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MultiConVis: A Visual Text Analytics System for Exploring a Collection of Online Conversations

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Rise of Text Conversations

- People engage in asynchronous conversations frequently
- e.g., blogs, forums.



Blogs:

- More than 100 millions of blogs
- The audience is rising exponentially
- Many different categories: politics, technology, business, sports,...

Problem Scenario



- Lot of articles and comments were posted on Macrumors.
- John is interested about buying iPhone6.
- He decides to explore blogs about this issue to **verify** whether the bending issue is serious.



Problem Scenario

Existing Interfaces

- Lack of high-level abstraction
 - Only show conversations/comments as paginated lists ordered by recency

- Too many conversations
- Too many comments
- => **Information Overload**

Users

- Focus on most recent conversations/comments
- Generate short responses
- Leave conversations prematurely

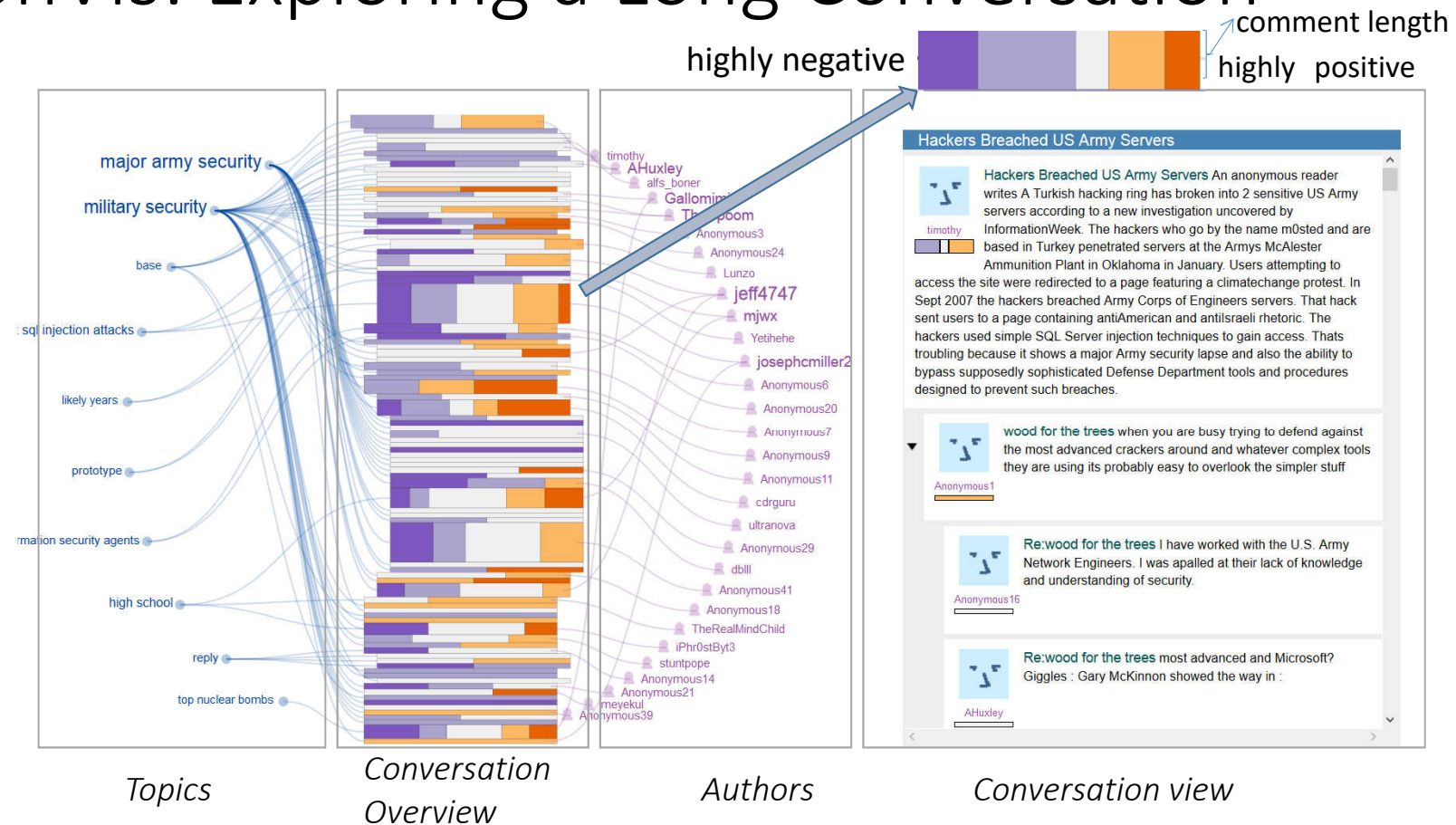
The screenshot shows a forum thread on MacRumors.com. The thread title is "Apple: Bending in iPhone 6 Plus From Normal Use 'Extremely Rare', Only 9 Customers Have Complained". It was started by Juli Clover on Thursday, September 25, 2014, at 4:42 pm PDT, and has 398 comments. The thread is on page 1 of 25. The first post is by Juli Clover, who is a MacRumors member. The post content is: "Apple has com the new iPhone the industry." "The company not as widespr exceeded test rare." The post has 10 replies. The first reply is by Espeonia, who says: "I have some doubts that only nine people have complained. Maybe nine people have complained about something else, but I doubt only nine people have complained about it bending." The second reply is by pena1mz, who says: "Sensationalism." The third reply is by nathanalf, who says: "Dekema2 said: 'If only nine customers complained, then why is the story spreading like wildfire?' Not sure. How come the iPhone 5, 4s, and 4 bending didn't cause a media craze like this either?!"

Our Solution

*tightly integrate **text analysis** and **interactive visualization** to support users in exploring **collection of online conversations**.*



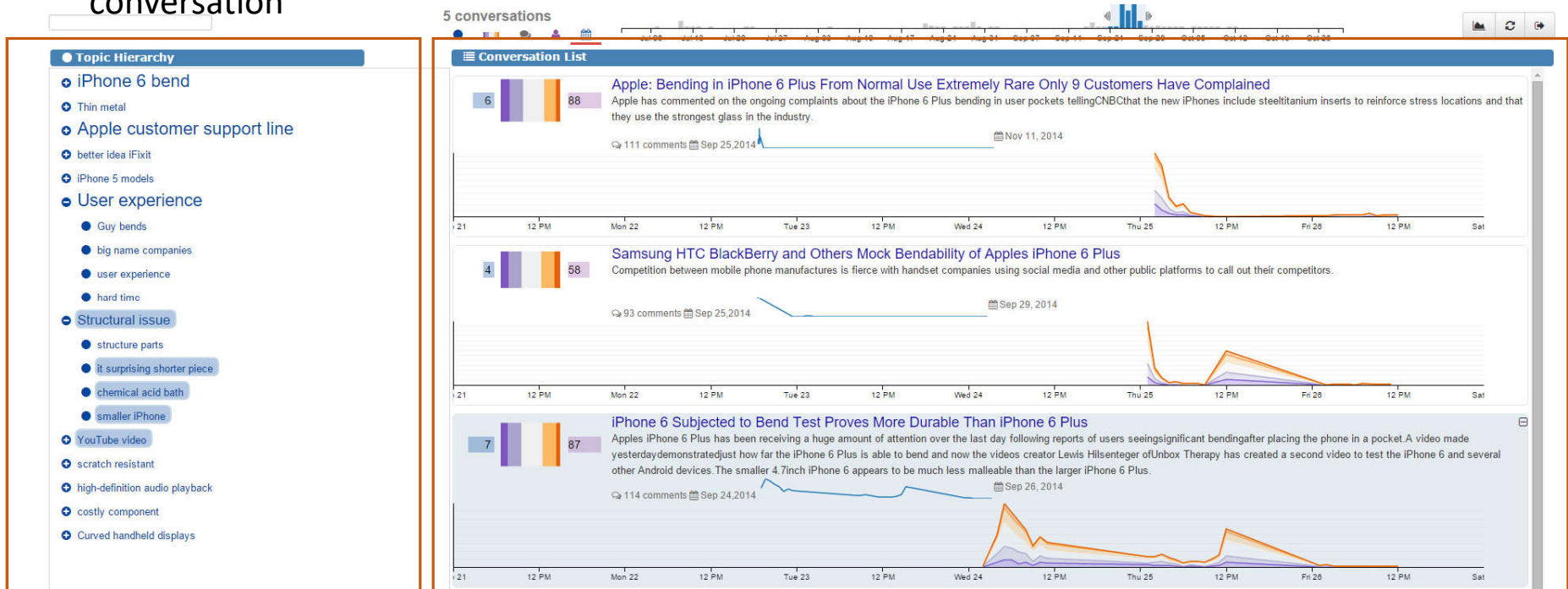
ConVis: Exploring a Long Conversation



Enamul Hoque and Giuseppe Carenini (EuroVis 2014, IUI 2015).

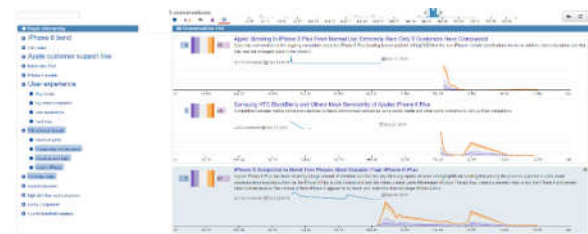
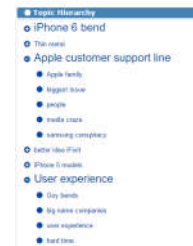
MultiConVis: Exploring a Collection of Conversations

- Large number of topics-> organize topics into **hierarchy**
- Designed on top of ConVis: **switch** from exploring a **collection** of conversations to a **single** conversation



Contributions

- Hierarchical topic modeling method
 - organizes large set of topics from multiple conversations
- User-centered design of MultiConVis.
 - multi-scale exploration of a collection of conversations
- Evaluation of MultiConVis :
 - user performance and subjective opinions compared to a traditional interface



Contributions

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Topic Hierarchy Generation for Multiple Conversations

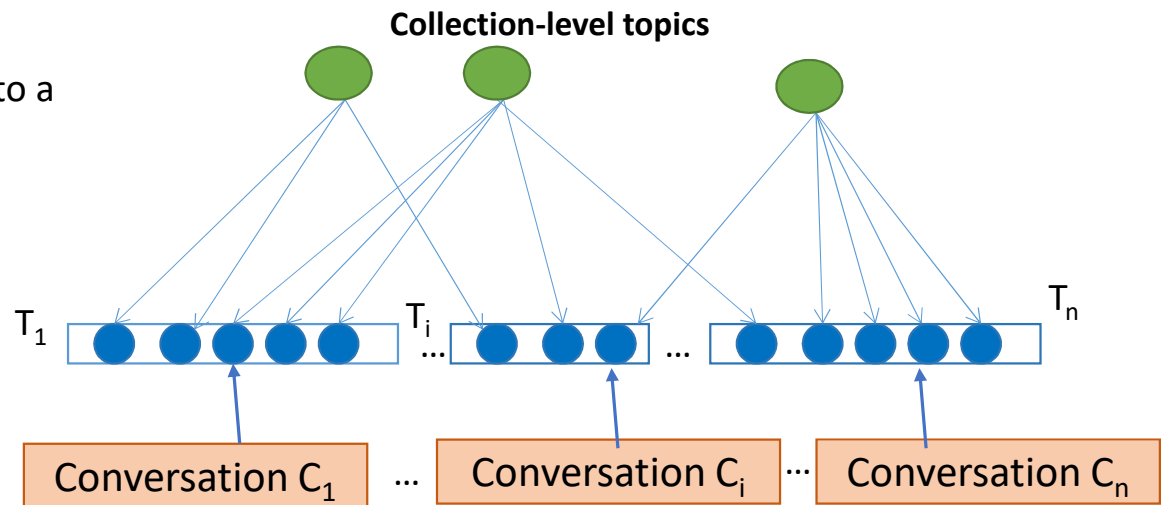
Bottom-up approach:

2

The sets of topics $\{T_1, T_i, T_n\}$ are clustered into a hierarchical topic structure

1

Generate topics for each conversation
Taking conversational features into account
(Joty et al., 2013)



Topic Hierarchy Generation for Multiple Conversations

1) Create a weighted undirected graph: $G(V, E)$

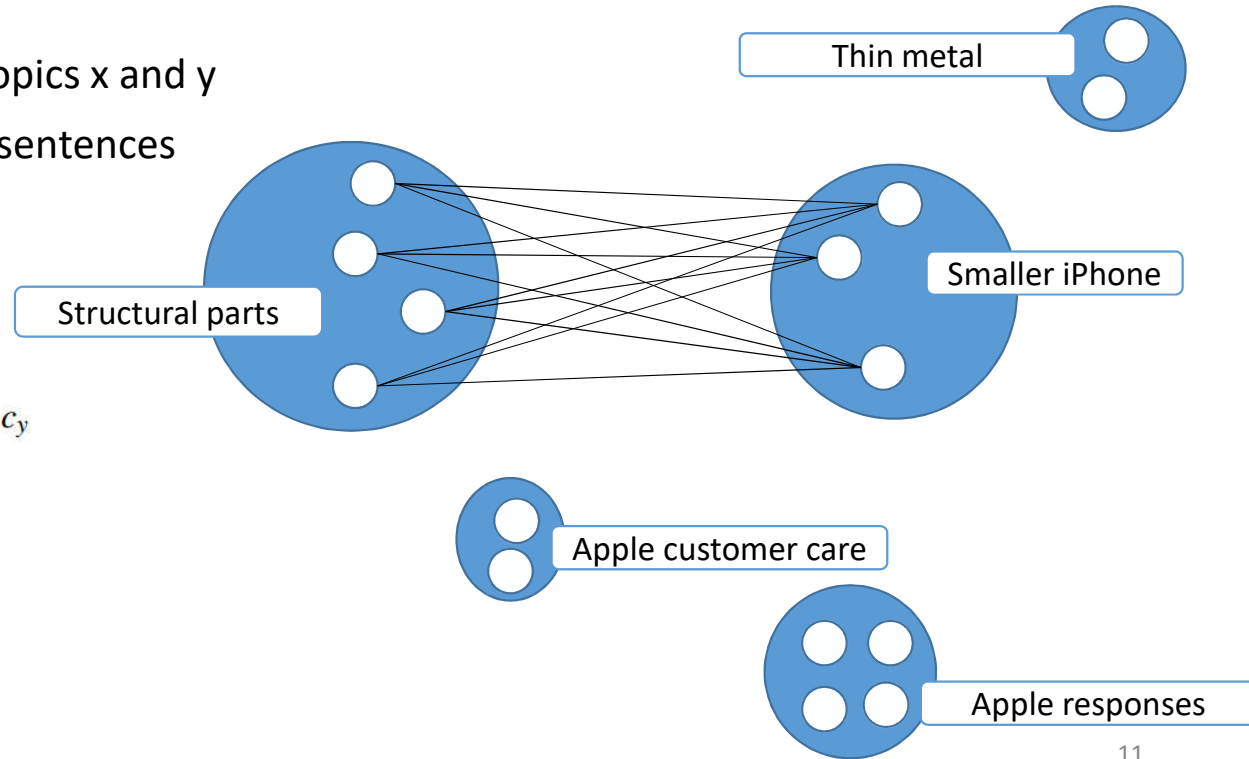
● Nodes: **Topics** from conversations

Edge weight $w(x, y)$: Similarity between two topics x and y

Sum of the pairwise similarity between their sentences

$$w(x; y) = \frac{1}{l \times m} \sum_{s_i \in S_x, s_j \in S_y} sim(s_i, s_j)$$

$$sim(s_i, s_j) = \begin{cases} \begin{cases} CosineSim(s_i, s_j) & \text{if } c_x \neq c_y \\ k & \text{if } k \geq 1 \\ CosineSim(s_i, s_j) & \text{if } k = 0 \end{cases} & \text{else} \end{cases}$$



Topic Hierarchy Generation for Multiple Conversations

1) Create a weighted undirected graph: $G(V, E)$

2) Apply Graph based clustering

- Normalized cut criteria (*Shi & Malik, 2000*)

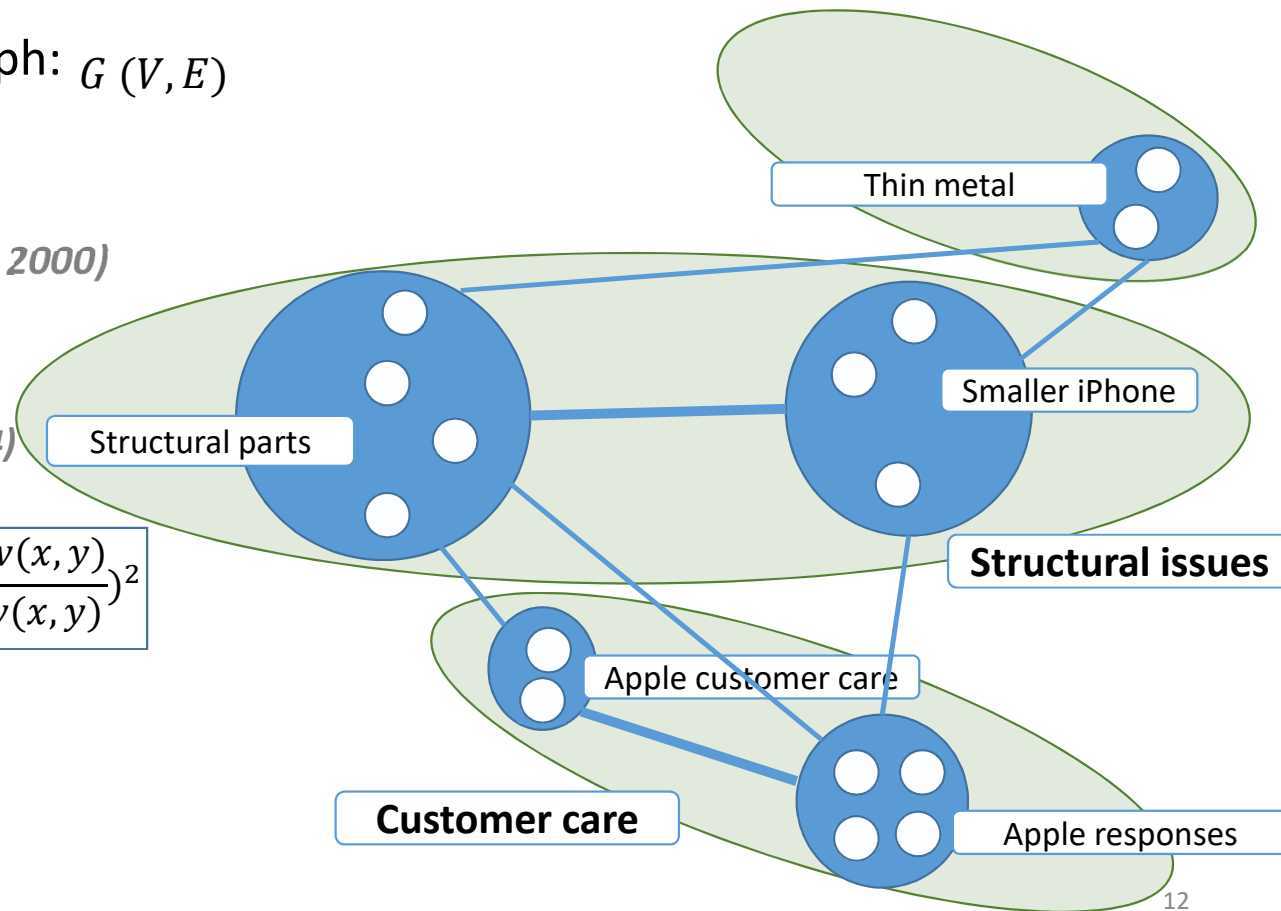
Num. of topics:

(*Newman and Girvan, 2004*)

Maximize:

$$Q_n(G) = \sum_{c=1}^n \frac{\sum_{x \in V_c, y \in V_c} w(x, y)}{\sum_{x \in V, y \in V} w(x, y)} - \left(\frac{\sum_{x \in V_c, y \in V} w(x, y)}{\sum_{x \in V, y \in V} w(x, y)} \right)^2$$

3) Label each cluster



Contributions

- Hierarchical topic modeling method
 - organizes large set of topics from multiple conversations



➔ User-centered design of MultiConVis.

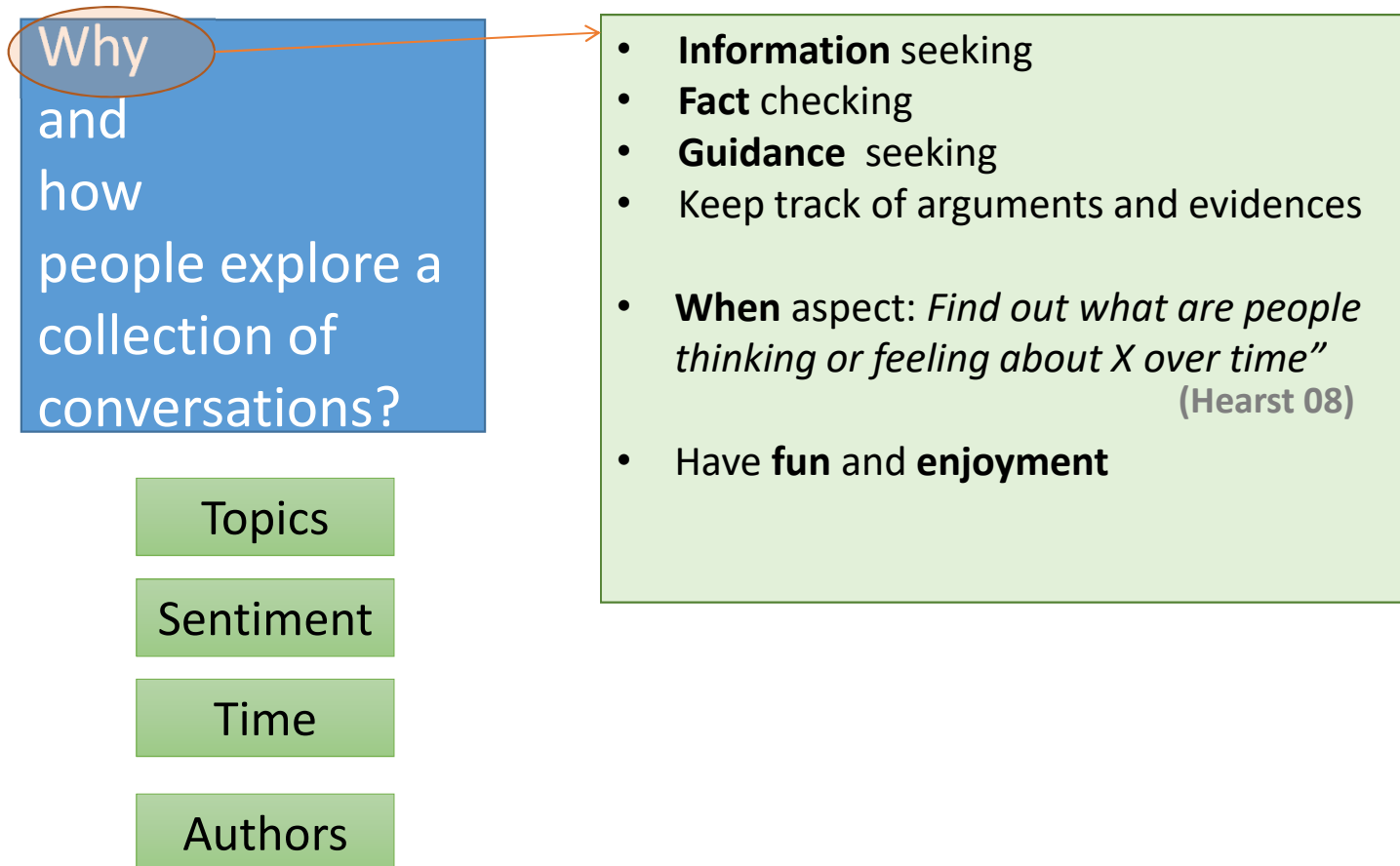
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User Requirements Analysis



User Requirements Analysis

Why
and
how
people explore a
collection of
conversations?

- **Variety seeking** behaviour:

- Read various sub-topics of a topic

- **Skimming** behaviour: Explore vs. focused reading

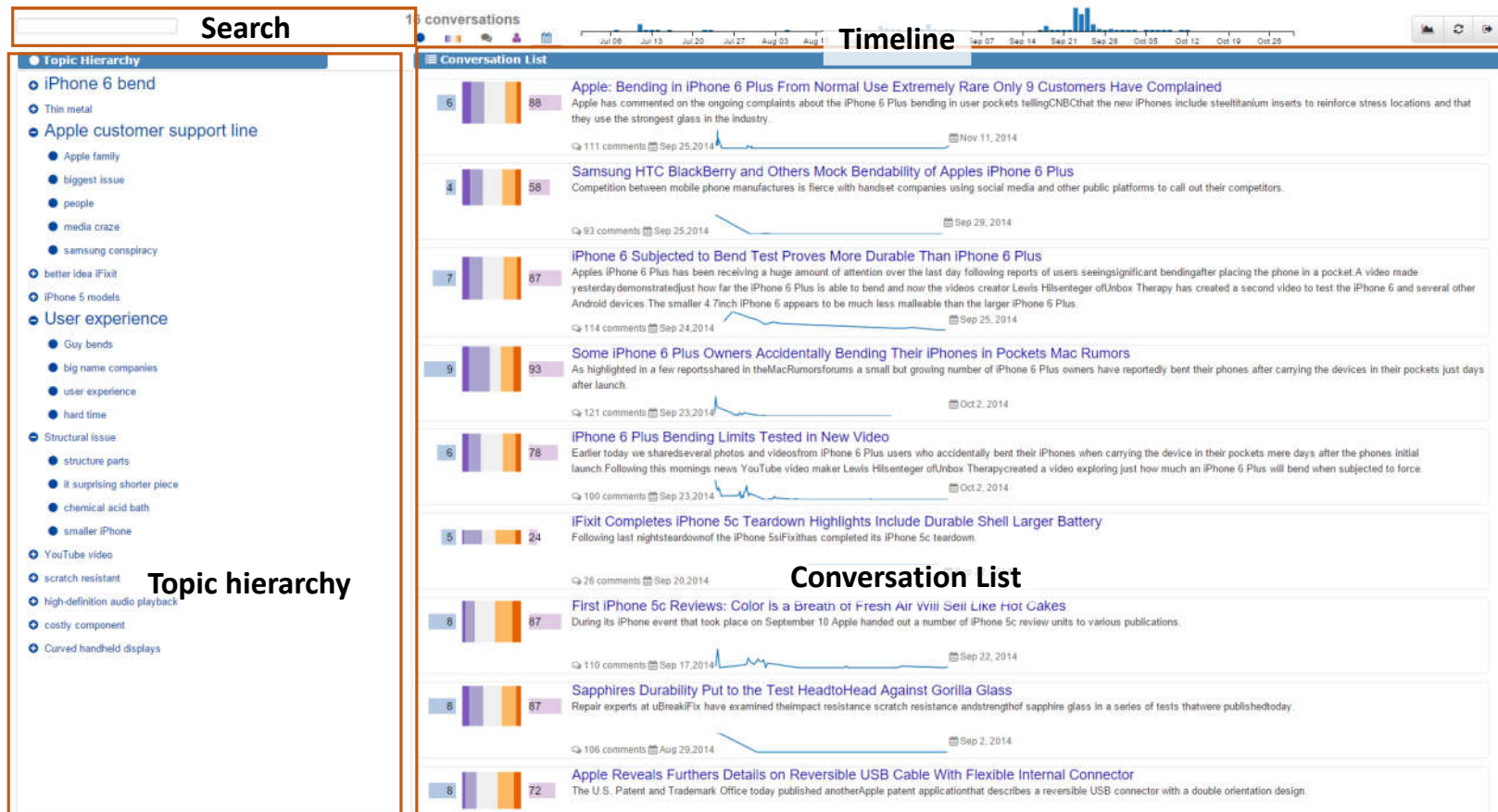
- **Switching** between **multiple-levels** of granularity:

Various levels
All Conversations
Subset of relevant Conversations
One Conversation
-> Comments

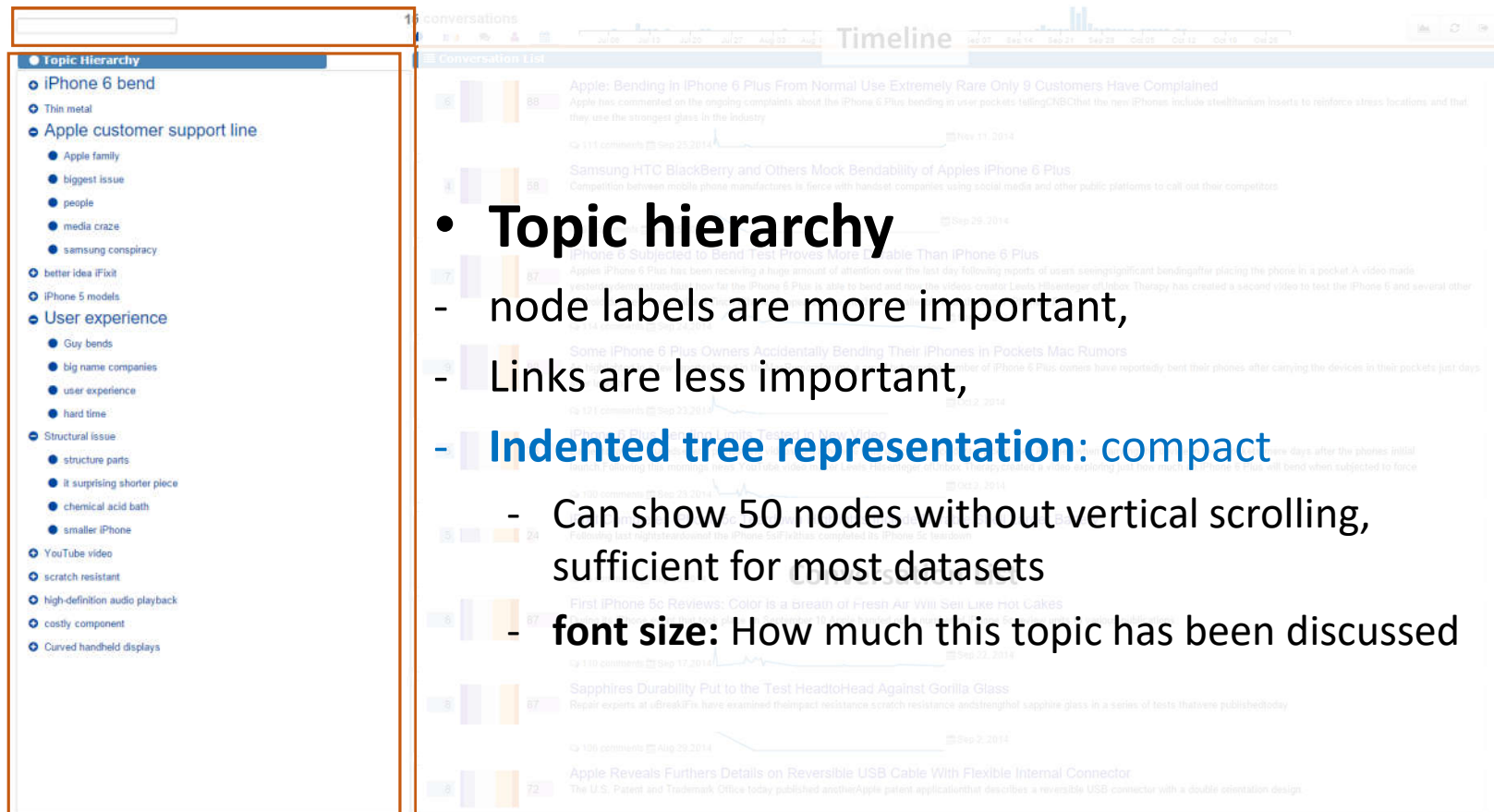
Data Abstractions

<div>Levels</div> <div>Facets</div>	Collection of Conversations		One Conversation	
Topics				
Time				
Sentiment				
Authors				

Visual Encoding: Set of Conversations



Visual Encoding: Set of Conversations



- **Topic hierarchy**
 - node labels are more important,
 - Links are less important,
 - **Indented tree representation: compact**
 - Can show 50 nodes without vertical scrolling, sufficient for most datasets
 - **font size:** How much this topic has been discussed

Visual Encoding: Set of Conversations



Video Demo

Contributions

- Hierarchical topic modeling method
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Evaluation of MultiConVis :

- user performance and subjective opinions compared to a traditional interface



User Evaluation

Case studies:

- Participants explored the datasets according to their information needs
 - Regular blog reader: iPhone bending
 - Journalist: ObamaCare health reform
 - Business analyst: iWatch release
- In follow-up interviews: topic hierarchy was extremely useful

Laboratory study:

- Compare with a traditional interface
- **Task:** Explore the given set of conversations, write a summary of major keypoints

Evaluation: Lab Study

- 16 subjects (aged 18-37, 6 females)
- Within subjects

Search: 12 conversations 17 Sort ▾

Apple: Bending in iPhone 6 Plus From Normal Use Extremely Rare Only 9 Customers Have Complained
Apple has commented on the ongoing complaints about the iPhone 6 Plus bending in user pockets today(2014) that the new iPhones include steelbrakes inserts to reinforce stress locations and that they use the strongest glass in the industry.
111 comments | Sep 24, 2014

Samsung HTC BlackBerry and Others Mock Bendability of Apples iPhone 6 Plus
Competition between mobile phone manufacturers in force with handset companies using social media and other public platforms to call out their competitors.
49 comments | Sep 24, 2014

iPhone 6 Subjected to Bend Test Proves More Durable Than iPhone 6 Plus
Apple's iPhone 6 Plus has been receiving a huge amount of attention over the last day following reports of users seeing significant bending after placing the phone in a pocket. A video made by iFixit today on shatterproof phone and videoblog from iPhone 6 Plus users who accidentally bent their iPhones when carrying the device in their pockets mere days after the phones initial launch. Following this morning's news, YouTube video maker Lewis Hiltzberger of iFixit has created a second video to test the iPhone 6 and several other Android devices. The smaller 4.7 inch iPhone 6 appears to be much less malleable than the larger iPhone 6 Plus.
114 comments | Sep 24, 2014

Some iPhone 6 Plus Owners Accidentally Bending Their iPhones in Pockets Mac Rumors
As highlighted in a few reports based in the MacRumors forums a small but growing number of iPhone 6 Plus owners have reportedly bent their phones after carrying the device in their pockets just days after the launch.
121 comments | Sep 23, 2014

iPhone 6 Plus Bending Limits Tested in New Video
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100 comments | Sep 23, 2014

iFixit Completes iPhone 6c Teardown Highlights Include Durable Shell Larger Battery
Following last night's teardown of the iPhone 6c iFixit has completed its iPhone 6c teardown.
25 comments | Sep 23, 2014

First iPhone 6c Reviews: Color is a Breath of Fresh Air Will Sell Like Hot Cakes
During the iPhone event that took place on September 16 Apple teased out a number of iPhone 6c review units to various publications.
118 comments | Sep 17, 2014

Sapphires Durability Put to the Test Headlines of Apple's Durability Review
Repair experts at iFixit have examined the impact of sapphire glass on the durability of various mobile devices published today.
106 comments | Sep 23, 2014

Apple Reveals Further Details on New iPhone 6c
The U.S. Patent and Trademark Office today published another patent application that describes a reversible USB connector with a double alignment design.
118 comments | Sep 23, 2014

Expert Believes Alleged iPhone 6 Sapphire Front Panel Could Be Legitimate
Earlier this week rumors circulated the alleged front panel of the 4.7 inch iPhone 6 surfaced which showed the screen being put through stress tests involving weights and bending and so on.
118 comments | Sep 23, 2014

iPhone 6 Front Panel Subjected to Scratch Test, Significant Bending
Earlier today, we shared a video of what appeared to be the front panel of the 4.7 inch iPhone 6 subjected to a limited bending stress test, but YouTube user Margen Brouwer has no additional stress tests, including more significant bending and scratching.
118 comments | Sep 23, 2014

Curved Handheld Displays Almost Ready for Market
Both LG and Samsung plan to release phones that feature curved displays in the near future reports technology.
118 comments | Sep 23, 2014

iPhone 6 bend

- Apple family
- biggest issue
- people
- media coverage
- spanning complexity

User experience

- Day bends
- SIG news companies
- user experience
- Apple time

Structural issues

- structure parts
- it supporting shelter place
- chemical acid bath
- smaller iPhone

YouTube videos

- scratch resistant
- high definition audio playback
- coolly component
- curved handheld displays

Traditional interface

16 conversations

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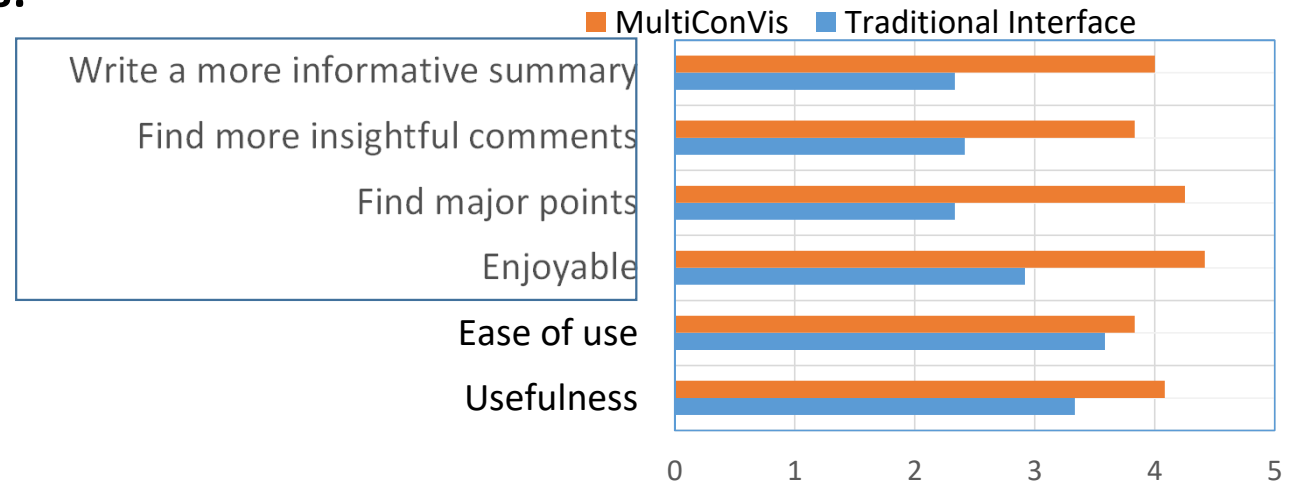
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MultiConVis

User Study: Selected Results

- **Time-to-task completion:** No significant difference
- **Subjective ratings:**



- **Preference:**
 - MultiConVis (75%): topic organization, visual overview of conversations
 - Traditional interface (25%): simplicity and familiarity

Conclusions

1) **Hierarchical topic modeling** for a collection of online conversations

- consider **unique features of conversations**.

2) **Design** of MultiConVis.

- **Multi-scales exploration** of a collection of conversation
 - Consistency of encoding among various scales

3) **Evaluation**

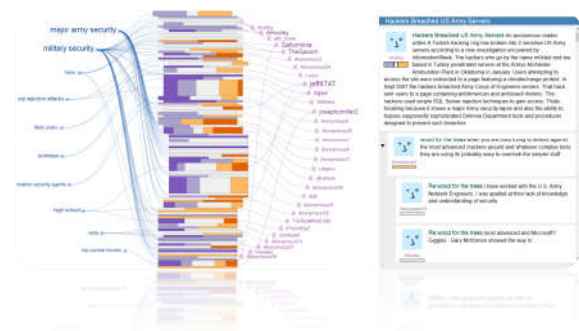
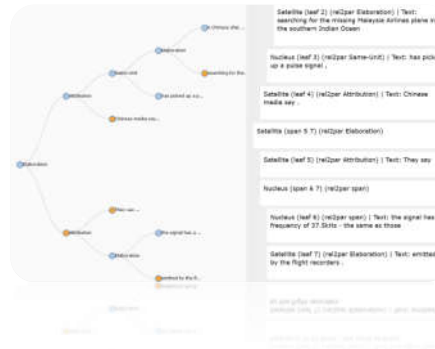
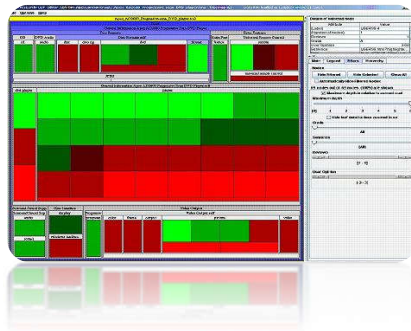
- MultiConVis was preferred by majority of participants
- Assessment of different interface features

Future Work

- Interactive topic hierarchy revisions
 - Allow user to modify topic hierarchy
- Apply and tailor to specific conversational genres
 - Community question answering forums
 - MOOC forums
 -
- Online longitudinal study
 - For ecological validity

For More Information...

www.cs.ubc.ca/cs-research/lci/research-groups/natural-language-processing/



Thanks:



Tamara Munzner



Raymond T. Ng

