

Use of Social Network Analysis in Bibliometric Researches

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Outline

- ❑ Methodology
- ❑ Literature
 - ❑ Social network analysis (SNA)
 - ❑ Some related terms
 - ❑ Development of the research on the SNA
 - ❑ Some related terms
 - ❑ Tools for the SNA
- ❑ Examples
- ❑ Conclusion

Methodology

- ❑ Literature review
- ❑ Data source *Web of Knowledge (WoK)*
- ❑ Data set covers 1928-2009
- ❑ Authored by the scholars affiliated with Turkish institutions
- ❑ Data cleaning process
- ❑ There is no document type distinction
- ❑ 198,687 (All TR addressed publications)
- ❑ 14,365 (TR addressed surgery publications)

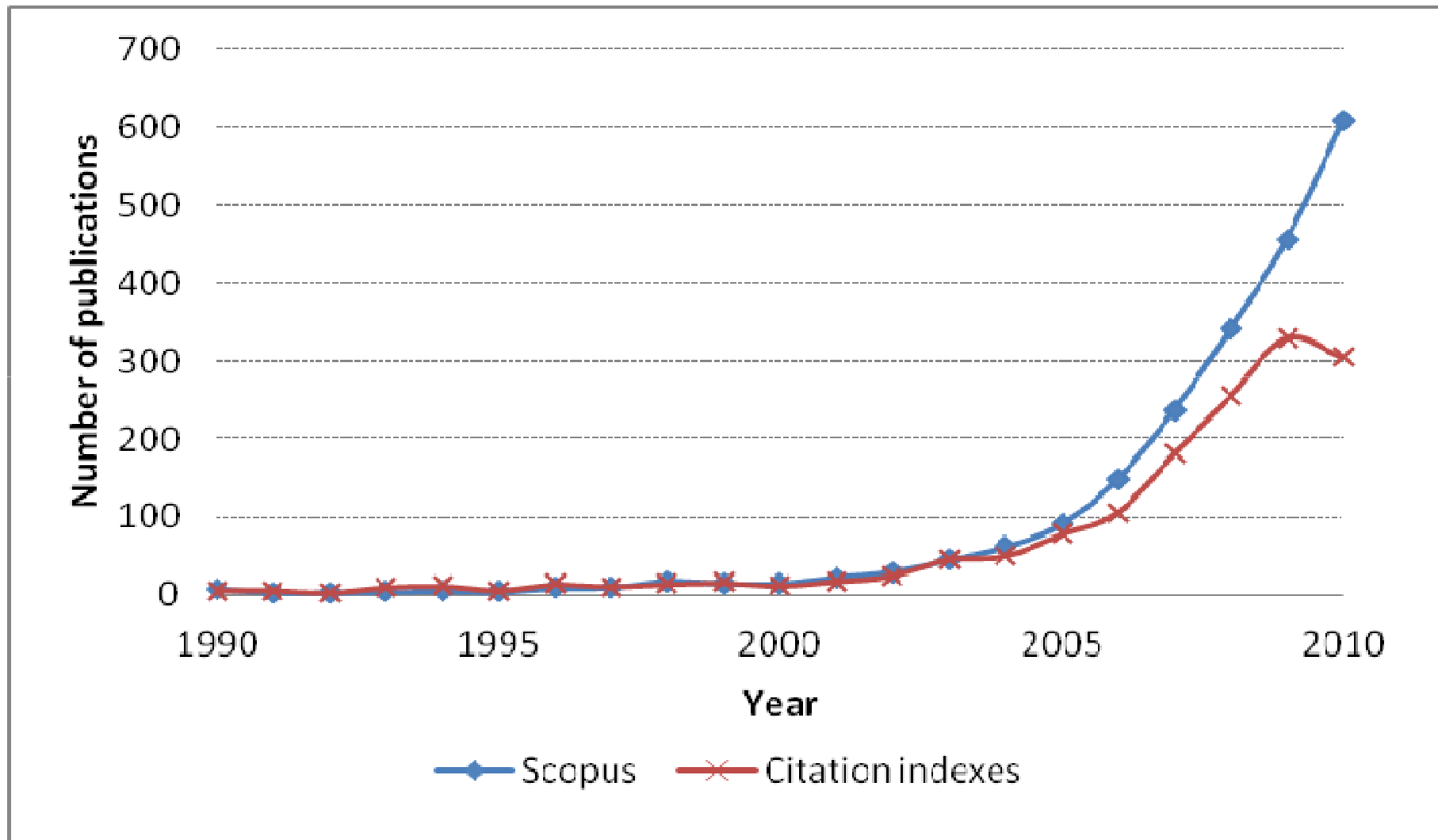
Social Network Analysis (SNA)

- ❑ “SNA is motivated by a structural intuition based on ties linking social actors,
- ❑ It is grounded in systematic empirical data,
- ❑ It draws heavily on graphic imagery,
- ❑ It relies on the use of mathematical an/or computational models” (Freeman 2004, p. 3)
- ❑ Different application areas
- ❑ Sociology, anthropology, social psychology, economics...

Bibliometrics

- ❑ “The application of mathematical and statistical methods to books and other media of communication” (Pritchard 1969, p. 348)
- ❑ Quantitative and qualitative research evaluation studies
 - ❑ Number of publications, citations, citation per publication
 - ❑ Impact factor
 - ❑ *h*-index
 - ❑ Relative citation impact
 - ❑ ...

of Publications on SNA (1990-2010)



Some Related Terms

- ❑ Density: An indicator for the general level of connectedness of the graph
- ❑ Degree centrality: It is equal to the number of connections that an actor has with other actors
- ❑ Closeness: A high closeness for an actor means that he or she is related to all others through a small number of paths
- ❑ Betweenness: It is based on the number of shortest paths passing through an actor

(Otte & Rousseau 2002, p. 447)

Tools for the SNA

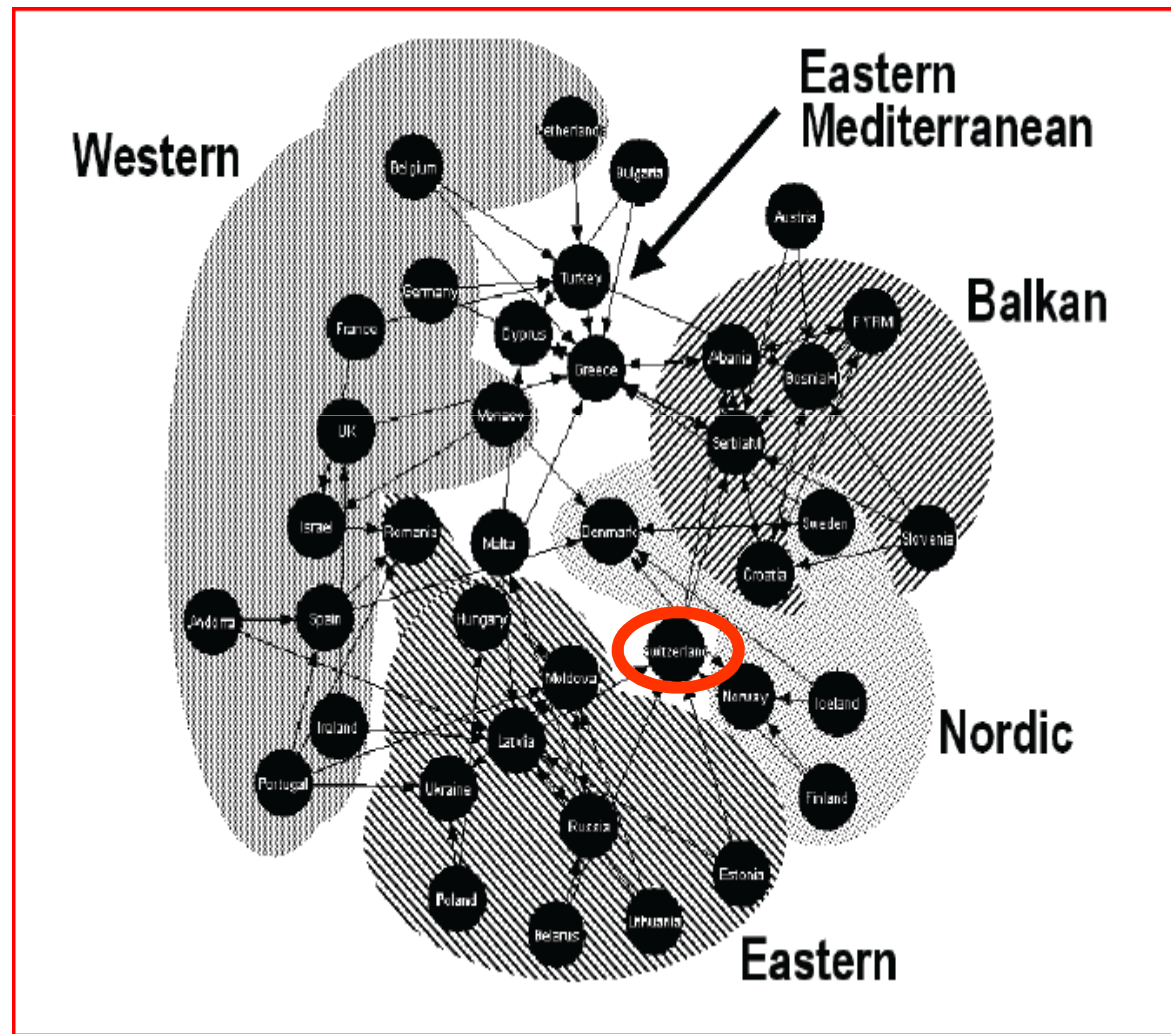
- ❑ **Bibexcel** (<http://www8.umu.se/inforsk/Bibexcel>): It can produce net-files for co-authorships, co-citations etc, and then convert these for further analysis and visualization with Pajek
- ❑ **Pajek** (<http://pajek.imfm.si>): It calculates most of the centrality measures
- ❑ **UCINET** (<http://www.analytictech.com/ucinet>): The matrix analysis routines
- ❑ **CiteSpace** (<http://cluster.cis.drexel.edu/~cchen/citespace>): Freely available Java application

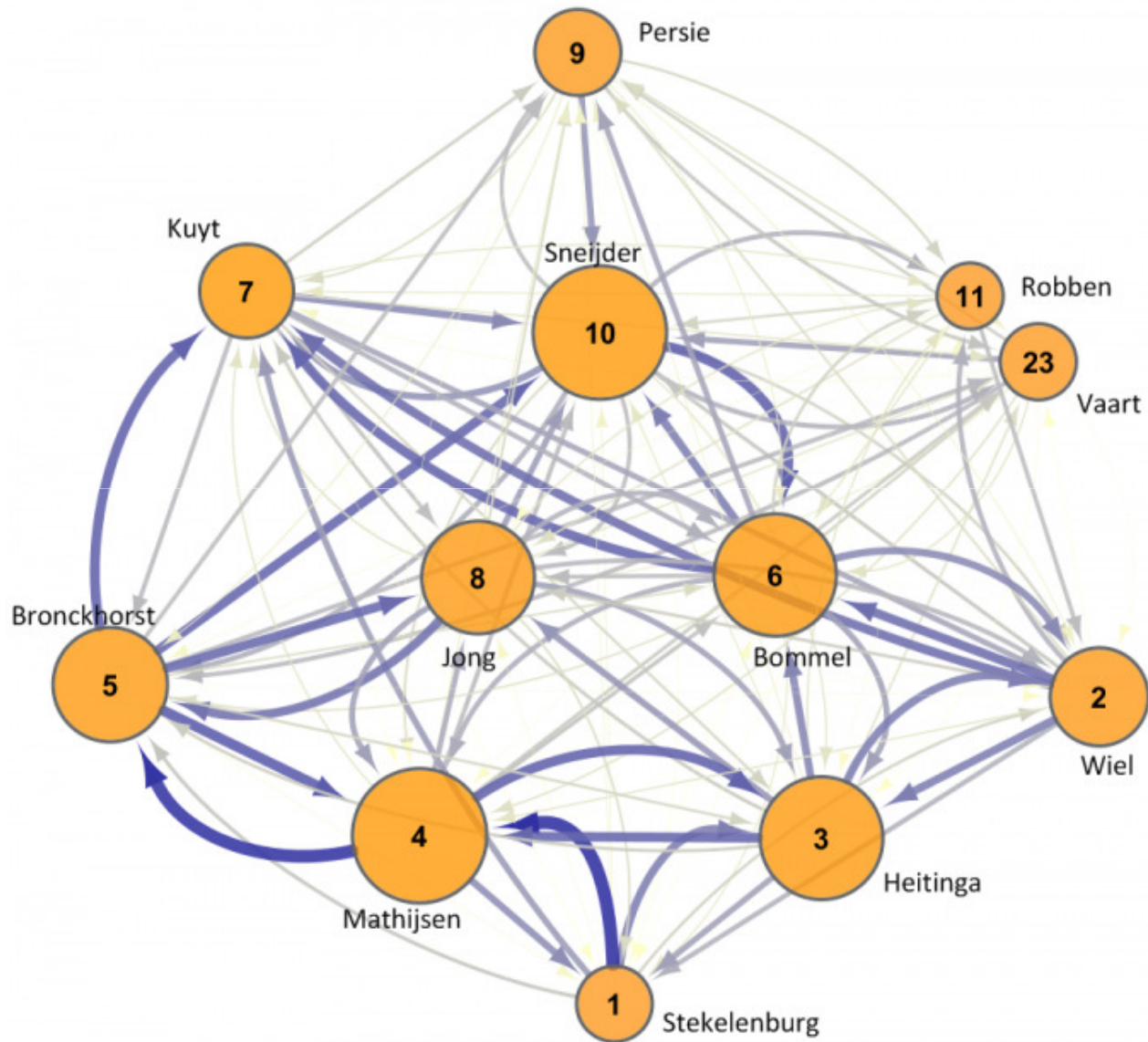
Examples from Literature

The Eurovision Song Contest as a 'Friendship' Network

Anthony Dekker

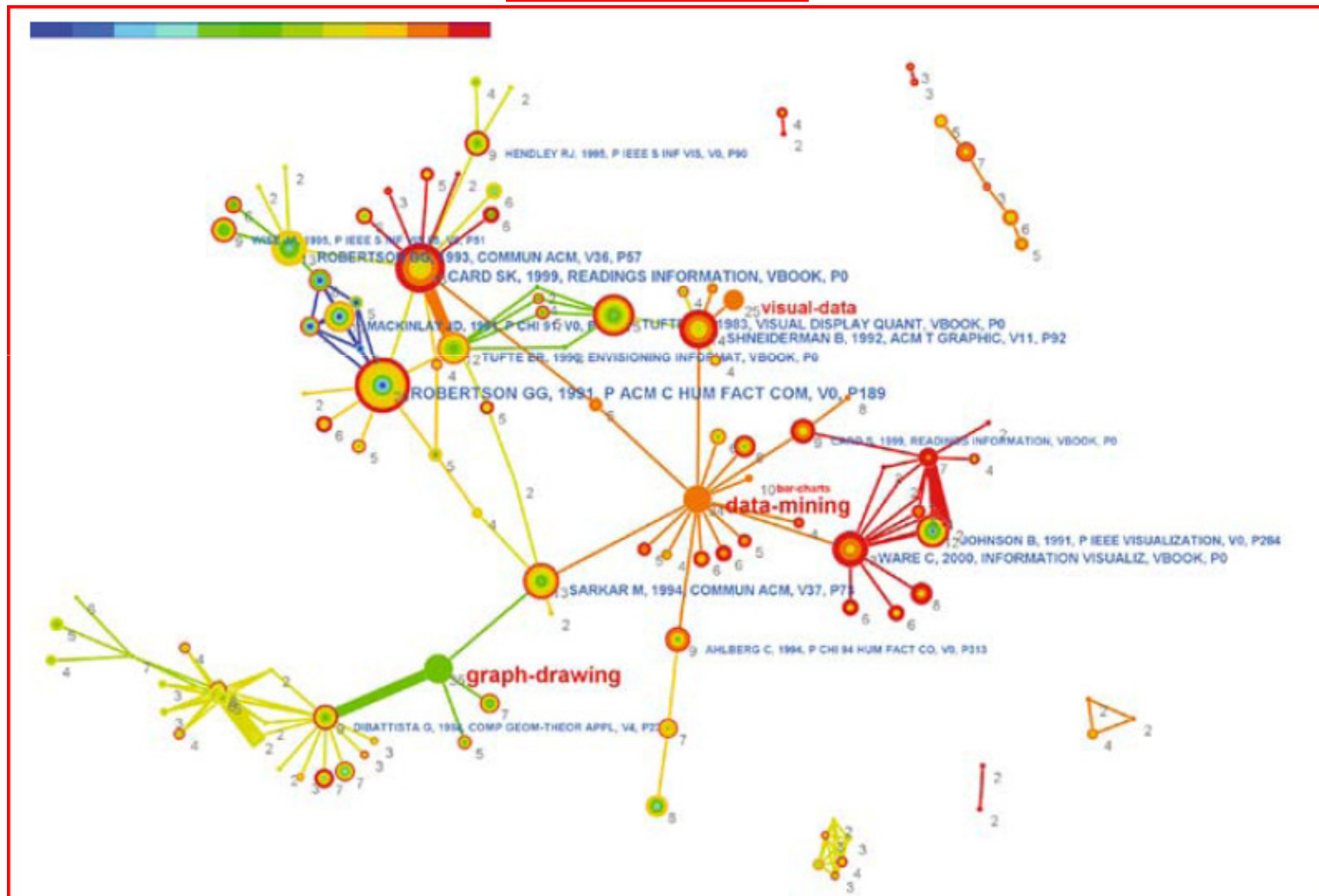
Australian Defence Science and Technology Organisation (DSTO)





Chaomei Chen

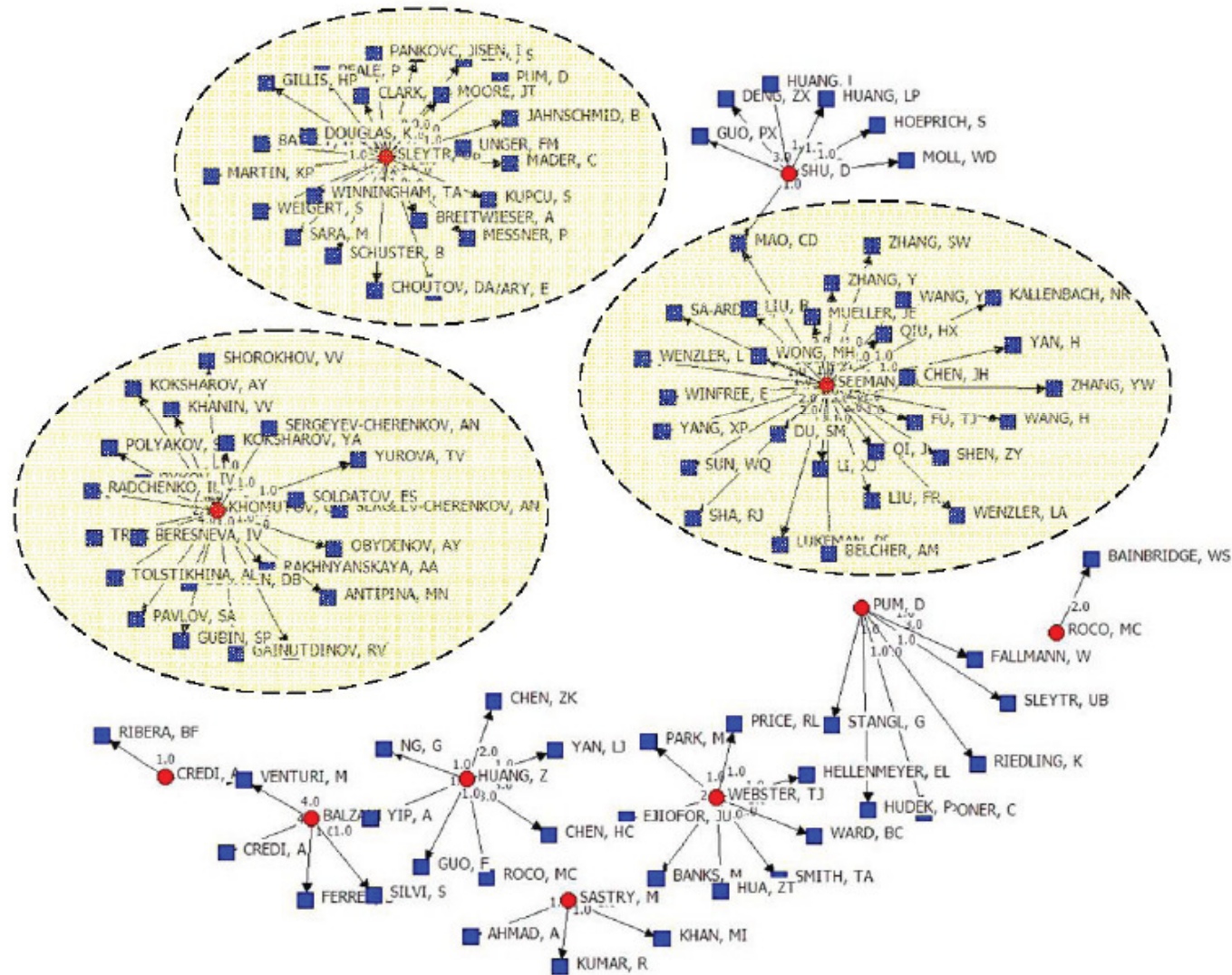
Information Visualization Beyond the Horizon



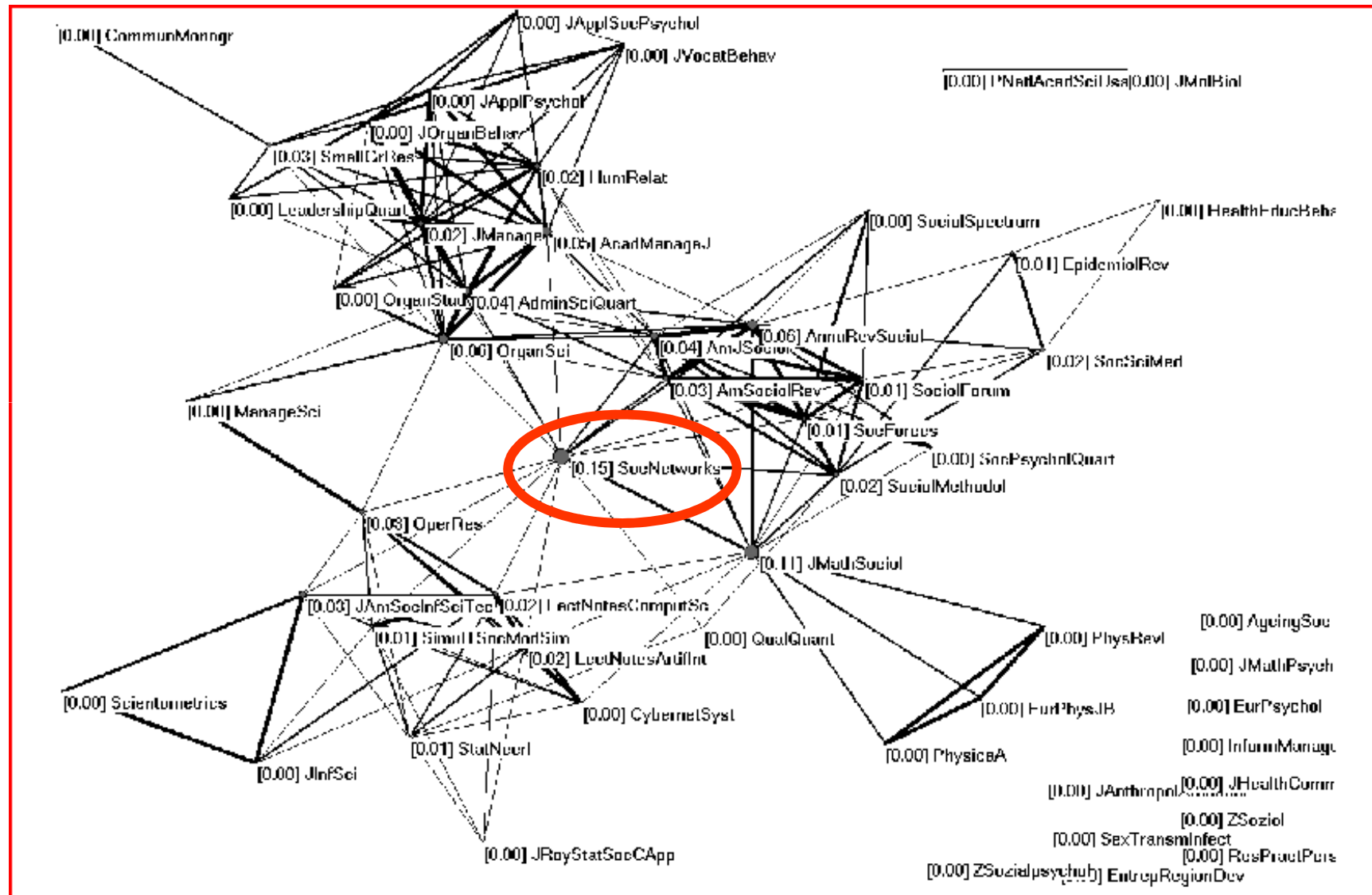
Bibliometrics and Social Network Analysis of the Nanotechnology Field

Guillermo Rueda, Pisek Gerdri, Dundar F. Kocaoglu

Department of Engineering and Technology Management, Portland State University, USA

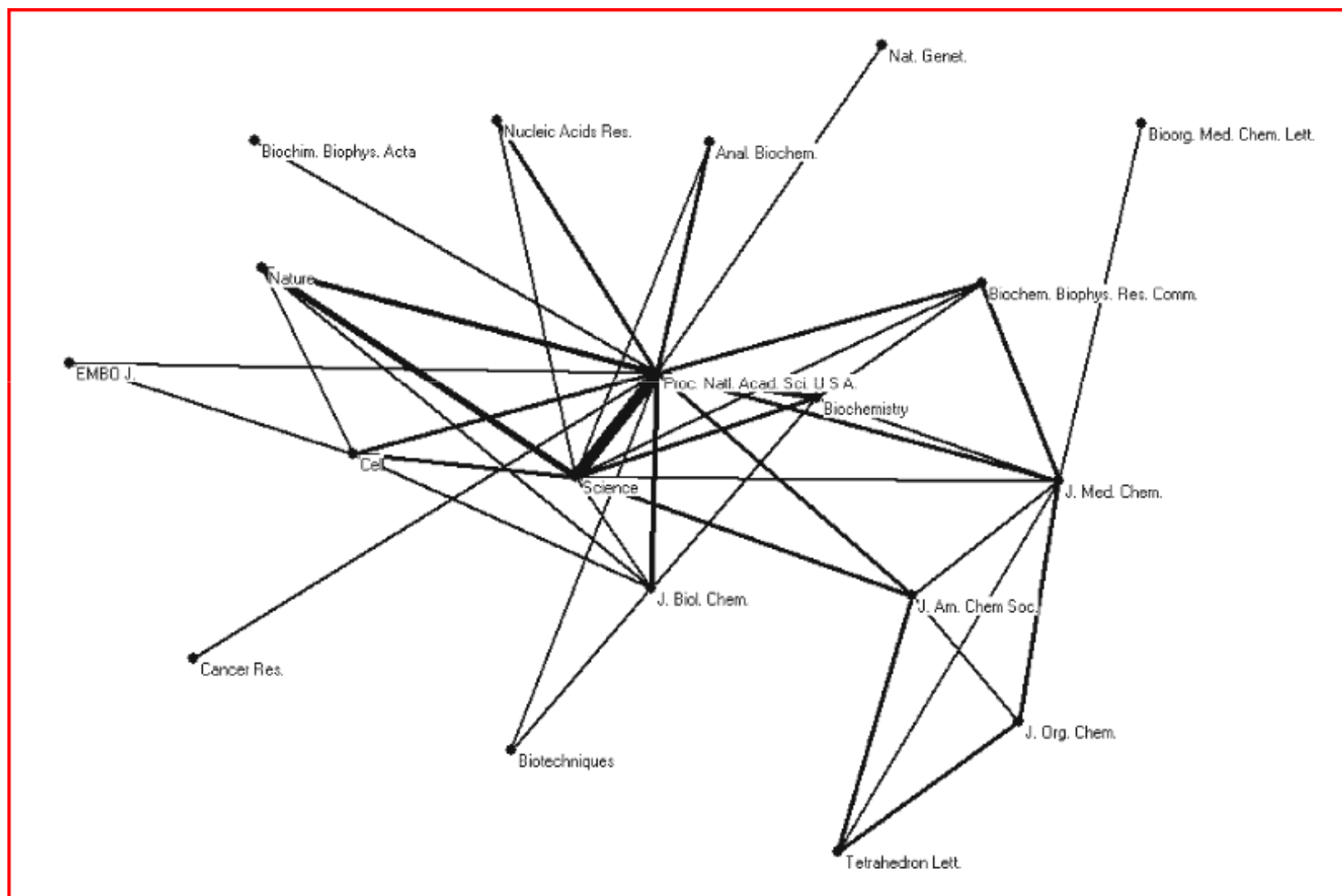


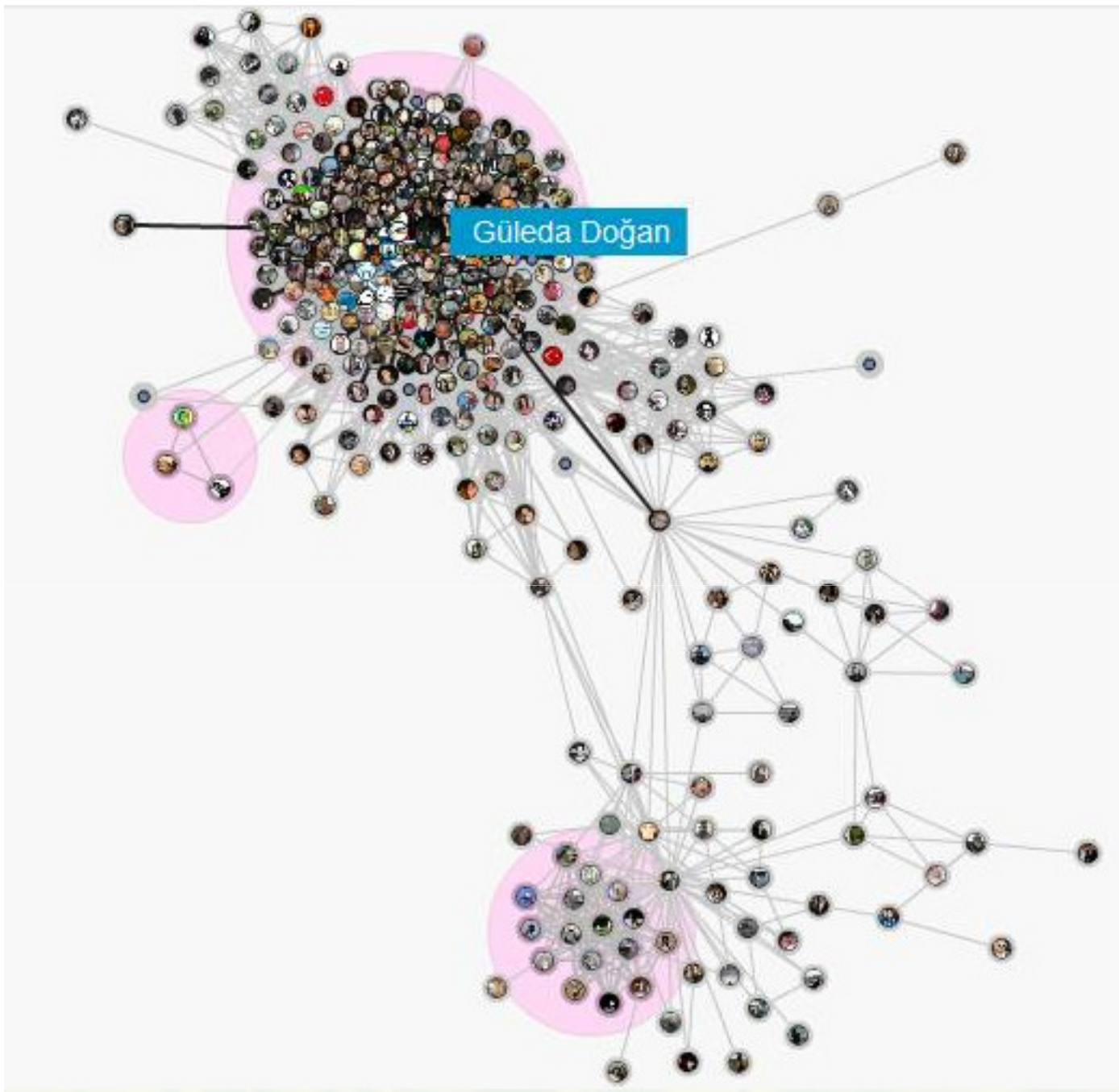
Betweenness Centrality as an Indicator of the Interdisciplinarity of Scientific Journals



Networks of scientific journals: An exploration of Chinese patent data

XIA GAO,^a JIANCHENG GUAN^b





Our Examples

Interface of CiteSpace

Projects

New More Actions ...

Project Home: C:\tubitak-2011\project

Data Directory: C:\tubitak-2011\data

GO! Stop Reset JVM Memory 475 (MB) Used 16 %

Space Status

1975-1977	top 10.0%	0	0	0
1978-1980	top 10.0%	0	0	0
1981-1983	top 10.0%	0	0	0
1984-1986	top 10.0%	0	0	0
1987-1989	top 10.0%	0	0	0
1990-1992	top 10.0%	701	70	155
1993-1995	top 10.0%	1677	100	439
1996-1998	top 10.0%	3534	100	762
1999-2001	top 10.0%	5011	100	978
2002-2004	top 10.0%	8495	100	1549
2005-2007	top 10.0%	11281	100	1813
2008-2009	top 10.0%	9524	100	1484

Process Reports

2005-2007 downloadFieldDelimitedSurgery.txt 14365
3907

2008-2009 downloadFieldDelimitedSurgery.txt 14365
2707

Records in the dataset: 186745
Records within the chosen range: 11713

Run time: 94.969 seconds

Merged network: Nodes=237, Links=4508
Exclusion List: 0
Network modeling ends at Mon Nov 28 16:10:05 EET 2011.

Time Slicing

From 1972 To 2009 #Years Per Slice 3 Entropy

Text Processing

Term Source
 Title Abstract Descriptors Identifiers

Term Type
 None Noun Phrases Burst Terms Detect Bursts

Network Configuration

Node Types
 Author Institution Country Term Keyword Category

Cited Reference Cited Author Cited Journal Paper Grant

Links
Strength Cosine Scope Within Slices

Top N per slice Top N% per slice Threshold Interpolation Select Cifers

Select top 10.0 % of most cited or occurred items from each slice.
The maximum number of selected items per slice 100 .

Pruning

Pathfinder Pruning sliced networks
 Minimum Spanning Tree Pruning the merged network

Visualization

Cluster View - Static Show Networks by Time Slices
 Cluster View - Animated Show Merged Network

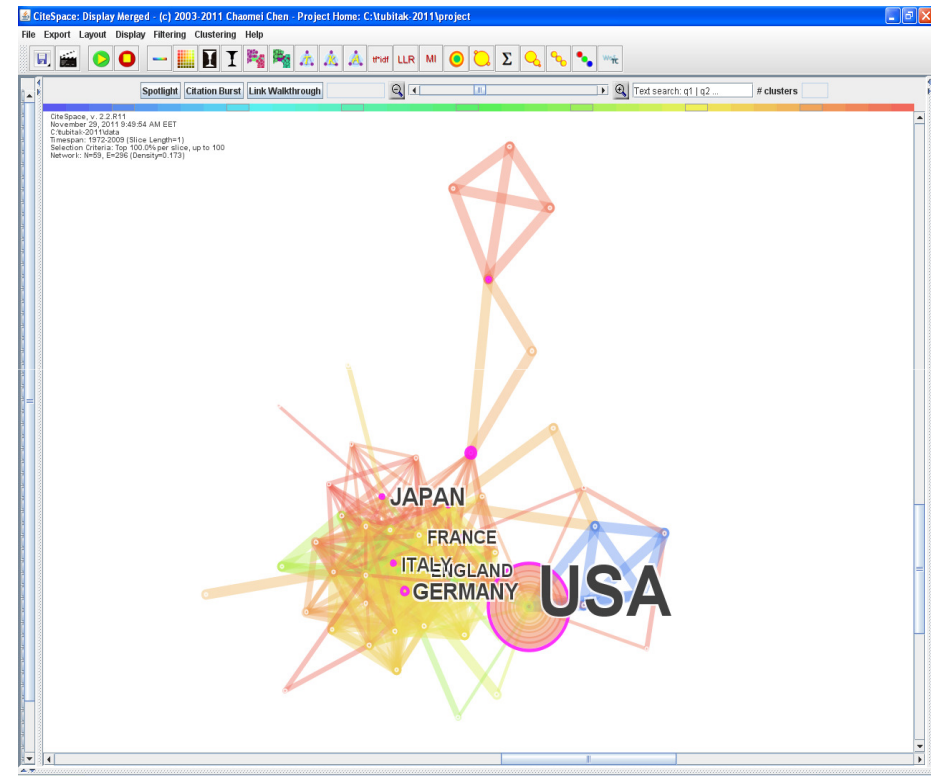
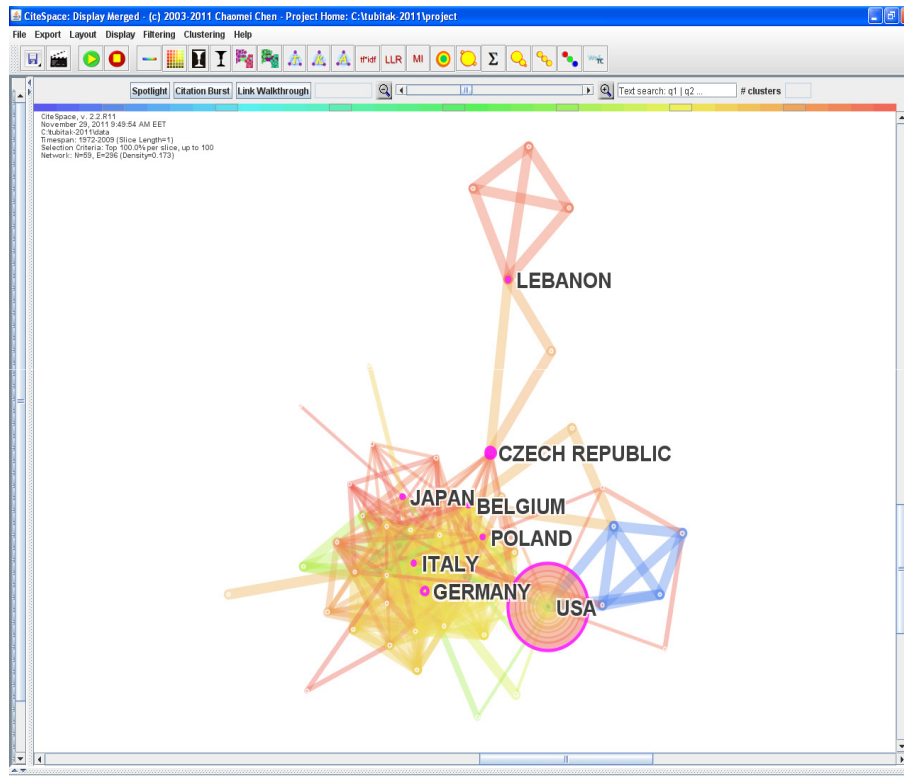
Collaboration Network of Turkey Addressed Surgery Publications

CiteSpace: Display Merged - (c) 2003-2011 Chaomei Chen - Project Home: C:\tubitak-2011\project

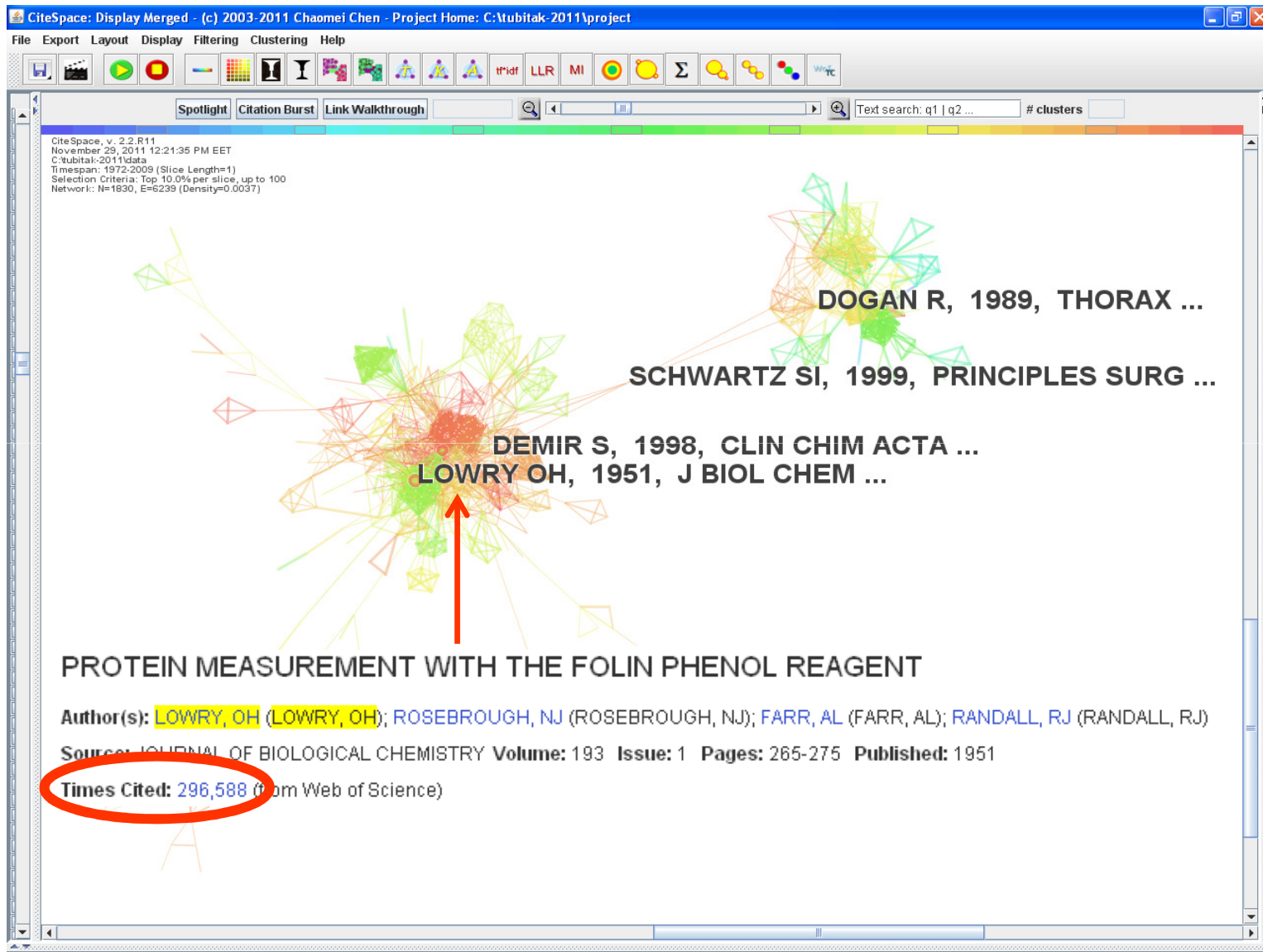
File Export Layout Display Filtering Clustering Help

Visible	Freq	Centrality	Year	Cited References
<input checked="" type="checkbox"/>	7	0.29	2004	CZECH REPUBLIC
<input checked="" type="checkbox"/>	68	0.18	1990	JAPAN
<input checked="" type="checkbox"/>	3	0.18	2004	LEBANON
<input checked="" type="checkbox"/>	552	0.15	1975	USA
<input checked="" type="checkbox"/>	41	0.15	1994	ITALY
<input checked="" type="checkbox"/>	21	0.15	1998	BELGIUM
<input checked="" type="checkbox"/>	10	0.12	1996	POLAND
<input checked="" type="checkbox"/>	64	0.11	1989	GERMANY
<input checked="" type="checkbox"/>	21	0.08	1994	SPAIN
<input checked="" type="checkbox"/>	13	0.08	1995	BRAZIL
<input checked="" type="checkbox"/>	19	0.07	1991	SWEDEN
<input checked="" type="checkbox"/>	12	0.07	1992	NETHERLANDS
<input checked="" type="checkbox"/>	26	0.06	1993	SWITZERLAND
<input checked="" type="checkbox"/>	8	0.06	1999	GREECE
<input checked="" type="checkbox"/>	39	0.05	1986	ENGLAND
<input checked="" type="checkbox"/>	37	0.05	1988	FRANCE
<input checked="" type="checkbox"/>	12	0.05	1984	SCOTLAND
<input checked="" type="checkbox"/>	24	0.04	1999	AUSTRIA
<input checked="" type="checkbox"/>	2	0.04	1975	THAILAND
<input checked="" type="checkbox"/>	13	0.03	1992	NORWAY
<input checked="" type="checkbox"/>	10	0.03	2001	ISRAEL
<input checked="" type="checkbox"/>	9	0.03	2001	FINLAND
<input type="checkbox"/>	13963	0.02	1972	TURKEY
<input checked="" type="checkbox"/>	30	0.02	1988	CANADA
<input checked="" type="checkbox"/>	11	0.02	2008	W IND ASSOC ST
<input checked="" type="checkbox"/>	10	0.02	2005	AUSTRALIA
<input checked="" type="checkbox"/>	4	0.02	2001	MEXICO
<input checked="" type="checkbox"/>	2	0.02	1975	SINGAPORE
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<input checked="" type="checkbox"/>	14	0.00	2008	GRENADA
<input checked="" type="checkbox"/>	8	0.00	2004	SOUTH KOREA
<input checked="" type="checkbox"/>	8	0.00	2002	PEOPLES R CHINA
<input checked="" type="checkbox"/>	5	0.00	2005	NEW ZEALAND
<input checked="" type="checkbox"/>	3	0.00	2004	DENMARK
<input checked="" type="checkbox"/>	3	0.00	2005	CYPRUS
<input checked="" type="checkbox"/>	2	0.00	1997	HUNGARY
<input checked="" type="checkbox"/>	2	0.00	1999	ARGENTINA
<input checked="" type="checkbox"/>	2	0.00	1975	MALAYSIA
<input checked="" type="checkbox"/>	2	0.00	2009	SERBIA
<input checked="" type="checkbox"/>	2	0.00	1996	RUSSIA
<input checked="" type="checkbox"/>	2	0.00	2003	SAUDI ARABIA
<input checked="" type="checkbox"/>	2	0.00	2005	WALES
<input checked="" type="checkbox"/>	1	0.00	2005	INDIA
<input checked="" type="checkbox"/>	1	0.00	2009	UZBEKISTAN
<input checked="" type="checkbox"/>	1	0.00	2005	PAKISTAN
<input checked="" type="checkbox"/>	1	0.00	2002	SERBIA MONTENEG
<input checked="" type="checkbox"/>	1	0.00	2009	ALGERIA
<input checked="" type="checkbox"/>	1	0.00	2004	PORTUGAL
<input checked="" type="checkbox"/>	1	0.00	2008	SYRIA
<input checked="" type="checkbox"/>	1	0.00	2000	AZERBAIJAN
<input checked="" type="checkbox"/>	1	0.00	2000	ISLAND

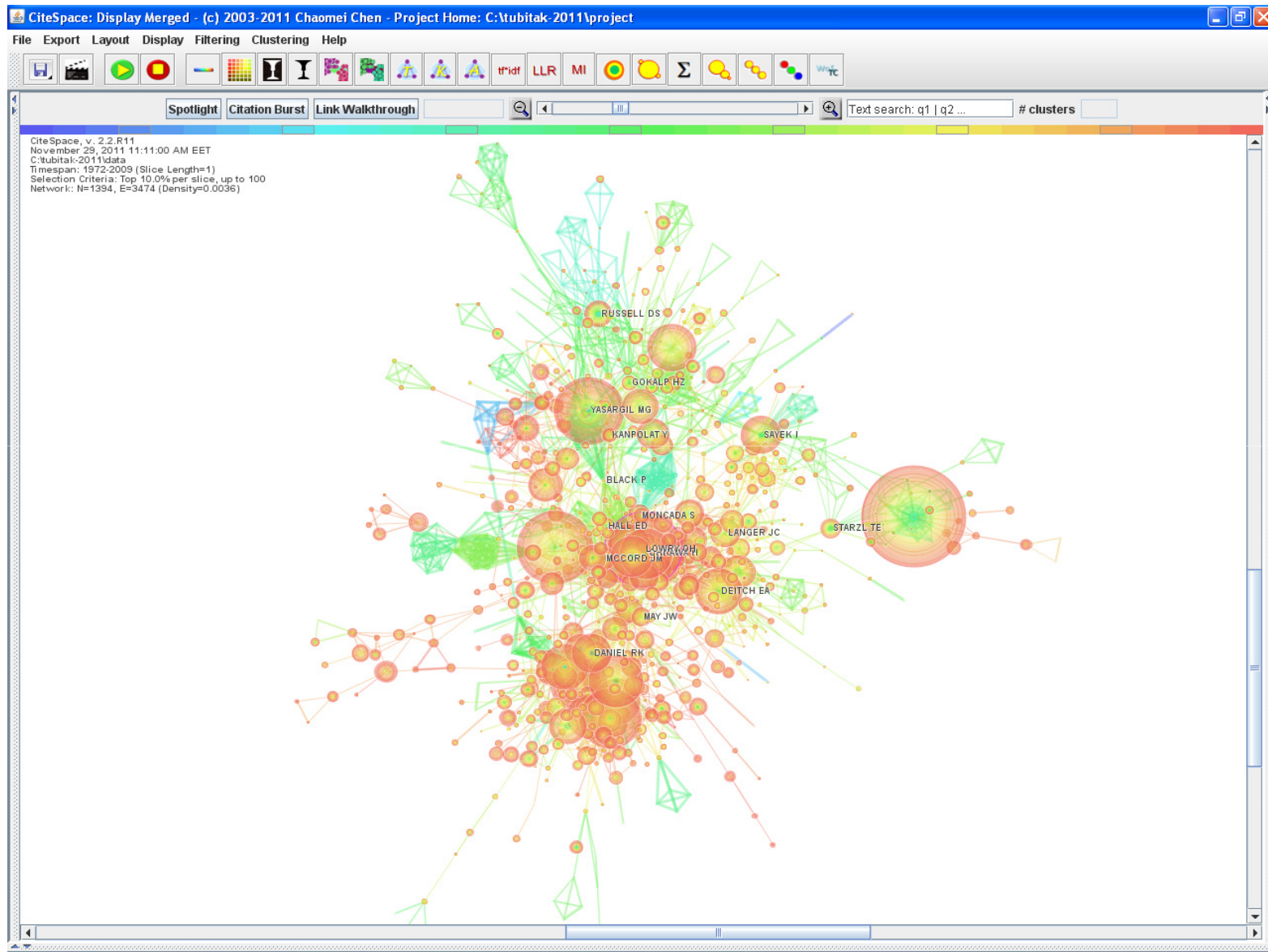
Collaboration Network of Turkey Addressed Surgery Publications



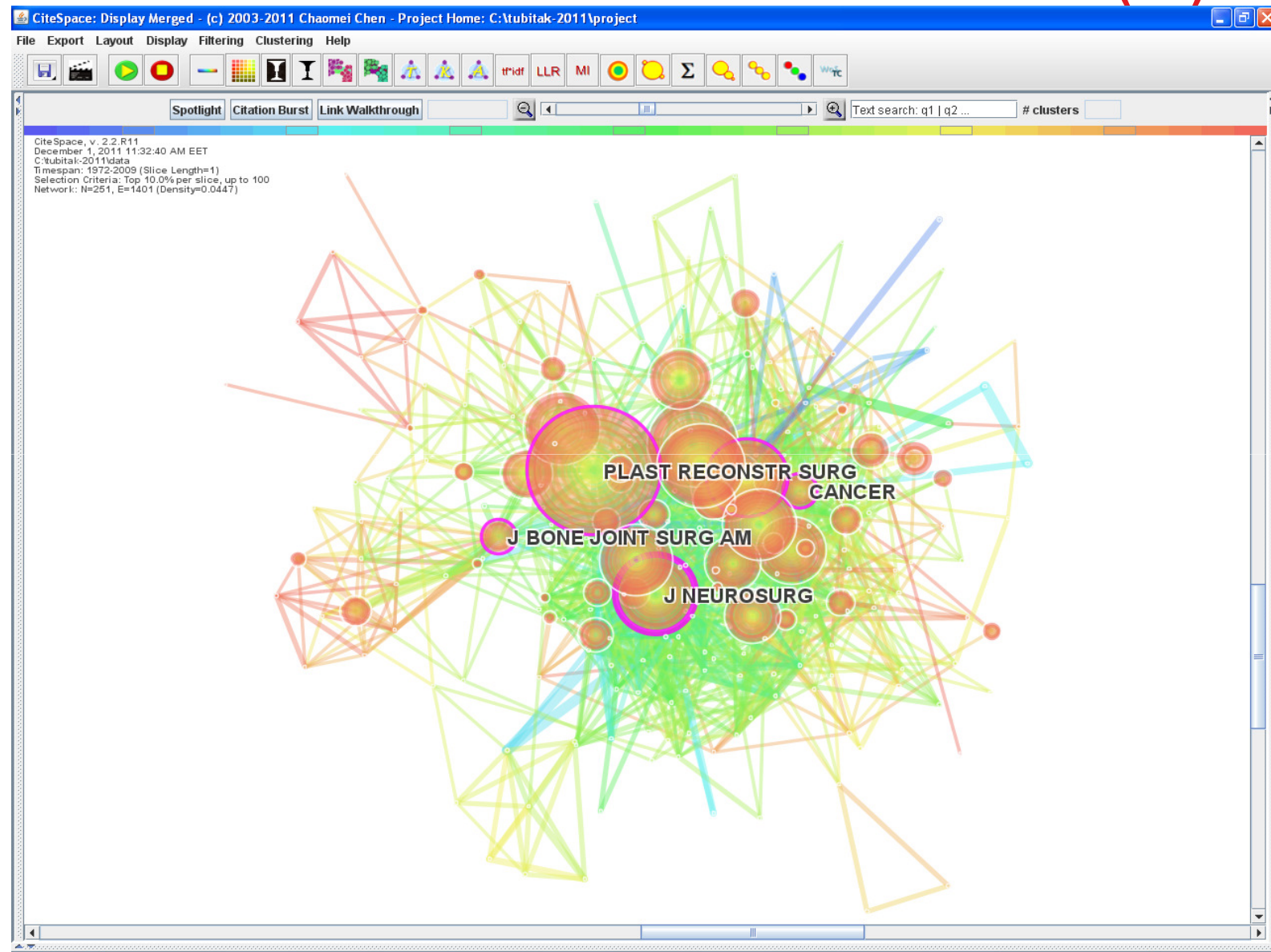
Document Co-citation Network



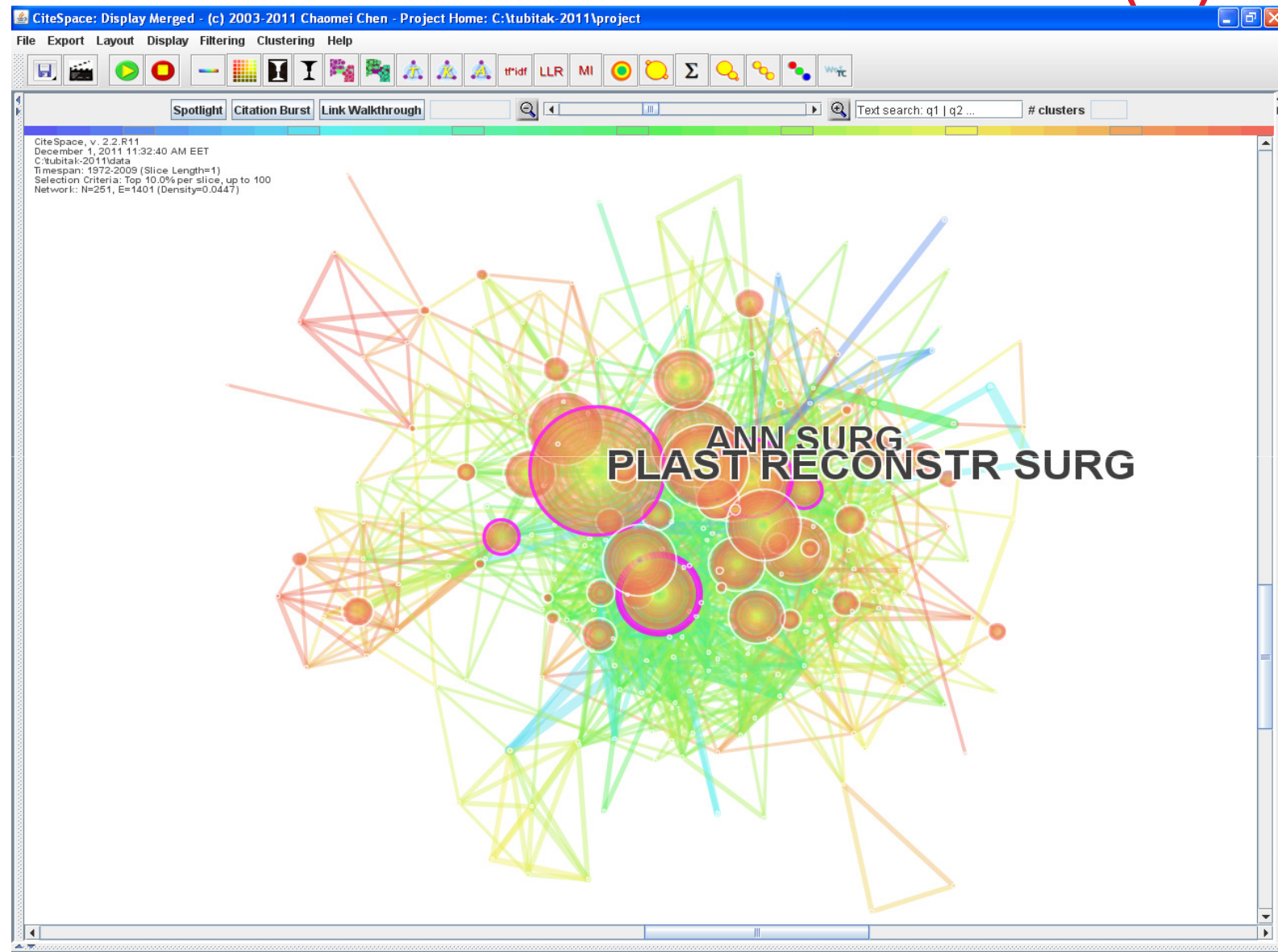
Author Co-citation Network



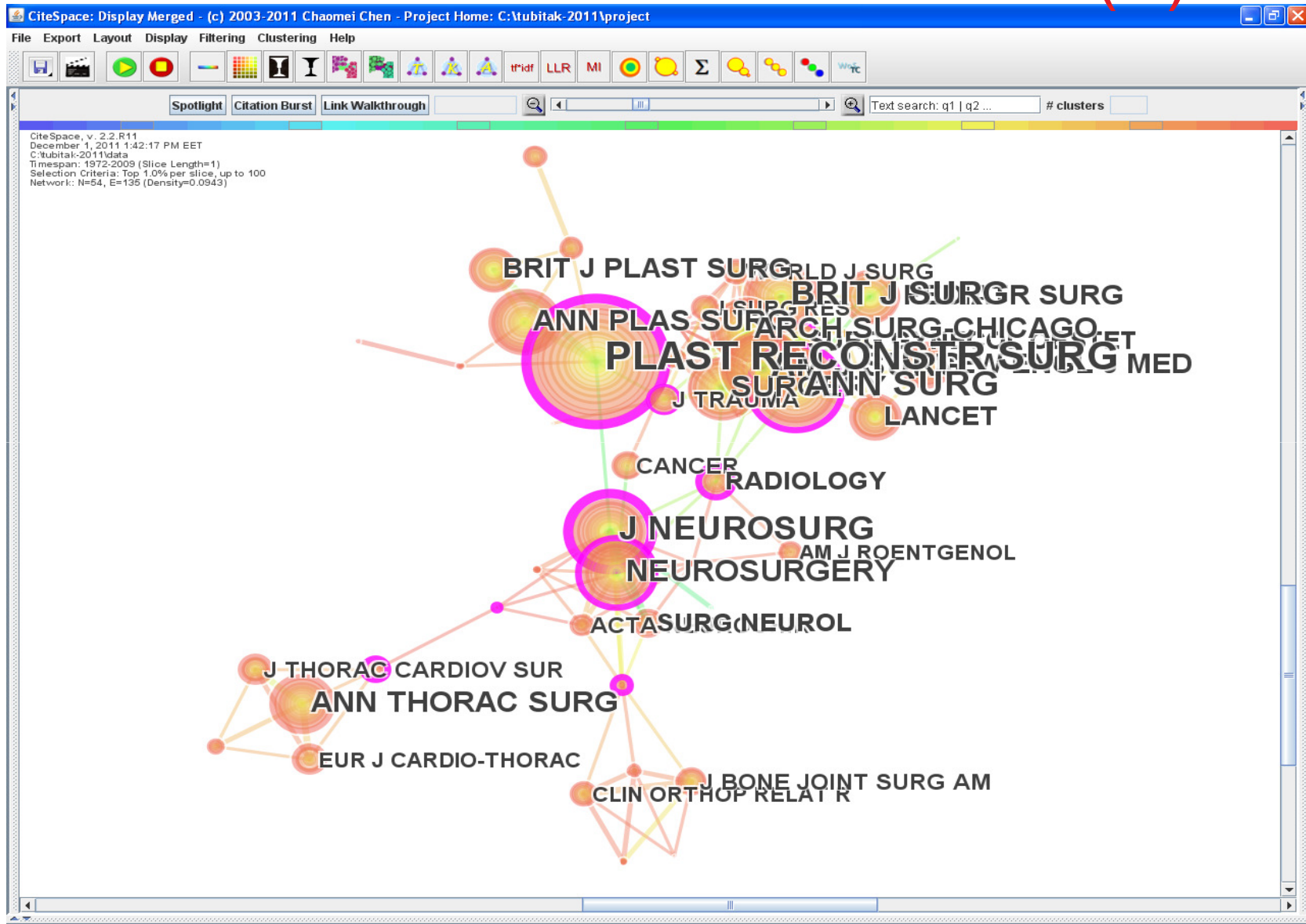
Journal Co-citation Network (1)



Journal Co-citation Network (2)



Journal Co-citation Network (3)



Conclusion

- ❑ SNA is an emerging field, and it has gained importance in recent years in the related literature
- ❑ SNA method can be used to measure the impact of different actors in scholarly communication
- ❑ To help better understanding for network structures and bibliometric raw data

Acknowledgments

- This study is supported by a research grant (no: 110K044) of the Turkish Scientific and Technological Research Center (TÜBİTAK).

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