Social Capital
in Online Communities
Research Area Overview

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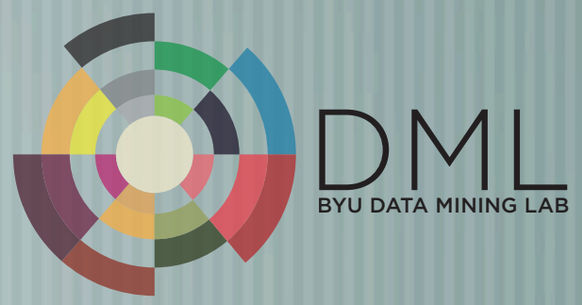


Introduction

- Online communities
- Prevalent shift in how people discover information
- Social networks dynamic and complex
- Rich social network data now available

Overview

- Types of network links
- Utility of large networks
- Social network analysis (SNA)
- Social capital (SC)
- Conclusion

Types of Network Links

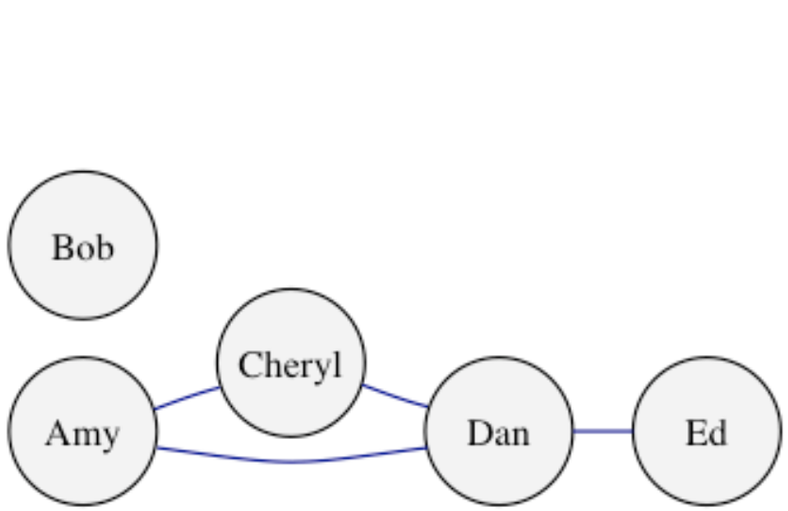
Explicit Link

- Direct knowledge, interaction, or communication
- Ex. friends, web links, and club members
- Explicit Social Networks (ESNs)

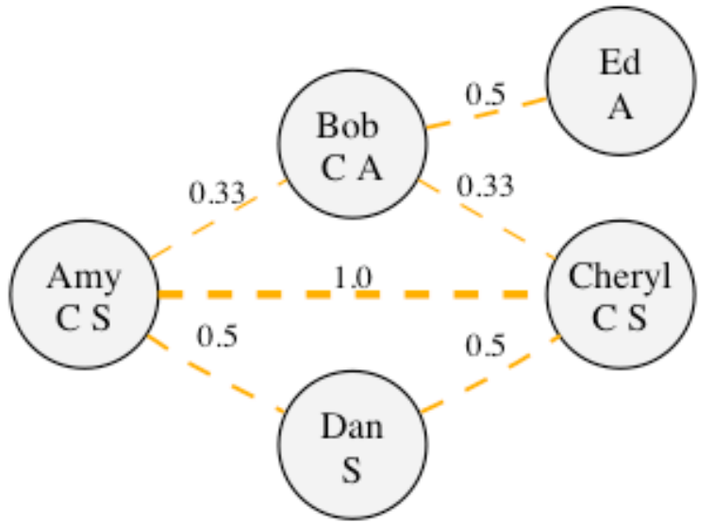
Implicit Link

- Inherent similarities or affinities
- Ex. attributes, hobbies, interests, and background
- Implicit Affinity Networks (IANs)

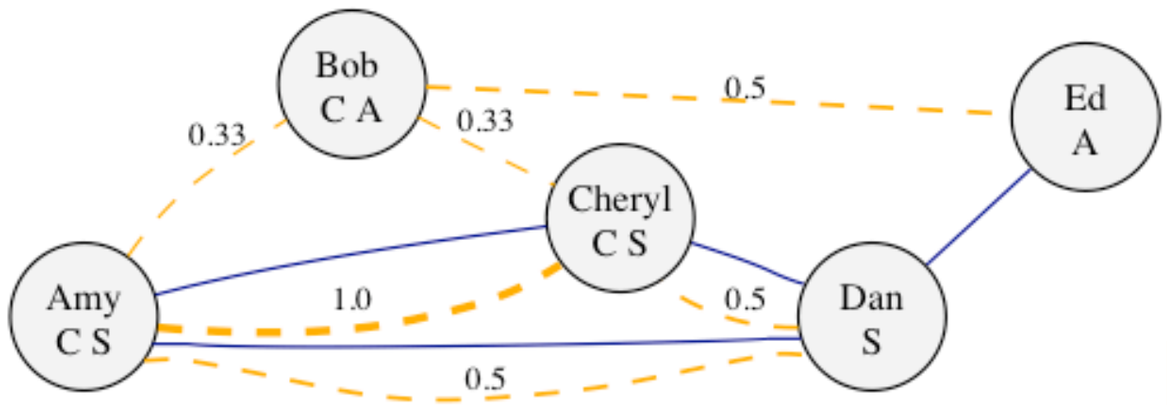
ESN, IAN, Hybrid Network



(a) Explicit Social Network - ESN



(b) Implicit Affinity Network - IAN



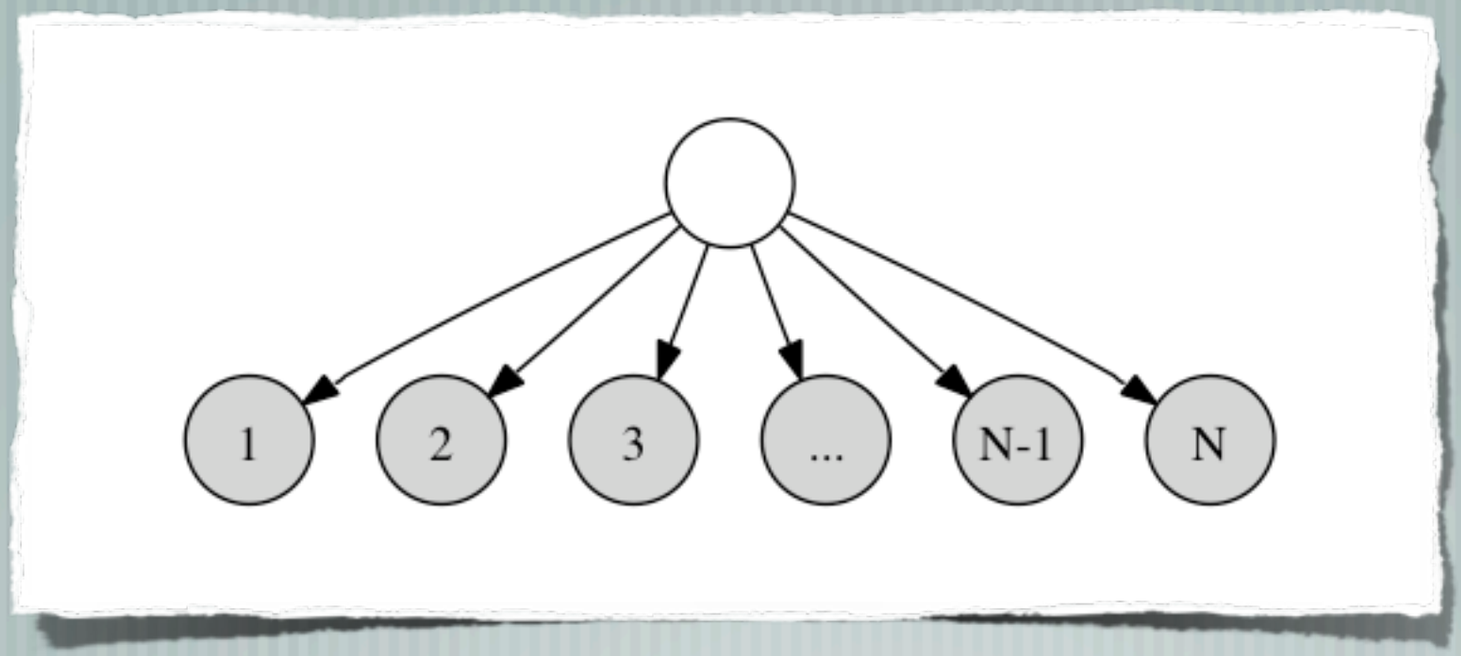
(c) Hybrid Network - ESN and IAN combined

Time graphs
each edge has an associated time-stamp

Utility of Large Networks

Broadcast Network Utility

Sarnoff's law



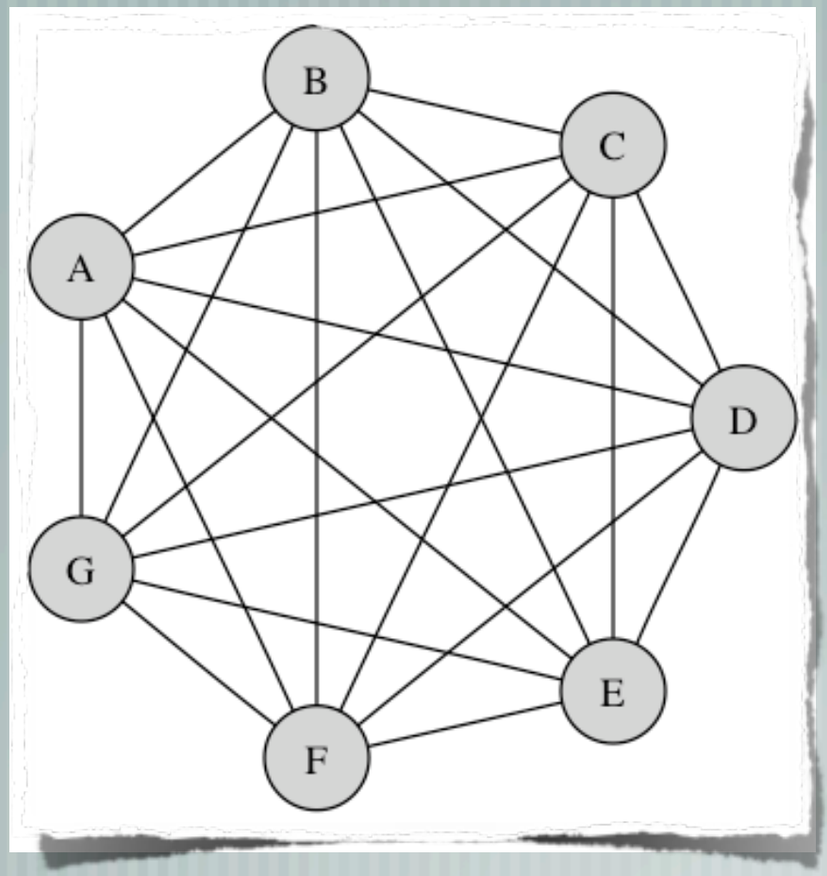
Broadcast Network
utility proportional to the number of viewers *N*

Example: television or radio network

Interesting Statistic
31.1 million US TV viewers watched Michael Jackson's memorial (millions more watched online)

Peer Connecting Network Utility

Metcalfe's Law

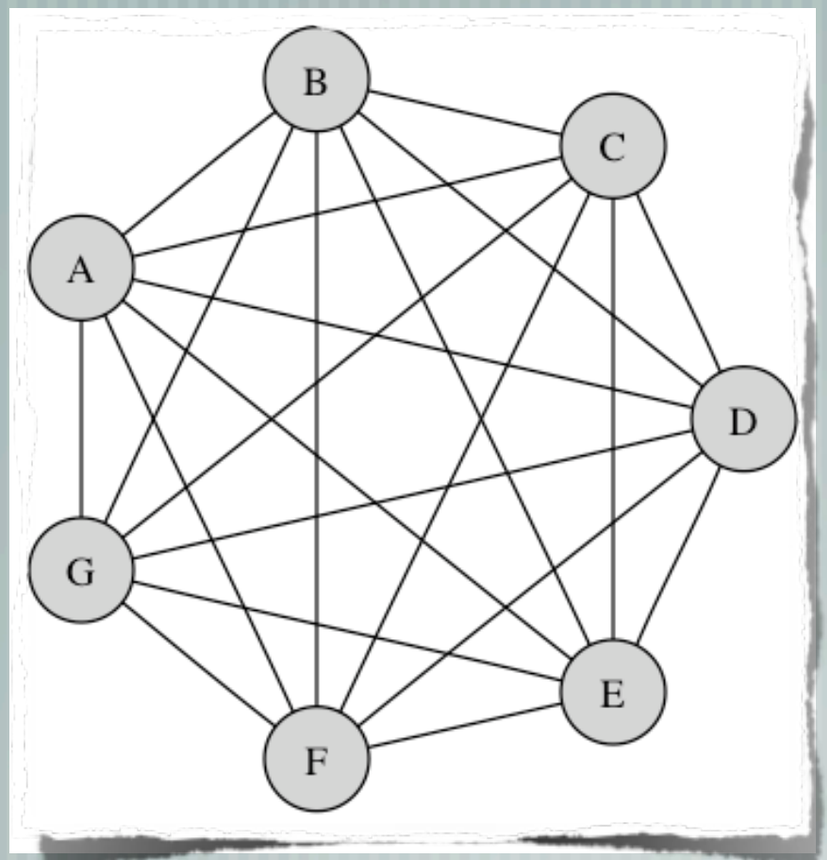


Peer Connecting Network
utility proportional to $N(N-1)/2$

Example: telecommunications network

Group Forming Network Utility

Reed's Law

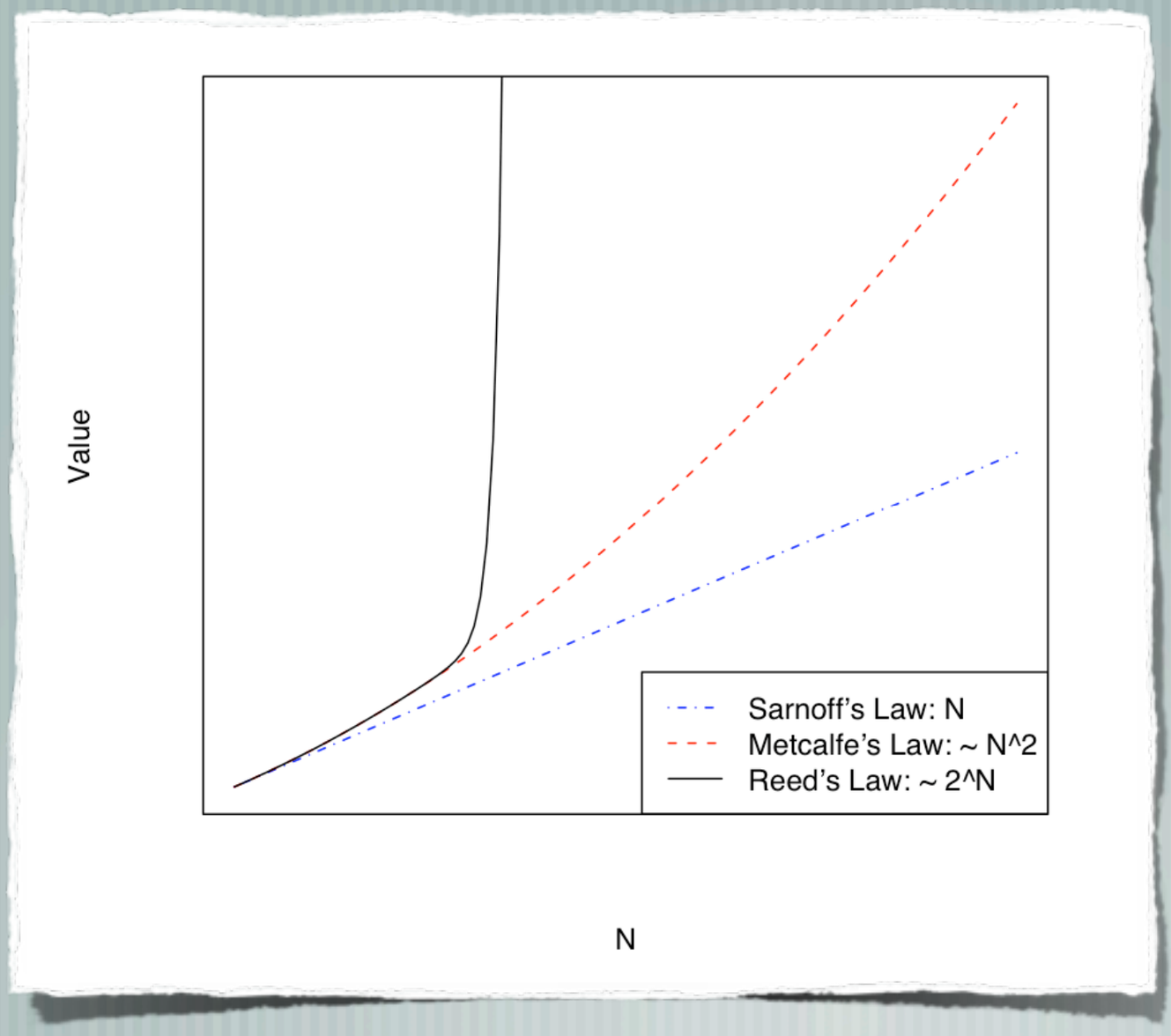


Size	Groups	#
2	{A,B}, {A,C}, {A,D}, ..., {F,G}	21
3	{A,B,C}, {A,B,D}, ..., {E,F,G}	35
4	{A,B,C,D}, {A,B,D,E}, ..., {D,E,F,G}	35
5	{A,B,C,D,E}, ..., {C,D,E,F,G}	21
6	{A,B,C,D,E}, ..., {B,C,D,E,F,G}	7
7	{A,B,C,D,E,F,G} *(shown above)*	1
	Total groups:	120

Group Forming Network
utility proportional to 2^*N*

Example: online social networks

Utility Comparison



Reed's Law

The utility associated with facilitating group affiliations (Reed's Law) far surpasses both the other laws

Social Network Analysis

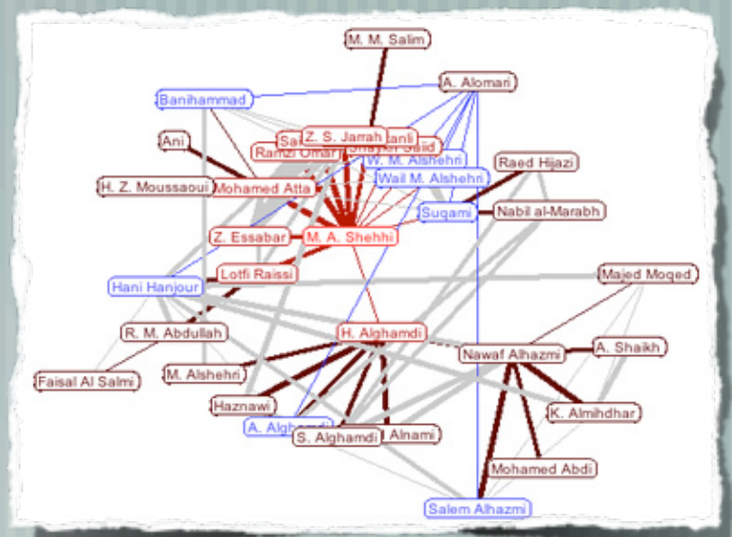
Social Network Analysis

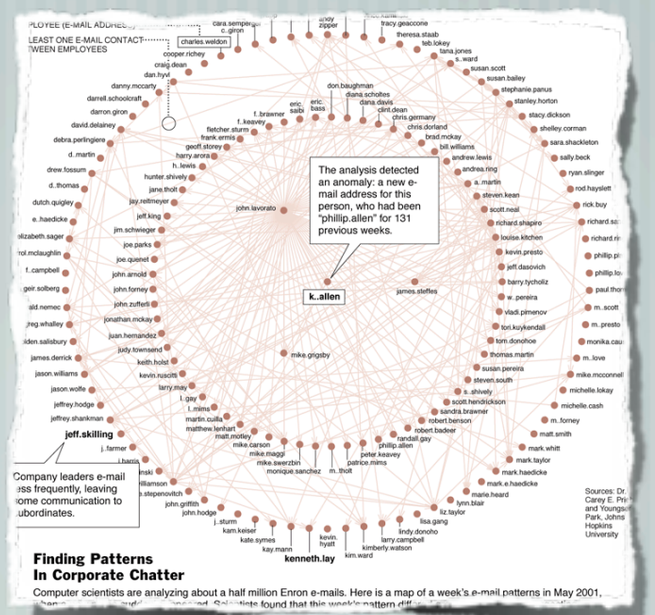
Methodology

- Assumes relationships are important
- Visual and mathematical components
- Recent surge of work in this area

Multi-disciplinary Applications

- Terrorism: key players, map associations
- Biology: zebras, wasp colonies
- Epidemiology: spread of viruses
- Other: soccer, Enron





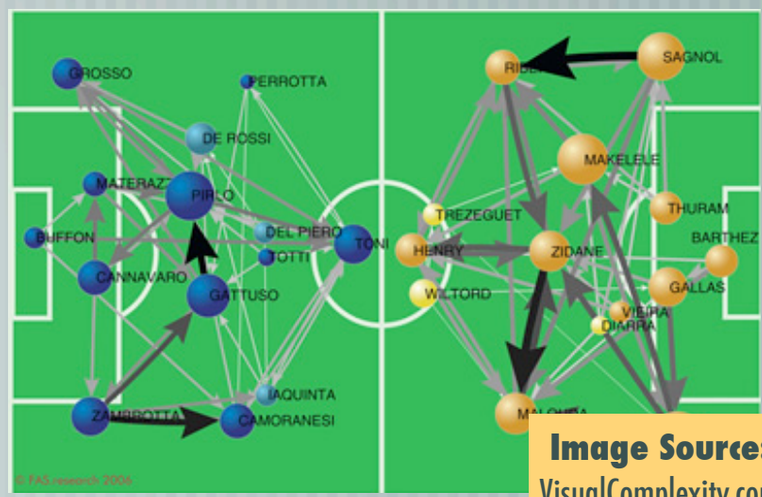


Image Source:
VisualComplexity.com

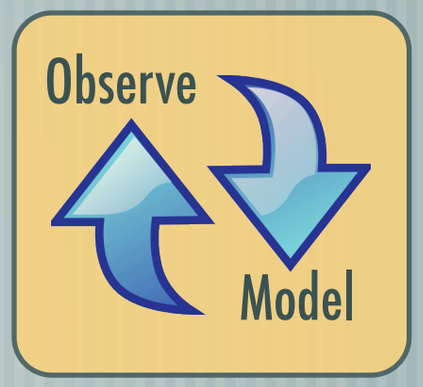
Growth and Evolution Research

Traditional Model

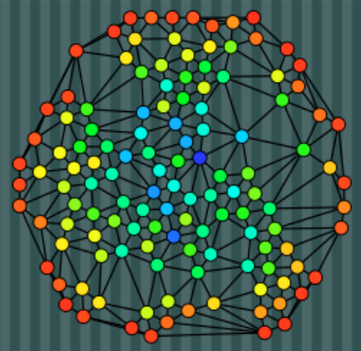
- Scale-free model (Albert-Barabasi, Science'99)
- Small world model (Watts-Strogatz, Nature'98)

Recent Models

- Microscopic model (Leskovec et al., KDD'08)
- Butterfly model (McGlohon et al., KDD'08)
- Affiliation co-evolution model (Zheleva et al., KDD'09)



Centrality Measures

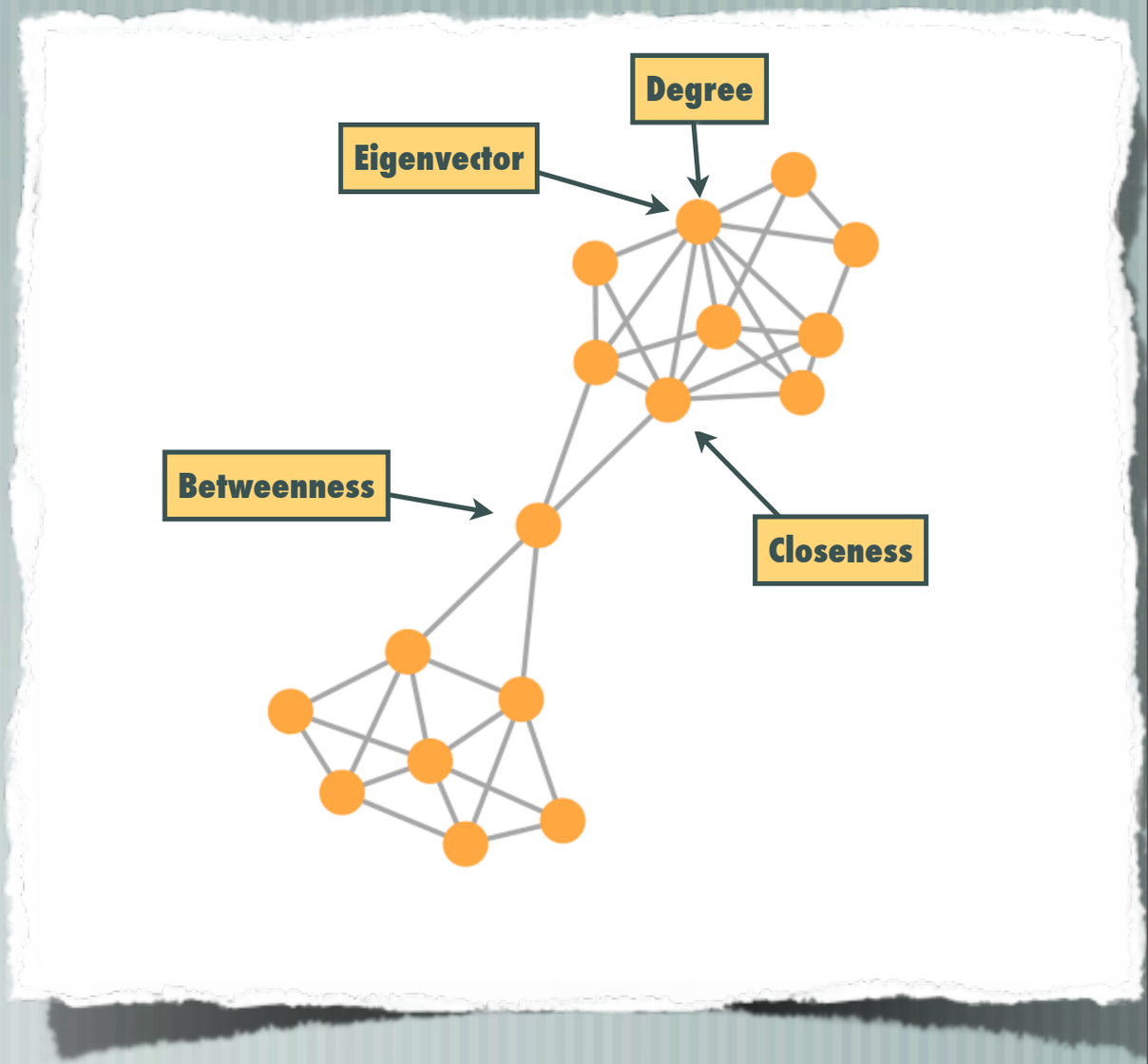


Node importance

Measures

- Degree, Betweenness, Closeness
- Eigenvector (Google PageRank)

Consider ESN only



Social Capital

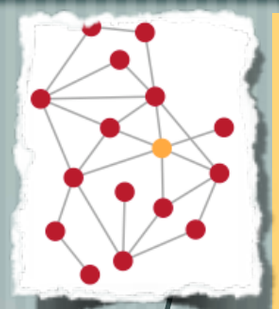
Social Capital

- Use of social connections to achieve some benefit
  - Fosters reciprocity, coordination, collaboration, and communication
  - Popularized by Putnam — bonding and bridging
  - Researched by Burt, Lin, Coleman, and Bourdieu

Examples
CEO Compensation study (Belliveau)
Web Startup Group
Medical support groups

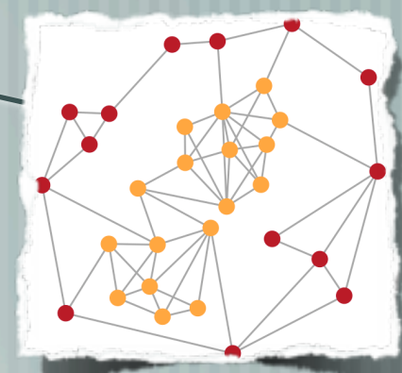
Social Capital Metrics

Burt
Lin
Licamele & Getoor

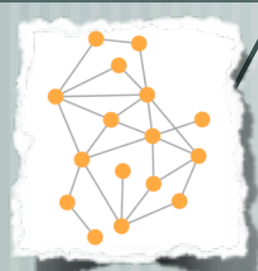


size/degree
density
heterogeneity*
compositional quality*
effective size
constraint
closeness
betweenness
eigenvector

	Type of Focus	
Type of Actor	**Internal**	**External**
Individual		Ones relationships with others Me ↔ Them
Group	Structure of the relationships within the group Us ↔ Us	Structure of the relationships of the group with outsiders Us ↔ Them



Putnam
Licamele & Getoor



density
avg/max distance
centralization cp
homophily*

group degree
group closeness
group betweenness

Borgatti

Key

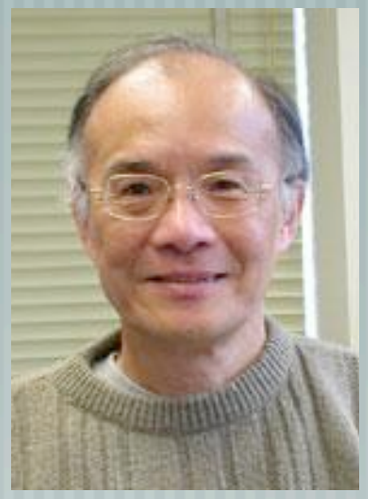
Metrics

Research

Researchers

Mark Granovetter

- Strength of Weak Ties
- Bridging is beneficial

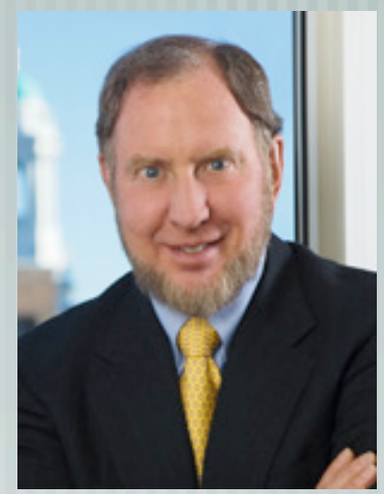


Nan Lin

- Social Resources

Ronald Burt

- Brokerage and Closure
- Structural Holes



Robert Putnam

- Decline of Social Capital
- Bonding & Bridging
- Group membership analysis

Others: Stephen Borgatti, Lise Getoor (CS)

Conclusion

Conclusion

- Rich social network data is plentiful and available
- Social network analysis tools are available
- The social capital online is poorly understood
- Now is the time to perform social capital research online

Coming up...

- The proposal will discuss:
  - Quantitative modeling of social capital online
  - Experiments to test models
- Research will answer questions, like:
  - What sub-groups should a community newcomer attempt to connect with?
  - What influence does an individual have upon online friends in terms of mobilizing them to act?

Questions & Comments

Ask me now:

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