

Analyzing the impact of science funding programs on the evolution of research fields

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A Visual Analytics Approach

A more comprehensive approach to reveal scientific impact & innovation.

- General data-driven methods for revealing trends, events, relationships, possible cause & effect.
- Interaction is essential for putting the human analyst in the loop.
- Tools that can be put in the hands of impact or policy analysts and program managers.



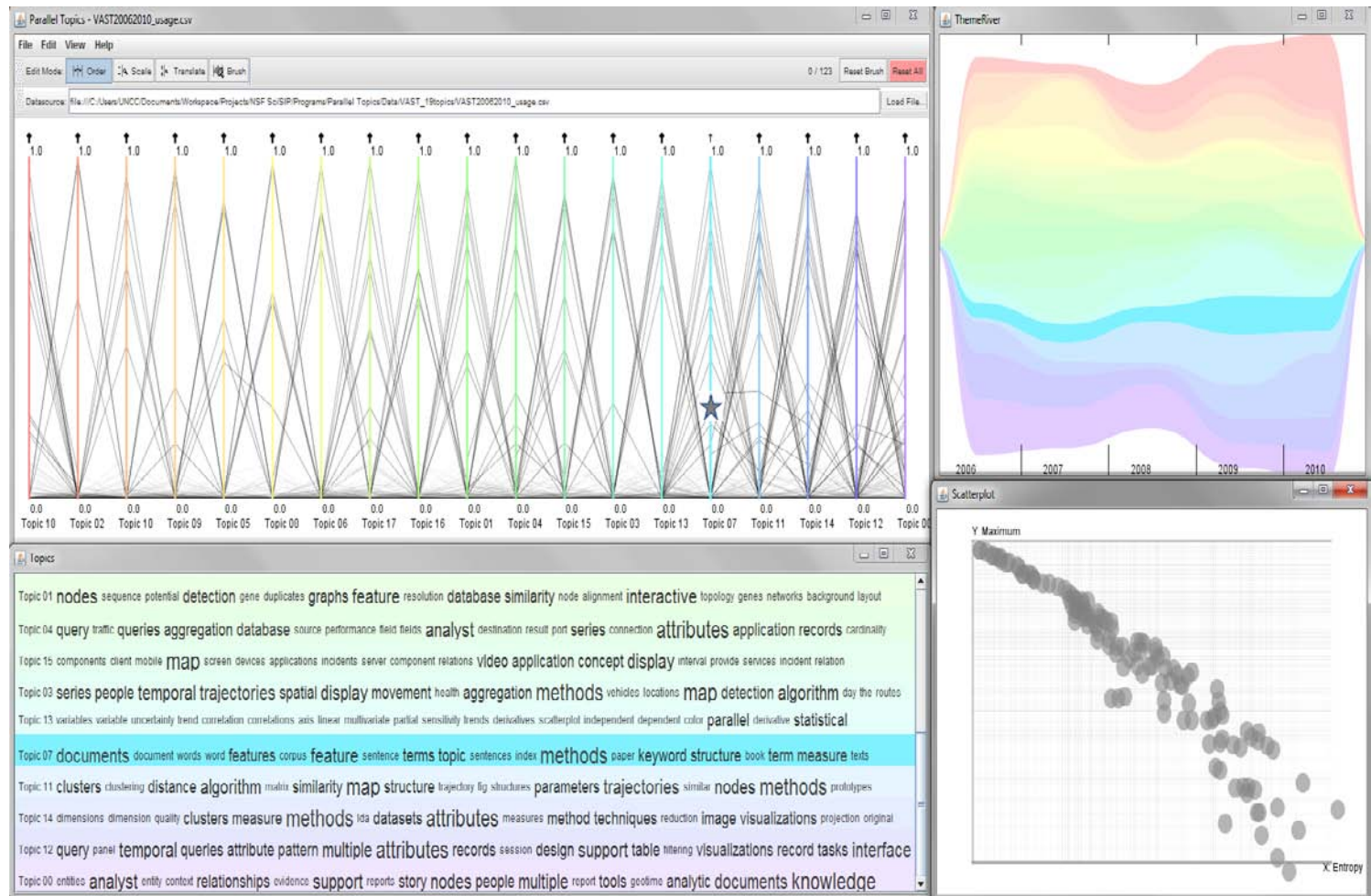
Visual Analytics Tools

Tools embodying general methods for comprehensive analysis:

- Exploration, discovery, and general trends (Example: ParallelTopics, LeadLine)
- Deeper, detailed analysis (Example: Lead-Lag)
- Forecasting impact and decision support for science policy (Example: Knowledge Encapsulation Framework and dynamic Bayesian nets model)

ParallelTopics

Topic streams over time



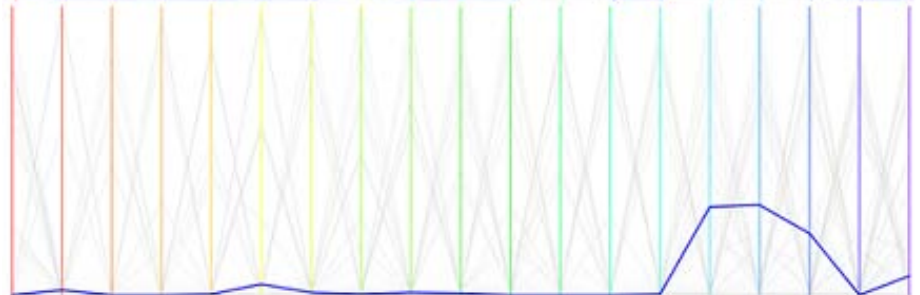
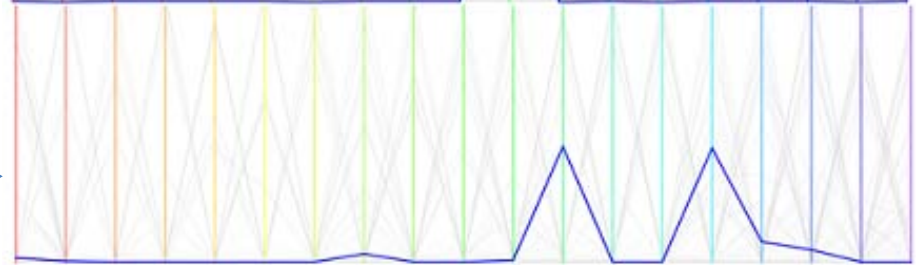
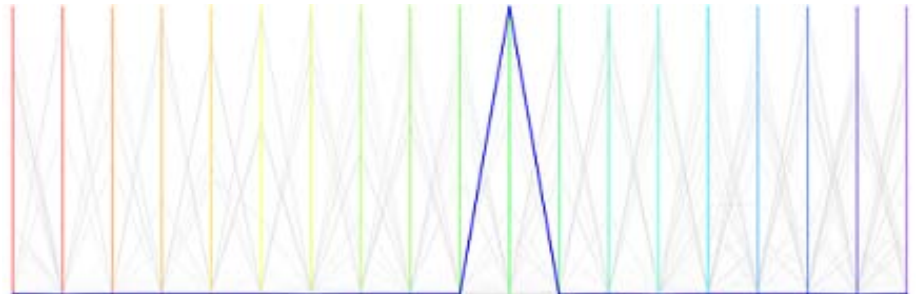
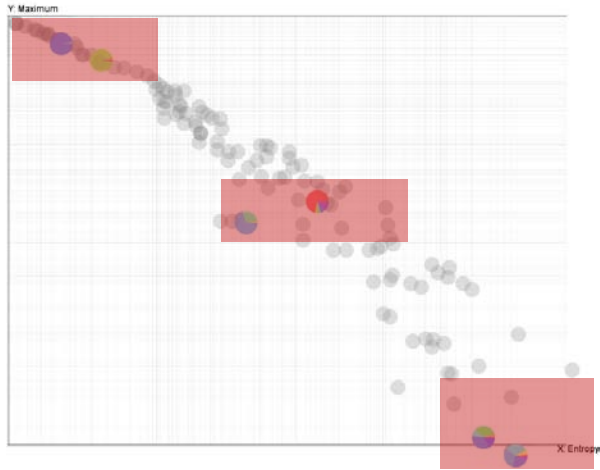
Distribution of proposals from single topic to multiple topic



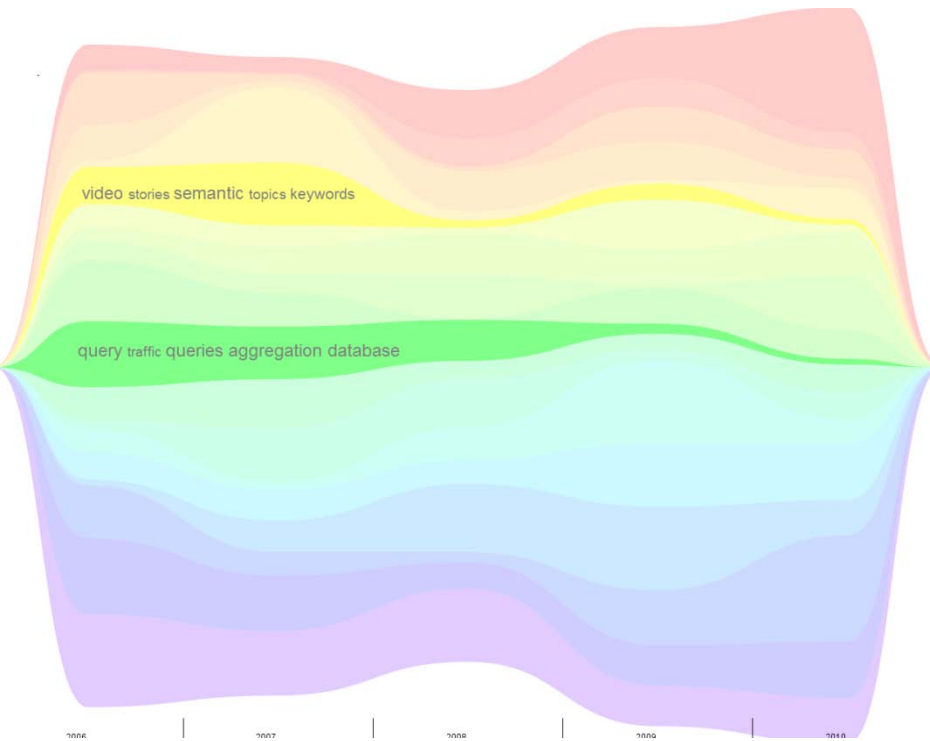
Distribution of proposals over topics

Key word lists for each topic

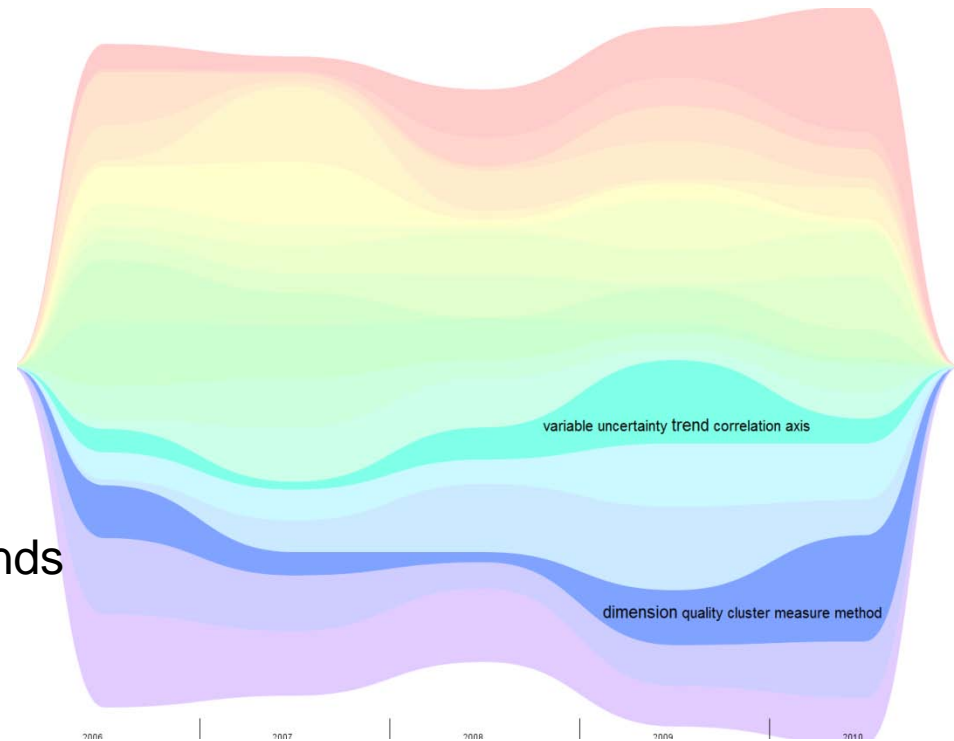
ParallelTopics



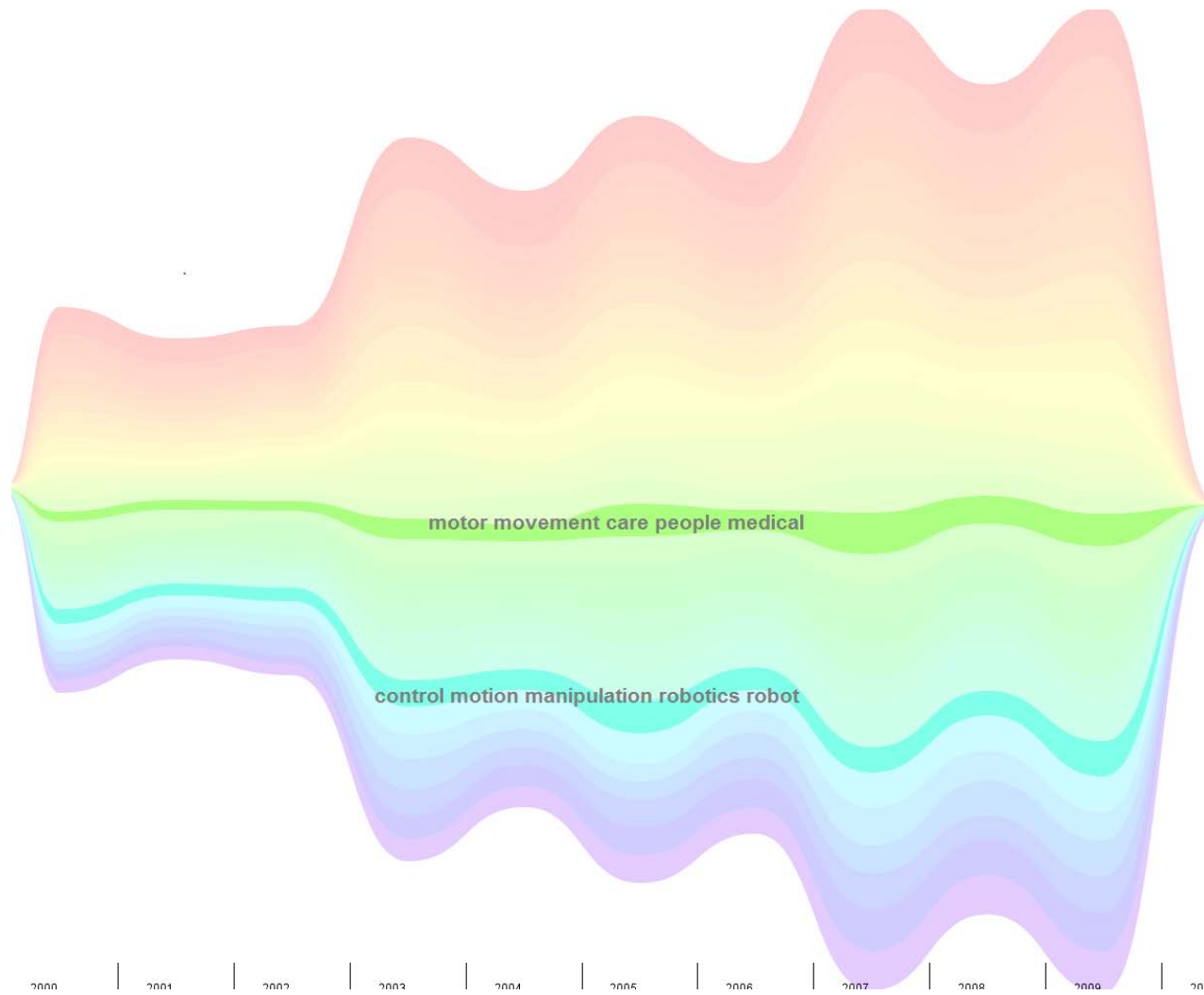
Topic Trends in ParallelTopics



Visual Analytics research paper trends
(2006-2010)

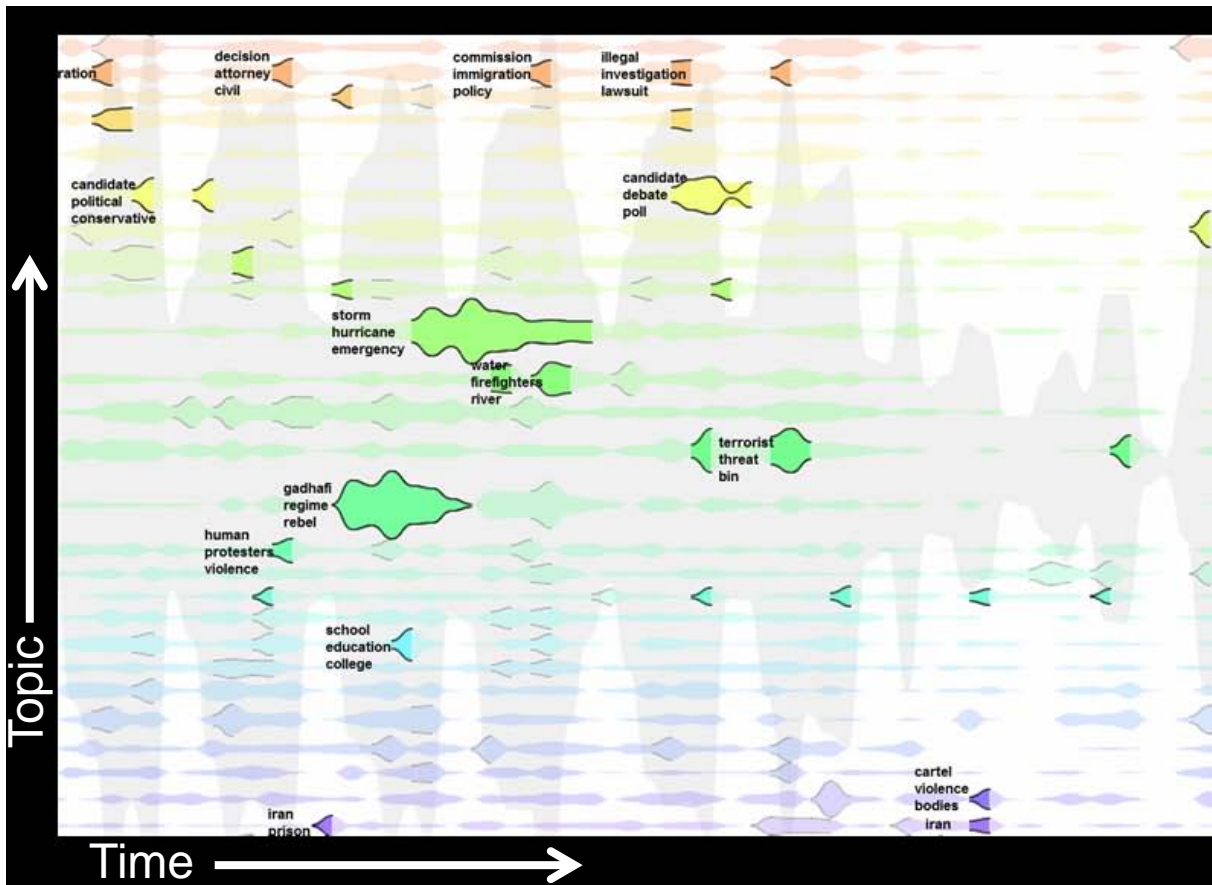


Topic Trends in ParallelTopics

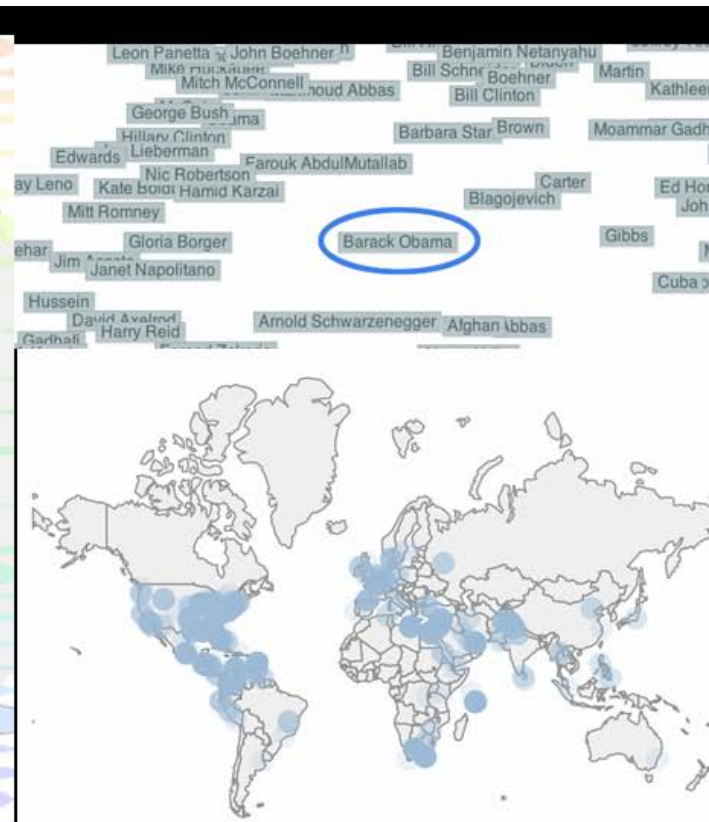


LeadLine

Entity View



Event View



Geo View

Lead-Lag

Investigate the lead-lag relations between funding and research (Collaboration of Jing Yang with Dr. Shixia Liu and her group at Microsoft Research Asia)

- Does funding lead/lag research in a given research field or topic?
- How do the relationships between funding and research evolve over time?
- What are the most important proposals/papers that shape the lead of funding/research?
- Has consequences for:
 - Scientific investment assessment
 - Funding allocation and program establishment
 - Review panel organization

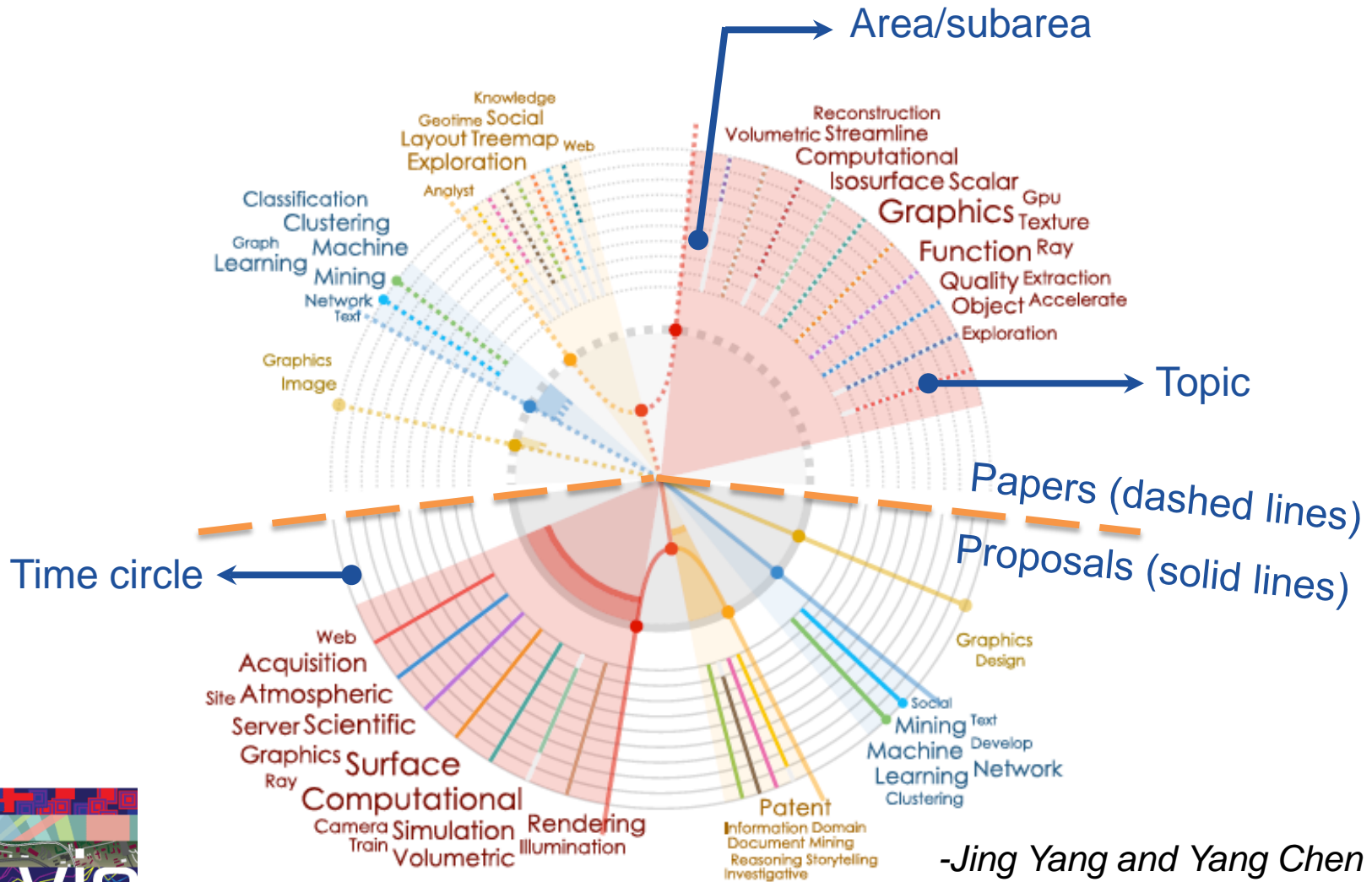
Methodology

- Compare two or more corpora
- Perform topic modeling on the combined corpora to identify research **areas**, **subareas**, and **topics**.
- Conduct **lead-lag** analysis on multiple levels of detail
 - Overall lead
 - Dynamic change of lead over time
- Visualize the results
 - Radial tree: overall lead-lag
 - Twisted-ladder: temporal change
- Example
 - **NSF funded grant abstracts** (2000-2009)
 - 1K grant abstracts (IIS, CCF, and CNS)
 - **Abstract of papers** (2000-2009)
 - 5k conference papers (Vis, InfoVis, KDD, SIGGRAPH, etc.)



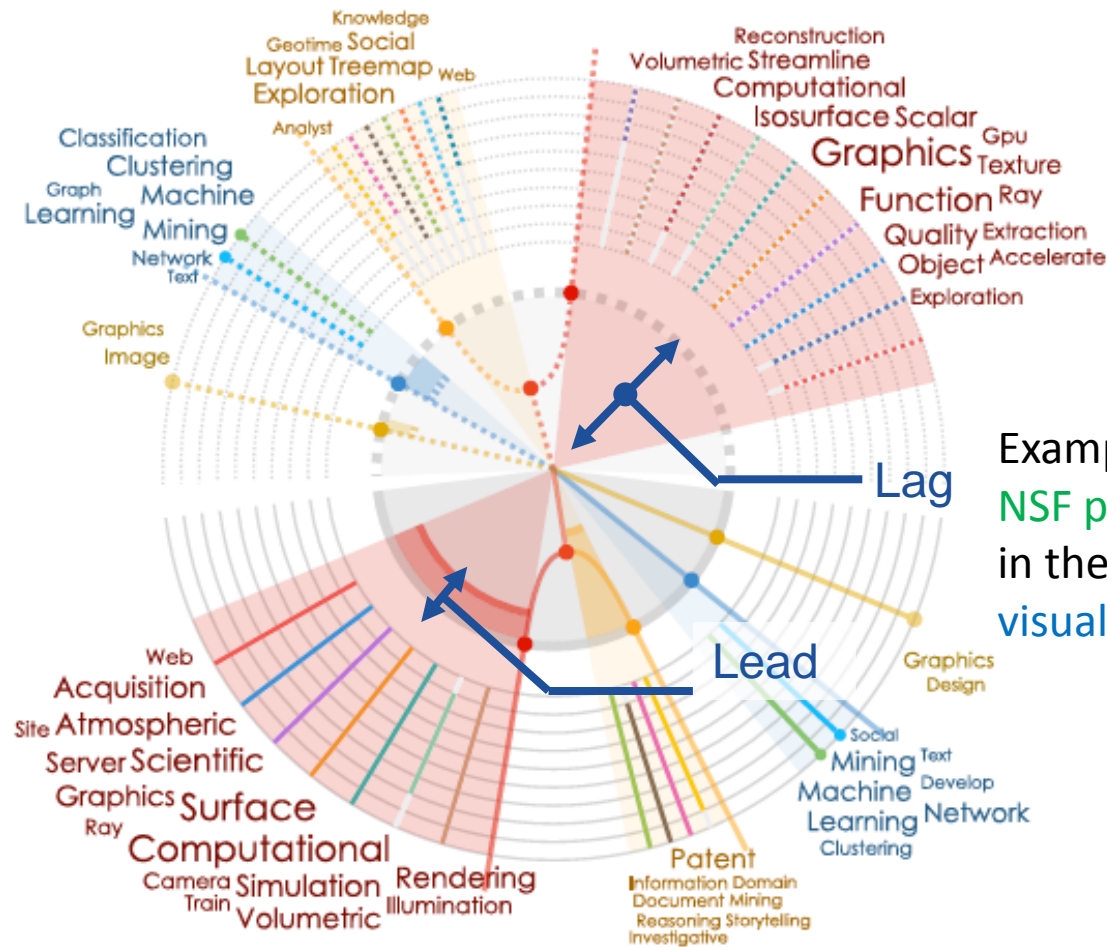
Lead-Lag

NSF vs. Papers: Overall leads



-Jing Yang and Yang Chen

NSF proposals vs. Papers: Overall leads



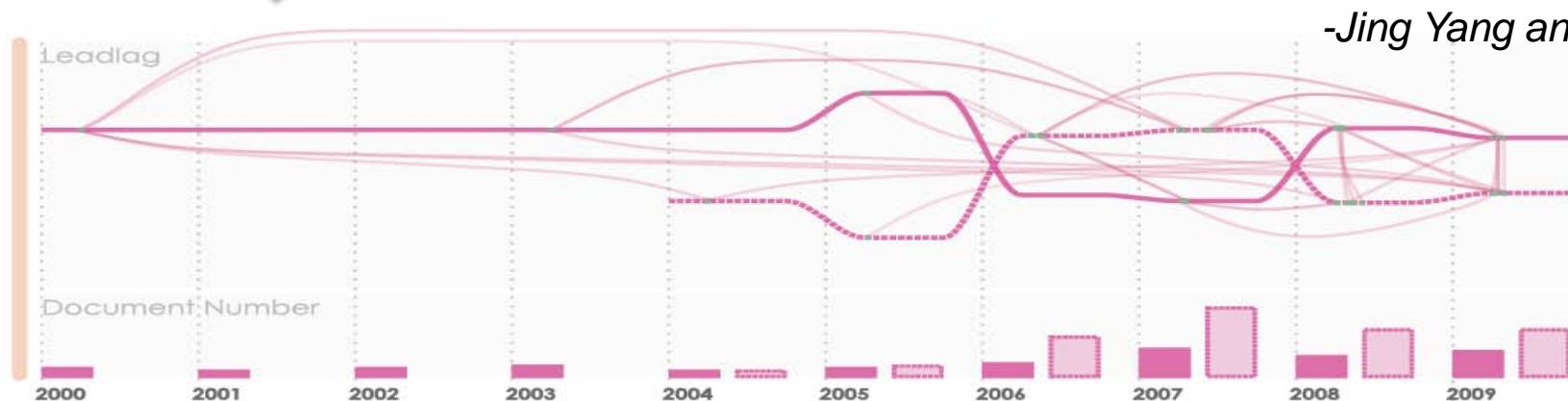
Example:
NSF proposals lead papers
in the subarea of scientific
visualization

NSF Proposals vs. Papers: Local changes

Subarea of information visualization NSF leads Paper



A topic of “analytic/knowledge/reasoning”. Paper (dash) leads in 2006 and 2007. NSF (solid) leads over the rest of the years.



-Jing Yang and Yang Chen

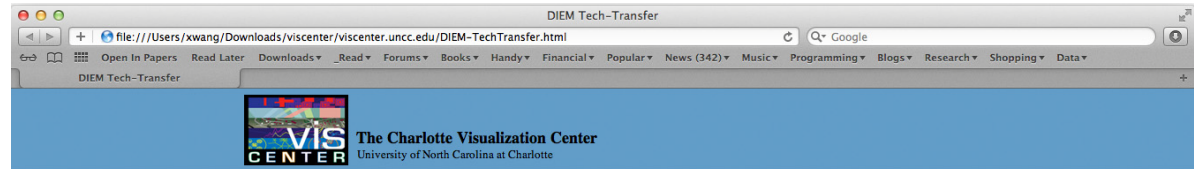
Document alignment between NSF and paper on the topic from 2000 to 2009.

Questions?

www.viscenter.uncc.edu



Products --- Tools & Data Website

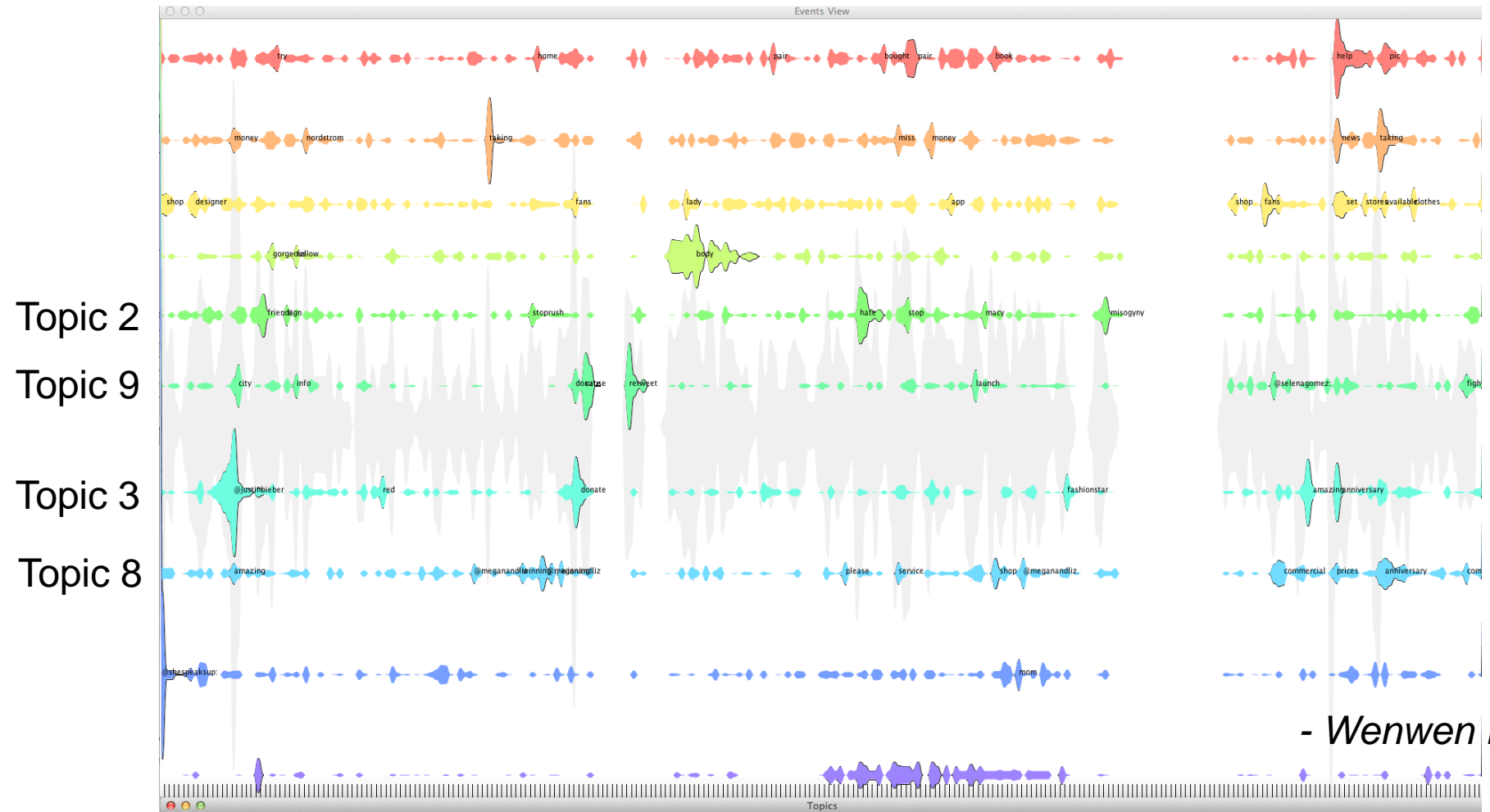


- We are developing and will soon launch a Tools + Data Website via www.viscenter.uncc.edu
- This site will contain downloads of the above tools plus others with descriptions of their capabilities and how to use them.
- Some publicly available data will also be available.
- Downloads will be by permission.

Example from
another project

A screenshot of the 'Advanced Visual Analytics Tools & Data' section of the website. The page has a blue header with 'Projects', 'Teams', and 'Publications' tabs. The main content area is titled 'Advanced Visual Analytics Tools & Data' and 'Terrain Atlas and Visual Analysis DSS system'. It includes a 3D visualization of a coastal area with a red line indicating a path or boundary. Below this is a section titled 'Storm Surge Animation and Analysis' with a 3D visualization of a storm surge over a coastal area. Further down is a section titled 'Event Structure Analysis for Hurricane Wind and Eye movement' with a 3D visualization of a hurricane's eye and wind patterns. The bottom section is titled 'Oil Spill and Dispersion Animation and Analysis' with a 3D visualization of an oil spill. Each section contains a brief description of the tool and a link to 'Learn more about this project'.

Know Your Customers (Know Their Customers)



- Wenwen Dou

Topic 02 macy online **stop**rush extra perfect favorite stop friends **hate** code list buy **lim**baugh ads size guys

Topic 09 heart launch fragrance **donate** fight @selenagomez: @goredforwomen: meet dise @goredforwomen wo

Topic 03 thanksgiving parade red christmas wear july buy fashionstar fireworks celebrate **ready** nyc anniversary

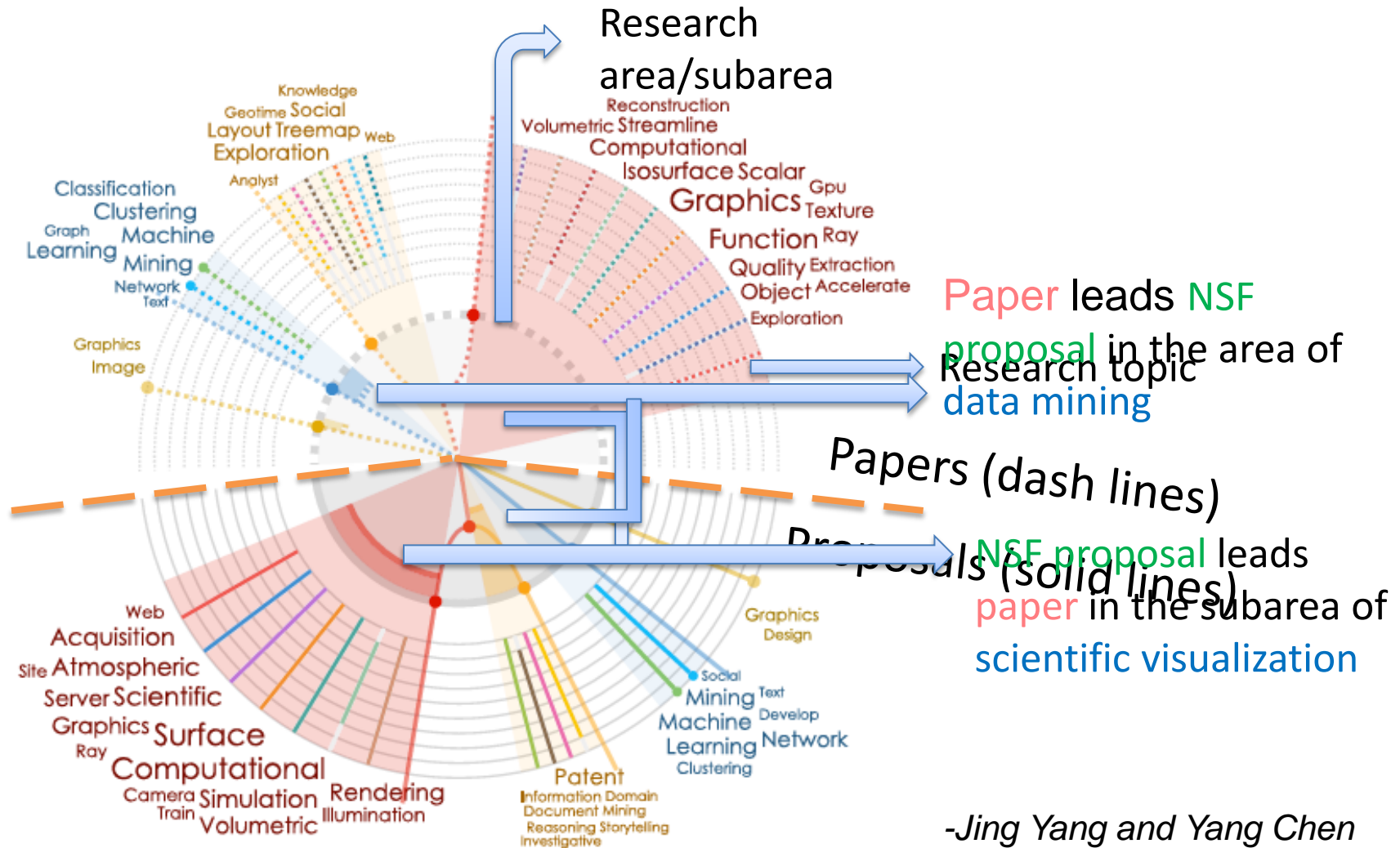
Topic 08 @meganandliz **contest** please @iheartradio customer service risingstar **amazing** commercial produc

Topic 04 week hope recipeshare party top mom congrats twitter won rsvp join congratulations **tonight** worth hills @

Topic 06 enter chance hotel giuliana follow **contest** giveaway guidemetosave dance **http** bag @dongtown cou

Lead-Lag

NSF vs. Papers: Overall leads



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