

Social Network Analysis: Nuts & Bolts

Papp KK¹, Zhang GQ²

¹Director, Program Evaluation, CTSC, ²Professor,
Electrical Engineering and Computer Science,
Professor, Center for Proteomics and Bioinformatics,
Director of Research Informatics, Center for Clinical
Investigation



Outline

- Define social network analysis (SNA)
- Describe types of networks
- The language of SNA
 - size, density, nodes, vertices, paths, centrality, betweenness, boundary spanner, information broker, peripheral specialist.
- SNA Software Package
- Issues & interesting applications



Define SNA

What is SNA?

A visual technique to discern patterns of relationships or ties among, for example, people, groups of people and organizations or units.

It uses graph theory and sociograms and yields numerical indices that may be used to describe the network.



What is SNA?

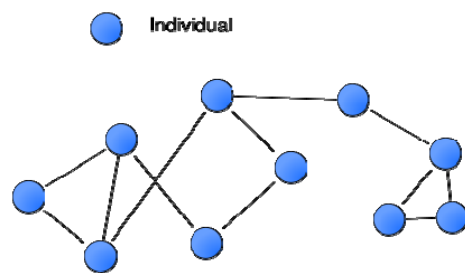
Who reports liking whom?

Choice:

Chooser:	Bob	Carol	Ted	Alice
Bob	---	0	1	1
Carol	1	---	0	1
Ted	0	1	---	1
Alice	1	0	0	---



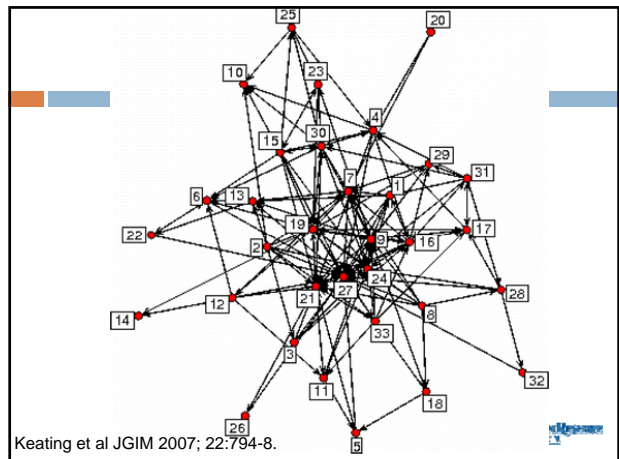
A sociogram showing ties



Network Matrix

Start/ end	1	2	3	4	5	6	7	8	9	10
1	0	0	0	0	0	0	1	0	1	0
2	0	0	1	0	0	0	1	0	0	1
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	1	0	1	0
9	1	0	0	0	0	0	1	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Keating et al JGIM 2007; 22:794-8.



Keating et al JGIM 2007; 22:794-8.



A typology of ties studied in social network analysis

Similarities			Social Relations			Interactions	Flows	
Location	Membership	Attribute	Kinship	Other role	Affective	Cognitive		
e.g., Same spatial and temporal space etc.	e.g., Same clubs Same events etc.	e.g., Same gender Same attitude etc.	e.g., Mother of Sibling of	e.g., Friend of Boss of Student of Competitor of	e.g., Likes Hates etc.	e.g., Knows Knows about Sees as happy etc.	e.g., Sex with Talked to Advice to Helped Harmed etc.	e.g., Information Beliefs Personnel Resources etc.

S. P. Borgatti et al., *Science* 323, 892-895 (2009)

Published by AAAS

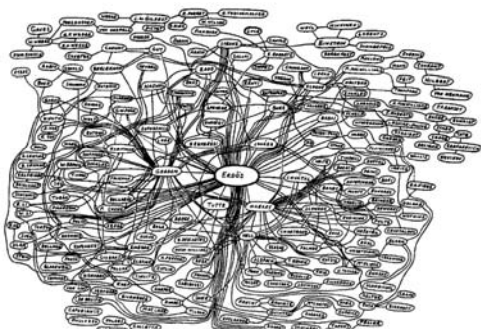


Describe types of networks

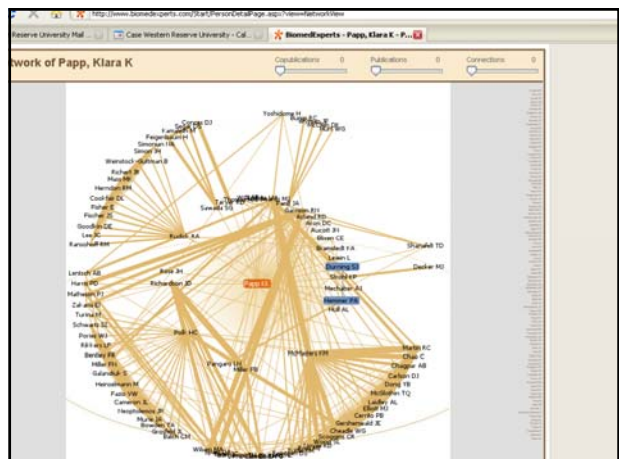
Individual—defined from a focal node's perspective

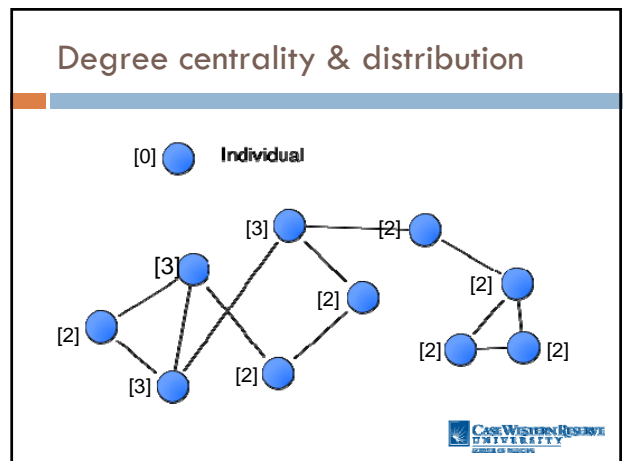
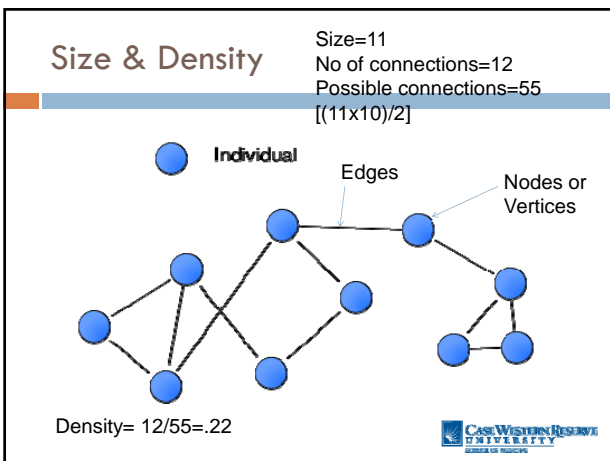
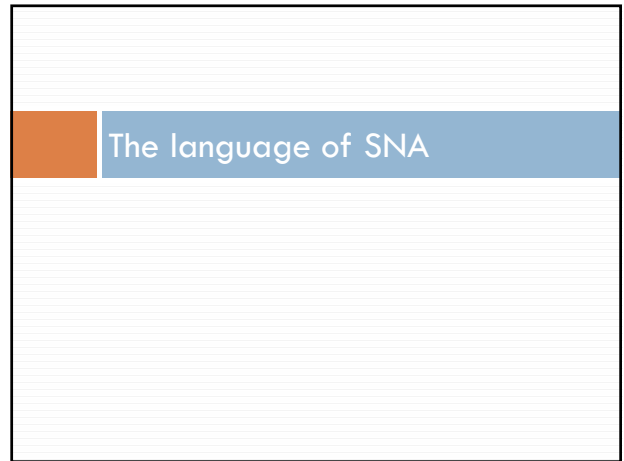
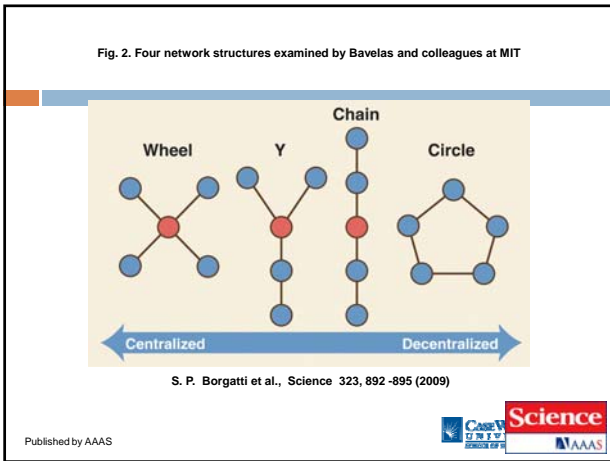
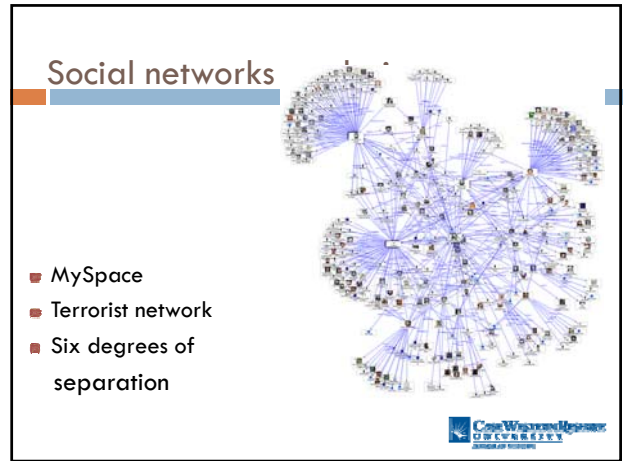
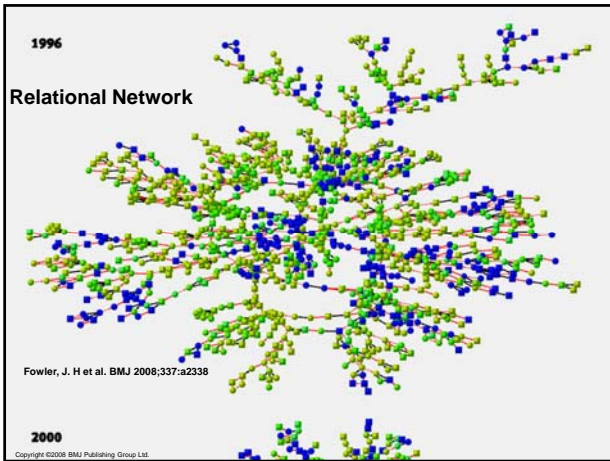
Relational—focuses on the relationships among nodes not the individual nodes themselves.

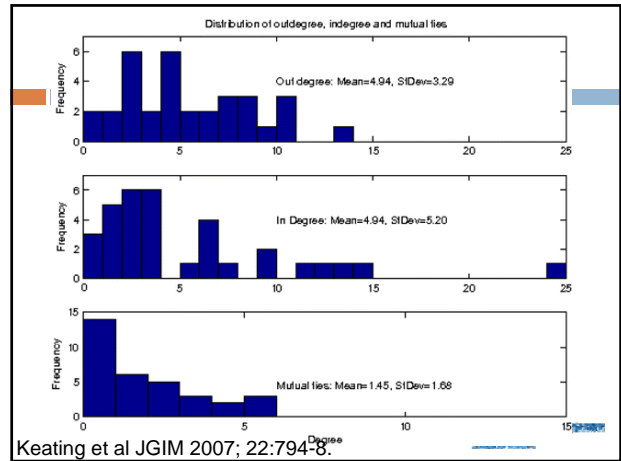
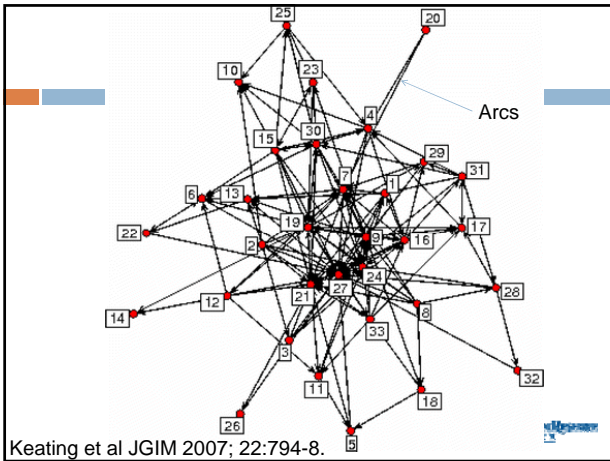
Erdős number



Balaban & Klein, *Scientometrics*02







Degree centrality

Degree centrality is simply the number of direct links that an entity has. An entity with high degree centrality:

- Is generally an active player in the network.
- Is often a connector or hub in the network.
- Is not necessarily the most connected entity in the network.
- May be in an advantaged position in the network.
- May have alternative avenues to satisfy organizational needs, and consequently may be less dependent on other individuals.
- Can often be identified as third parties or deal makers.

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Betweenness

Betweenness centrality identifies an entity's position within a network in terms of the number of occurrences between the shortest paths between other pairs of vertices in the network. An entity with a high betweenness centrality generally:

- Holds a favored or powerful position in the network.
- Represents a single point of failure—take the single betweenness spanner out of a network and you sever ties between cliques.
- Has a greater amount of influence over what happens in a network.

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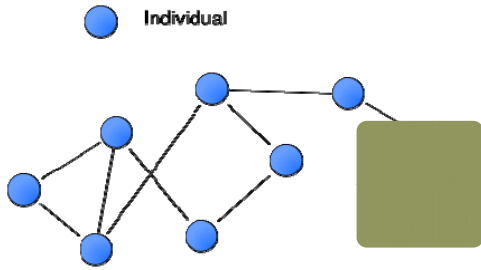
Boundary Spanner

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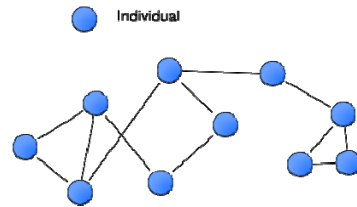
Peripheral Players

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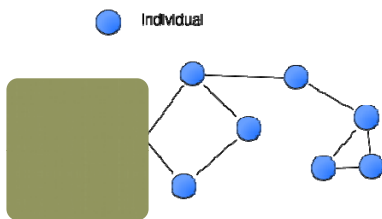
Cliques



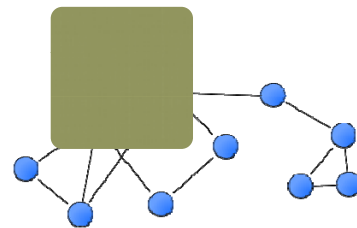
A word about network boundaries



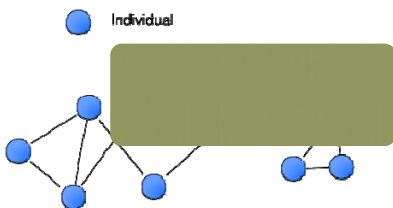
It's how you define your network...



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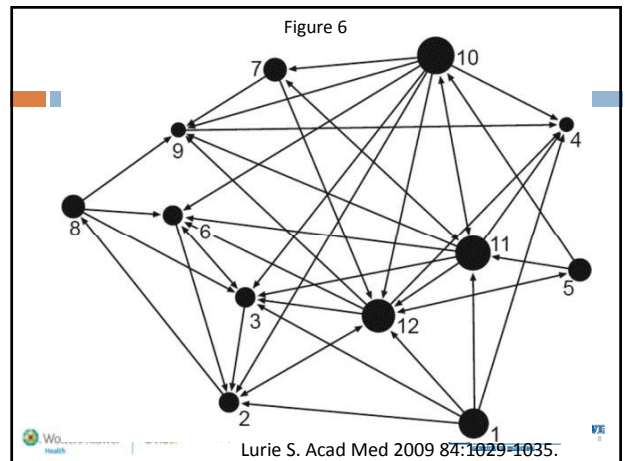
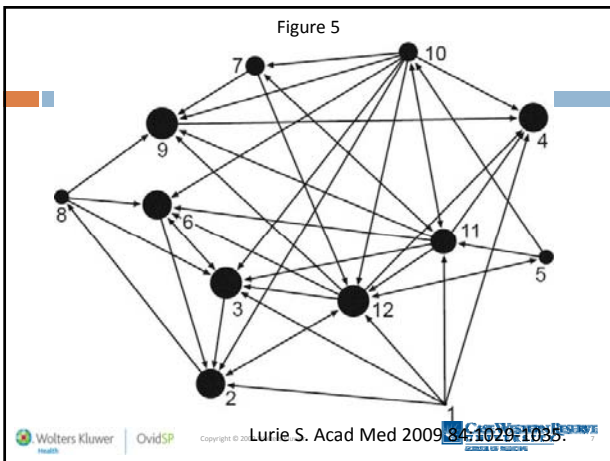
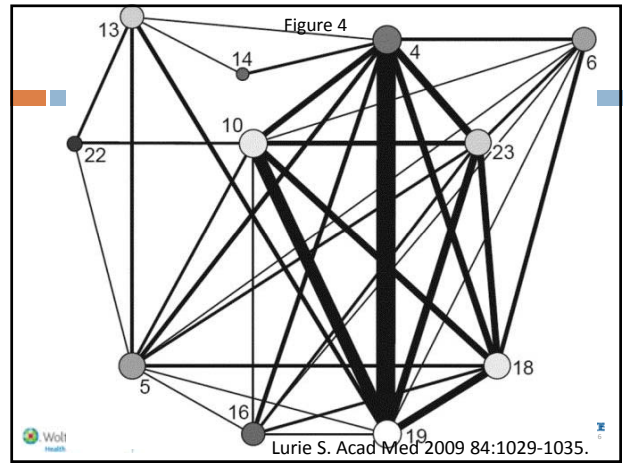
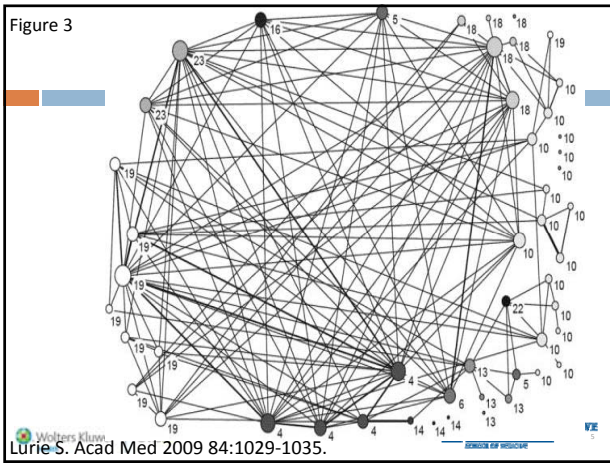
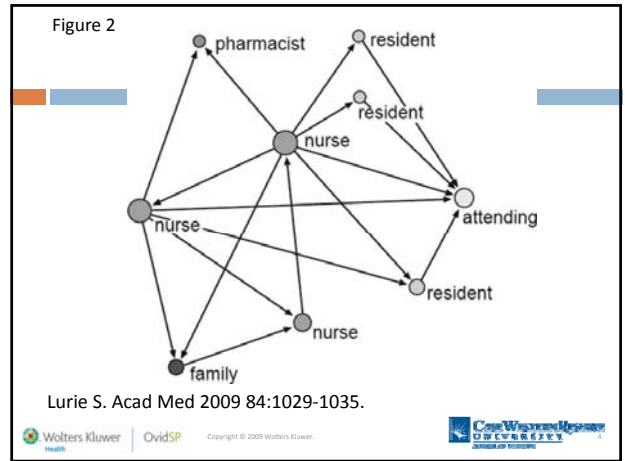
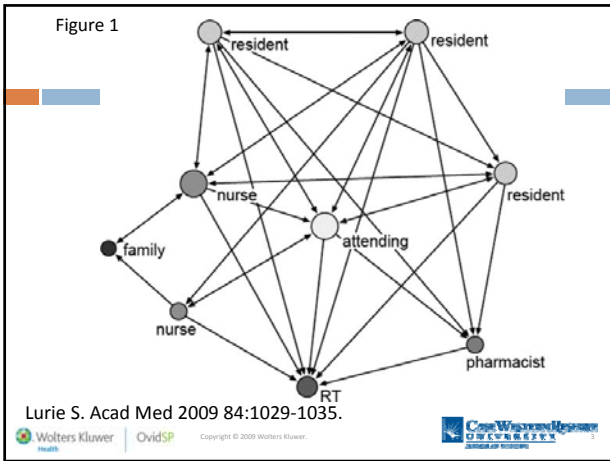
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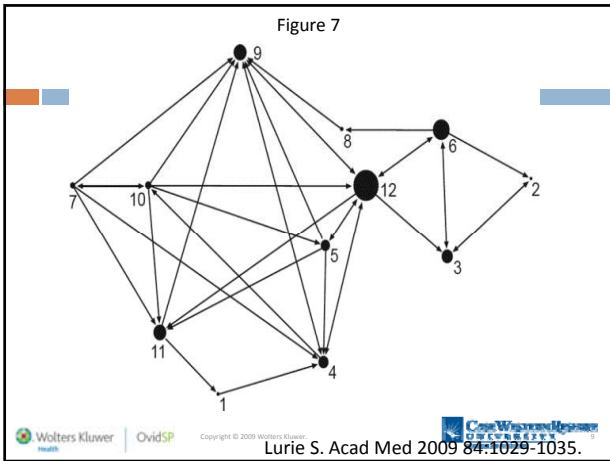


The next 7 Figures are from Lurie SJ et al. referenced below:

Social Network Analysis as a Method of Assessing Institutional Culture: Three Case Studies.

Lurie SJ, Fogg T, Dozier Ann. Academic Medicine 2009; 84(8):1029-1035.





SNA Software Packages

UCINET (www.analytictech.com)
 PAJEK (vlado.fmf.uni-lj.si/pub/networks/pajek/)

Summary

A field that has been pursued mainly in the social science disciplines has grown rapidly into many other areas including medicine.

Directions

- ▣ Using SNA for more than descriptive purposes
- ▣ Mapping changing networks over time
- ▣ Identifying robust methods of handling missing data

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You're invited....

SNA Workshop for Faculty
 Tuesday, November 17, 7:30-9:00 a.m.,
 SOM T-501

