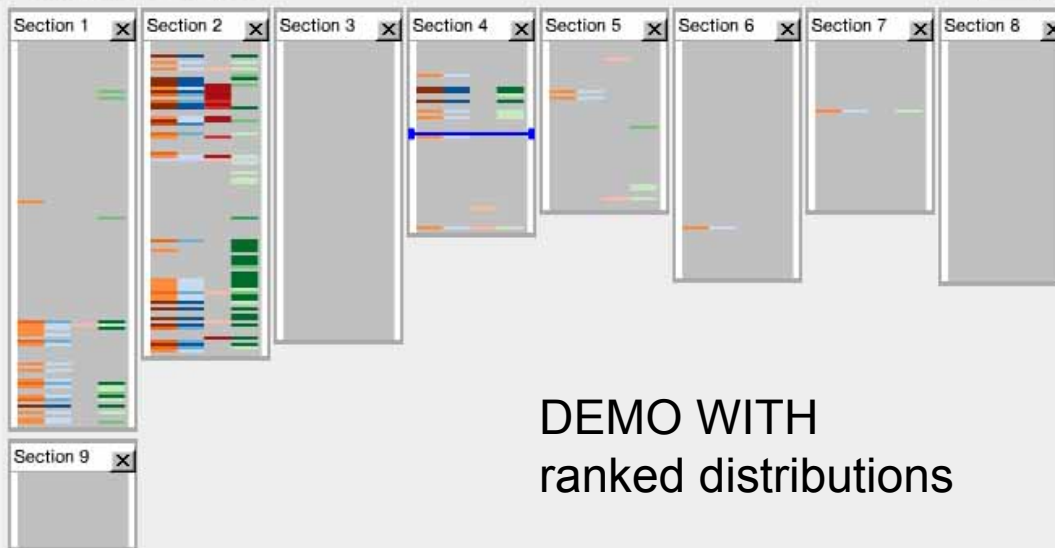
the first governess
 governess madeleine wymar
 governess in the
 in the house governess in the
 a governess and
 the governess and
 the second governess
 governess the herslands
 governess the herslands the
 governess in the the house w
 in the house governess in the
 ✓ governess

Load history

Collection Overview : 'The Making of Americans' (5 doc per line - 101 highlighted)



Sections Overview



DEMO WITH
ranked distributions

Legend

 +

in the house

 +

in the house|the house with

 +

servant

 +

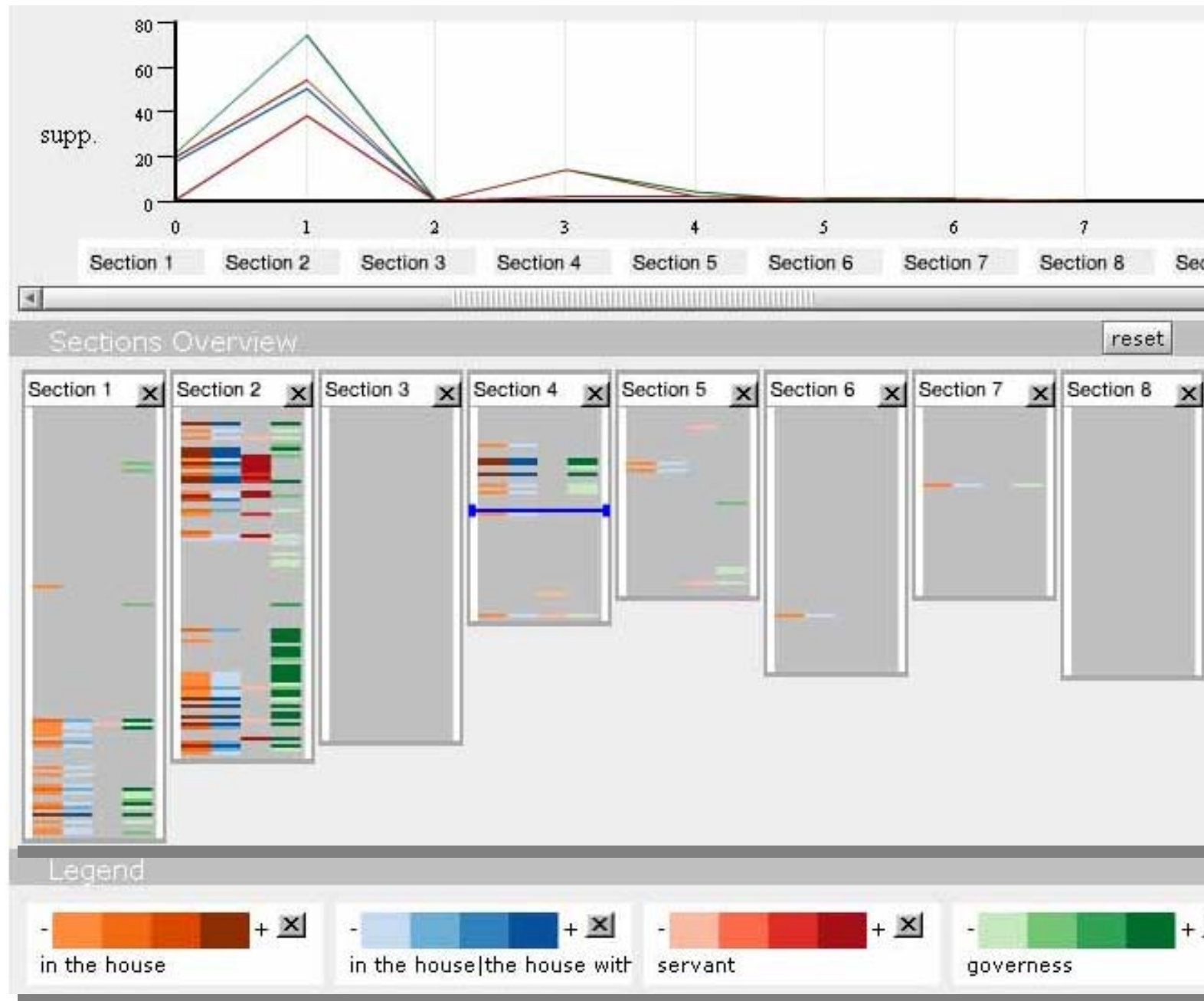
governess

Document View

Show ☒ Selection and context
☐ Results only

inside her and then she had there in her the beginning of the weakening in her the being lost among her children and her husband living in the house with her. In the living of Martha Hersland she was a little one in the ten acre place and she was then living there the half city half country living of the people around her and she went to school then and she was healthy enough then and happy enough then and she was always then getting older and getting bigger and she had some troubles then and always she was of them the people in the small houses near the ten acre place where she was living then and she had always the living in her and the being in her I was describing and sometimes she got a little fatter and sometimes a little thinner and sometimes she was happy enough and often she was not so happy and mostly always she was healthy and sometimes she had uneasy feelings in her and often her father was a trouble to her and often the governess was troublesome to her and mostly her mother was not very important for her and she went on and the family living of the Hersland family was changing some as I was saying and a little Martha was changing in her as the family living was changing around her and when it came to her to want her own education no one was paying much attention to her, each one of the Hersland family had then themselves inside them to themselves each one, the father as I was saying and the mother as I was saying and Alfred Hersland and his brother David as I will be saying in the history of the two of them. Always a little then Martha had trouble with each one of them, the family living in the house together, her father and her mother and her brother Alfred and David the younger brother but mostly then they none of them were really

Example of insights found using the spike ranking



Sample of data mining results

← 1 page of MoA

<p n="1082">Everyone then is an individual being. Everyone then is like many others always living thinking of everyone, this is now a description of all of them. There must then be a whole history must then now be a description of all repeating. Now I will tell all the meaning to me in repeating repeating.</p>

<p n="1083">Everyone is one inside them, everyone reminds someone of some other one who is Everyone has it to say of each one he is like such a one I see it in him, everyone has it to say of e else I can tell by remembering. So it goes on always in living, everyone is always remembering s the one at whom they are then looking. So they go on repeating, everyone is themselves inside th resembling to others, and that is always interesting. There are many ways of making kinds of mer making kinds of them there is a different system of finding them resembling. Sometime there wil be of seeing kinds of men and women. Sometime there will be then a complete history of each or repeating the whole of them and so sometime someone who sees them will have a complete histo someone will know all the ways there are for people to be resembling, someone sometime then w of everyone.</p>

<p n="1084">Soon now there will be a history of the way repeating comes out of them comes out they are young, when they are children, they have then their own system of being resembling; this the men and women in beginning, the being young in them, the being children.</p>

<p n="1085"> There is then now and here the loving repetition, this is then, now and here, a desc
repetition and then there will be a description of all the kinds of ways there can be seen to be kind
there will be realised the complete history of everyone, the fundamental character of everyone, th
mixtures in them, the strength and weakness of everything they have inside them, the flavor of th
being in them, and then you have a whole history then of each one. Everything then they do in liv
understanding, their living, loving, eating, pleasing, smoking, thinking, scolding, drinking, worki
laughing, sleeping, everything in them. There are whole beings then, they are themselves inside t

Sample of data mining results

5: a description of
4: this is now + is now a
4: there will be
4: of men and + men and women
4: of each one
4: men and women
4: is now a
4: history of each + of each one
3: this is now now a description is now a a descrip
3: this is now + a description of
3: there will be + will be a + a description of
3: there will be of each one
3: there will be a description of
3: there are many
3: one of them history of each each one of of each
3: of men and there will be
3: of men and men and women kinds of men
3: of men and men and women a history of
3: of each one a description of
3: now i will
3: men and women there will be
3: is now a a description of
3: history of each there will be
3: history of each each one of of each one a descri
3: history of each a description of
3: be a description a description of
2: will be a of each one
2: this is now there are many is now a now i will

148 patterns (4 pages)

← 1 page of MoA

<p n="1082">Everyone then is an individual being. Everyone then is like many others always living thinking of everyone, this is now a description of all of them. There must then be a whole history must then now be a description of all repeating. Now I will tell all the meaning to me in repeating repeating.</p>

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Sample of data mining results

5: a description of (7 occurrences, in 5 paragraphs, also in 41 patterns!)

4: this is now + is now a (4 occurrences in the same paragraphs)
<<<< THOSE ALWAYS CO-OCCUR (and always ADJACENT i.e. a 4-gram)

4: there will be (6 occurrences in 4 paragraphs)

4: *of men and* + men and women

4: of each one (9 occurrences in 4 paragraphs)

4: men and women (6 occurrences in 4 paragraphs)

4: is now a (6 occurrences in 4 paragraphs)

4: history of each + of each one

3: this is now + now a description + is now a + a description of <<<<REALLY all occurrences at "This is now a description of" so longer Ngrams more useful than.

3: this is now + a description of <<<<BETTER cause are ADJACENT

3: there will be + will be a + a description of

3: there will be of each one

3: there will be a description of

3: there are many

3: one of them history of each each one of of each one a description of

3: *of men and* there will be

3: *of men and* men and women kinds of men

3: *of men and* men and women a history of

3: of each one a description of

3: now i will

3: men and women there will be

Sample of data mining results

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3: of each one a description of

3: now i will

3: **men and women** there will be

Sample of data mining results

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3: this is now + now a description + is now a + a description of
occurrences at "This is now a description of" so long

3: this is now + a description of <<<< BETTER

3: there will be + will be a + a description of

3: there will be of each one

3: there will be a description of

3: there are many

3: one of them history of each each one of of each one

3: *of men and* there will be

3: *of men and* **men and women** kinds of men

3: *of men and* **men and women** a history of

3: of each one a description of

3: now i will

3: **men and women** there will be

<p n="1082">Everyone then is an individual being. Everyone then is like many others always living thinking of everyone, this is now a description of all of them. There must then be a whole history must then now be a description of all repeating. Now I will tell all the meaning to me in repeating repeating.</p>

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<p n="1084">Soon now there will be a history of the way repeating comes out of them comes out they are young, when they are children, they have then their own system of being resembling; this the **men and women** in beginning, the being young in them, the being children.</p>

<p n="1085">There is then now and here the loving repetition, this is then, now and here, a description of repetition and then there will be a description of all the kinds of ways there can be seen to be kind there will be realised the complete history of everyone, the fundamental character of everyone, the mixtures in them, the strength and weakness of everything they have inside them, the flavor of the being in them, and then you have a whole history then of each one. Everything then they do in living understanding, their living, loving, eating, pleasing, smoking, thinking, scolding, drinking, working, laughing, sleeping, everything in them. There are whole beings then, they are themselves inside them makes a history of each one of them.</p>

<p n="1086">Always from the beginning there was to me all living as repeating. This is now a description of was saying listening to repeating is often irritating, always repeating is all of living, everything in more and more listening to repeating gives to me completed understanding.</p>