CiteSpace: Visualizing and Analyzing the Structure and Dynamics of Scientific Fields

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Learning Objectives

• What is the design rationale of CiteSpace?
• What are the primary tasks supported by CiteSpace?
• How can I perform these tasks with CiteSpace?
• What is next?
<table>
<thead>
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<th>Outline</th>
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<td><strong>Introduction</strong></td>
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<tr>
<td><strong>Design Rationale</strong></td>
<td>Basic Ideas</td>
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<tr>
<td>A: Chen (2004) PNAS</td>
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<td>B: Chen (2006) JASIST</td>
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<td>C: Chen et al. (2010) JASIST</td>
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<tr>
<td>Questions and Discussions</td>
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<tr>
<td><strong>Functionality</strong></td>
<td>Data Collection and Expansion</td>
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<tr>
<td>Example 4: A Hands-on Test Project</td>
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<td>Example 5: Two-step citers to the set of {A, B, C}</td>
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<td>Questions and Discussions</td>
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<td><strong>What’s Next</strong></td>
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<tr>
<td>D: Chen (2012) JASIST – Predictive Effects</td>
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<tr>
<td>E: Chen et al. (2013) JASIST – The study of retraction</td>
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<tr>
<td>E: Chen and Leydesdorff (In Press) JASIST – Dual-map Overlays</td>
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<td>Questions and Discussions</td>
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</table>
About Me

Chaomei Chen
College of Information Science and Technology, Drexel University
Information visualization - visual analytics - mapping scientific frontiers
Verified email at cis.drexel.edu
My profile is public

Citation indices

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Since 2008</th>
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<tr>
<td>Citations</td>
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<td>h-index</td>
<td>38</td>
<td>29</td>
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<tr>
<td>i10-index</td>
<td>72</td>
<td>54</td>
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Citations to my articles

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<thead>
<tr>
<th>Title / Author</th>
<th>Cited by</th>
<th>Year</th>
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<tr>
<td>CiteSpace II: Detecting and visualizing emerging trends and transient patterns</td>
<td>604</td>
<td>2006</td>
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<td>in scientific literature</td>
<td></td>
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<tr>
<td>C Chen</td>
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<tr>
<td>Journal of the American Society for Information Science and Technology 57 (3</td>
<td></td>
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<td>Visualizing knowledge domains</td>
<td>603</td>
<td>2003</td>
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<td>K Börner, C Chen, KW Boyack</td>
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<td>Annual review of information science and technology 37 (1), 179-255</td>
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<td>Interacting with hypertext: A meta-analysis of experimental studies</td>
<td>395</td>
<td>1996</td>
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<tr>
<td>C Chen, R Rada</td>
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<td>Human-computer interaction 11 (2), 125-156</td>
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<td>Information visualization: Beyond the horizon</td>
<td>359</td>
<td>2004</td>
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<td>Springer</td>
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<td>Information visualisation and virtual environments</td>
<td>342</td>
<td>1999</td>
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<td>Springer</td>
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<tr>
<td>Searching for intellectual turning points: Progressive knowledge domain visualization</td>
<td>320</td>
<td>2004</td>
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<td>C Chen</td>
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<td>Proceedings of the National academy of Sciences of the United States of ...</td>
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Turning Points
The Nature of Creativity

Mapping Scientific Frontiers
The Quest for Knowledge Visualization
Second Edition
Introduction

• About You
  • Where are you from?
  • What do you do?
  • Have you used CiteSpace?
  • What would you like to know about CiteSpace?
Turning Points of Paradigm Shift
Networks of Co-cited References
Detecting Citation Bursts
## Detecting Citation Bursts

### References with Citation Bursts (20 of 341)

<table>
<thead>
<tr>
<th>References</th>
<th>Year</th>
<th>Strength</th>
<th>Begin</th>
<th>End</th>
<th>1990 - 2011</th>
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Discerning the Structure of a Network

#18 foreign tourism decision

#16 transnational terrorism

#23 september

#24 anticipatory action

#21 explosion

#19 bioterrorism

#22 wound management


Network: N=1357, E=9301 (Density=0.0101)
Modularity Q=0.7428
Mean Silhouette=0.8919

#99 biological terrorism

#122 nuclear window

HOFFMAN B., 1999, INSIDE TERRORISM ...

SCHMID AP, 1988, POLITICAL TERRORISM ...

GALEA S, 2002, NEW ENGL J MED ...
SCHLEINGER WE, 2002, JAMA-J AM MED ASSOC ...

#102 smallpox

#103 blast over-pressure

#105 ocular injury

#107 Australian hospital system

#115 psychometric evaluation

#111 september

#110 september
The Evolution of an Emerging Field
The Evolution of a Field: Biological Therapy
Timeline View of Evolution

#0 medical countermeasure
#1 triacetone triperoxide vapor
#2 malicious attack
#3 deterrence effect
#4 ebola haemorrhagic fever
#5 sexuality
#6 value
#7 liquid-chromatography tandem
#8 framing responsibility
#9 radiation countermeasure agent
#10 explosive evidence
#11 congressional authorization
#12 cyanide detection
#13 in-vivo
#14 human-right
#15 counter-terrorist strategy
#16 transnational terrorism
#17 causal model
#18 foreign tourism decision
#19 bioterrorism
#20 public health management
#21 explosion
#22 wound management
#23 september
#24 anticipatory action
#25 chemical defence
#26 guatemalan indian children
#27 flashhub memory
#28 japan
#29 cyberwar
#30 pharmacological effect
#31 rational-expectation
#32 adolescents concern
#33 nerve gas attack
#34 emotional belief
#35 prospect
#36 differing news frame
#37 consumer
#38 nuclear-energy synergetic
#39 proactive planning
#40 common couple violence
#41 securitization
#42 snowballing threat
#43 tourist
Citations to Retracted Articles
Citations to Retracted Articles
U.S. Patents
U.S. Patents: Yahoo!
U.S. Supreme Court Opinions

Landmark Cases

Gregg v. Georgia
Brown v. Allen
Gideon v. Wainwright
Miranda v. Arizona
Erie Railroad Co. v. Tompkins
Cantwell v. Connecticut
Brown v. Board of Education of Topeka
United States v. Darby
U.S. Supreme Court Opinions
U.S. Supreme Court Opinions
Predictive Effects of Structural Variation
Predictive Effects

#14 allergic rhinitis
#7 intestinal premalignant lesion
#10 regulatory t cell
#19 dendritic cell
#11 cyclophosphamide
#13 melanoma
#20 t cell
#15 prostate cancer
Concept Trees and Predicate Trees

The Origin of Species by Charles Darwin (1872)
A 13,583-node concept tree (left) and a 5,180 node predicate tree (right) (both partially shown)

- Great majority of naturalists believed that species...
- Forms of life are...
- It...
- He...
- We...
- They...
- Many exotic plants have...
- Mass of combustible matter is...
Geospatial Overlays
Dual-Map Overlays

Citation Overlays of Three Organizations (2008.1.1 – 2012.12.31)

Google: 620 articles

Microsoft: 1,050 articles

IBM: 3,965 articles
JCR Journal Dual-Map Overlays
JCR Journal Dual-Map Overlays

Base Map of Citing Journals

Add overlays

18. HISTORY, PHILOSOPHY,
Show cited journals

Show citation arcs

Show co-citation links

Show holistic trajectories

Web of Science®

Drifts

Trajectories
Edward Witten
Articles: 206 (1980-2011)
Red: discipline level
Blue: journal level

Disciplines:
- Physics (29 times)
- Mathematics (3 times)

Trajectory of Citing Journals
- Stable and compact core
- Mostly short-range shifts
- Few long-range shifts

Trajectory of Cited Journals
- Mostly near-range shifts
- Occasionally short-range shifts

Ben Shneiderman
Articles: 132 (1980-2012)
Red: discipline level
Blue: journal level

Disciplines:
- Mathematics/Computing (17 times)
- Psychology (8 times)
- Biology (2 times)
- Ecology (1 time)

Trajectory of Citing Journals
- Recurring multiple cores
- Combined short- and long-range shifts

Trajectory of Cited Journals
- More long-range shifts and short-range ones
- No linear trend
Resources

My Homepage
http://www.pages.drexel.edu/~cc345/

CiteSpace
http://cluster.cis.drexel.edu/~cchen/citespace

Google Citation Profile
http://scholar.google.com/citations?user=IjN4HSRsdakC&hl=en

ResearchGate
http://www.researchgate.net/profile/Chaomei_Chen/

CiteSpace on Facebook
https://www.facebook.com/pages/CiteSpace/276625072366558