



Social Network Analysis: The Basics

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Representing social networks

- Nodes (actors, vertices)
- Relations (ties, lines, paths, edges)

NETWORK IN ACTION: A TYPOLOGY OF NETWORK TIES

- Transaction relations: actors exchange control over physical or symbolic objects; most economic exchanges fall in this category.
- Communication relations: almost all kinds of social networks can be used to pass messages between the actors.
- Instrumental relations: actors contact one another to obtain tangible goods, assistance, or information. Examples of instrumental relations include employers using existing employees for recruitment of talents, employees using personal networks to obtain jobs, people using friends or neighbors to attend to their houses while they are away, friends giving rides, fixing cars, repairing houses, and providing day care.
- Sentiment relations: relations that are used to express emotions, such as affection, frustration, admiration, deference, and hostility.
- Authority/power relations: most of those network relations occur in formal hierarchical organizations where social actors assume formal roles and positions; accepting responsibilities, obligations, and privileges; receiving and sending commands; and reporting or being reported to.
- Kinship and descent relations: relations between family members linked via biological ties.

Nodelist

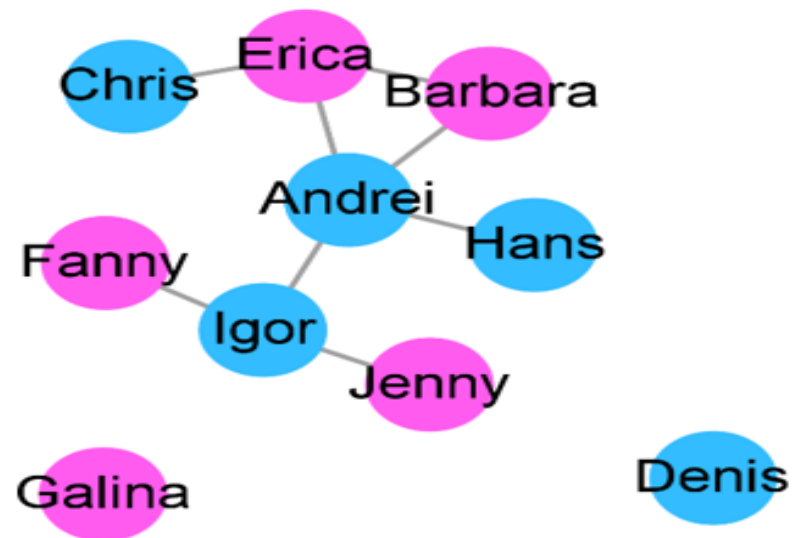
A	Andrei	male	Russian
B	Barbara	female	US
C	Chris	male	US
D	Denis	male	Russian
E	Erica	female	German
F	Fanny	female	British
G	Galina	female	Russian
H	Hans	male	German
I	Igor	male	Russian
J	Jenny	female	British

Adjacency matrix

	A	B	C	D	E	F	G	H	I	J
A	0	1	0	0	1	0	0	1	1	0
B	1	0	0	0	1	0	0	0	0	0
C	0	0	0	0	1	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	0
E	1	1	1	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	1	0
G	0	0	0	0	0	0	0	0	0	0
H	1	0	0	0	0	0	0	0	0	0
I	1	0	0	0	0	1	0	0	0	1
J	0	0	0	0	0	0	0	0	1	0

Edgelist (undirected)

A	B
A	E
A	H
A	I
E	B
E	C
I	F
I	J



Nodelist

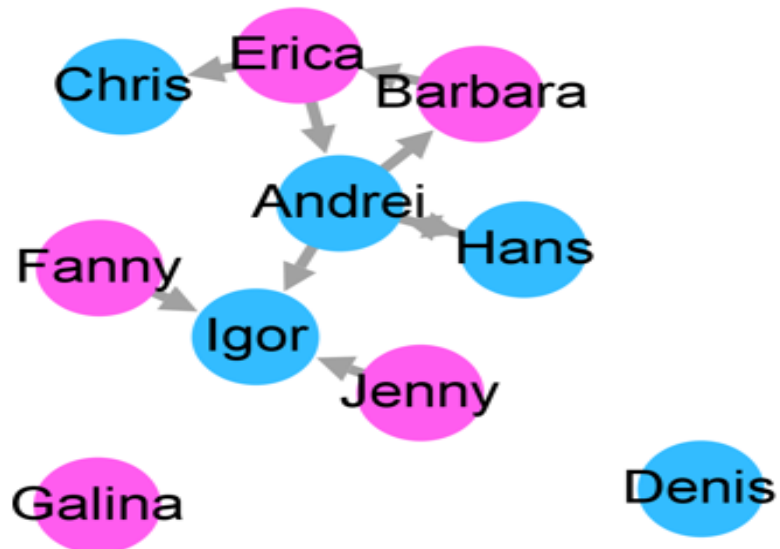
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Adjacency matrix

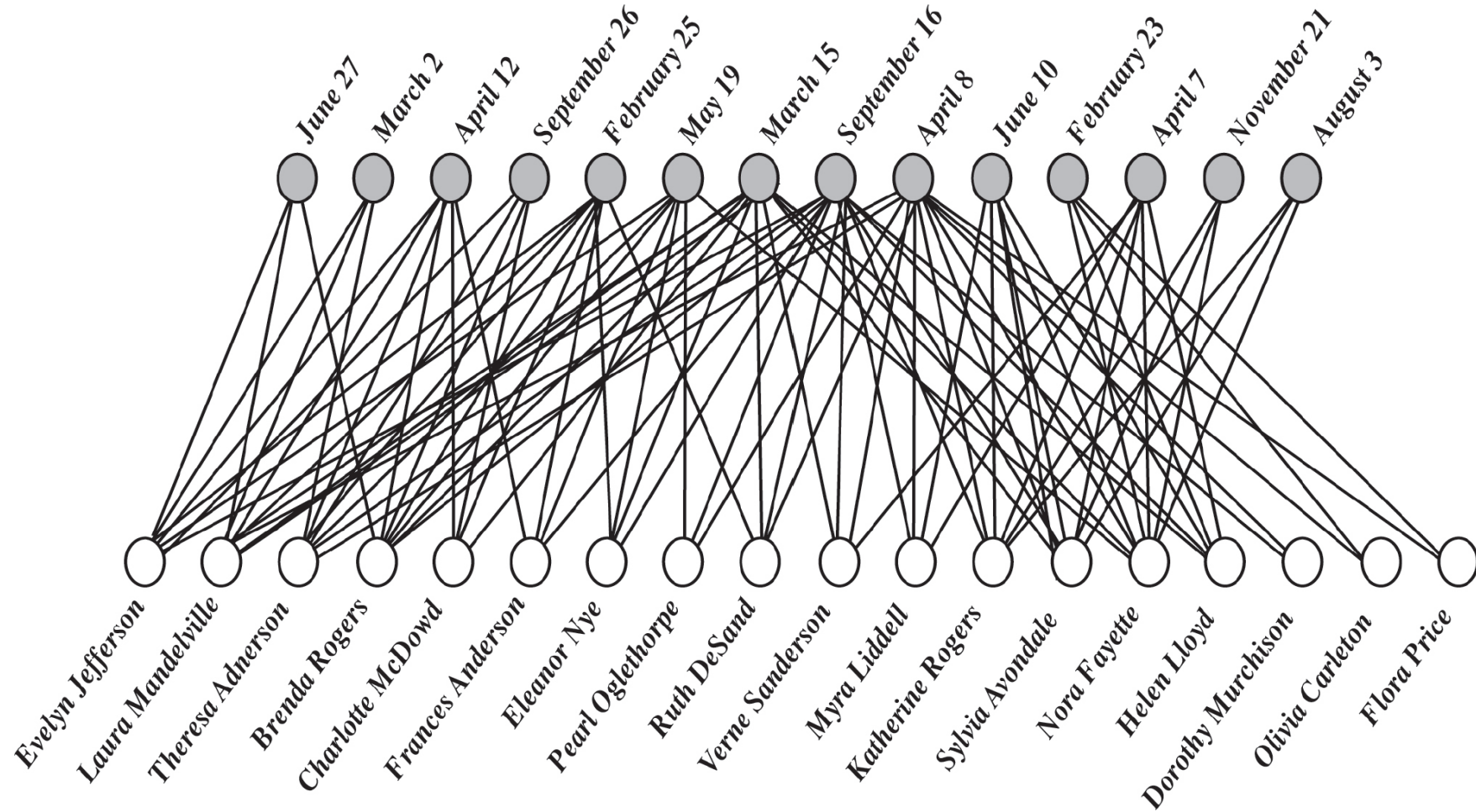
	A	B	C	D	E	F	G	H	I	J
A	0	1	0	0	0	0	0	1	1	0
B	0	0	0	0	1	0	0	0	0	0
C	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	0
E	1	0	1	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	1	0
G	0	0	0	0	0	0	0	0	0	0
H	1	0	0	0	0	0	0	0	0	0
I	0	0	0	0	0	0	0	0	0	0
J	0	0	0	0	0	0	0	0	1	0

Edgelist (directed)

Source	Target
A	B
A	H
A	I
B	E
E	A
E	C
F	I
H	A
J	I



Bipartite networks



Network parts and levels of analysis

- Atomistic model
- Dyadic pairs
 - Strategic alliances between pairs of firms
 - Intersexual relation and HIV infection
 - Homophily: birds with features fly together
- Triadic pairs
 - Triadic closure, transitivity
- Full network
 - Density, centralization, ERGM

Social networks
and pop
culture: the
small world
phenomenon

SOCIAL NETWORK IN ACTION: THE SMALL-WORLD EXPERIMENT

The “small-world” experiment was conducted by social psychologist Stanley Milgram (1967). In the experiment, he asked volunteers in two different U.S. states to relay a briefcase to a stockbroker in Boston, MA. The subjects were given a description of the target but not his address, and they were only allowed to pass the briefcase on to someone they knew on a personal basis (and who they thought would be closer to the target). Many briefcases never arrived, but those that did passed on average through the hands of five intermediaries. Hence, Milgram concluded that every U.S. citizen is connected to everybody else within the United States through no more than five intermediary steps. This finding has been the subject of both anecdotal and scientific fascination. For example, the “Bacon number” calculates the path length that connects any actor to Kevin Bacon in a network of co-appearances in the same movie. With the appearance of the Internet and social media, the world seems to have become even smaller—a recent study showed that the average path length connecting any two Facebook users in the world is only 4.74 (Ugander, Karrer, Backstrom, & Marlow, 2011).

Social network analysis theory: structural- relational explanation

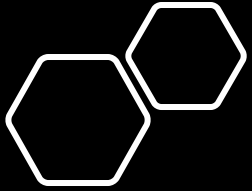
- Many attributes remain unaltered across different social contexts
 - Gender, race, education
- Relations, however, are highly contextual and conditional on the social environments
 - Student-teacher relation dissolves beyond the classroom
 - Marital relations forms and dissolves upon marriage and divorce/death of partners.
 - A woman holding a menial job requiring little initiatives can be active speaker at POA meetings.
- Difficult to measure such contextual relations with the traditional thing-concept individualistic approach
- In contrast, structural-relational explanation has no problem reconciling the discrepancy.

Social network analysis theories: structural mechanism

- Contacts
 - Direct contacts and ties bring information, awareness, and great influences of each other
 - Indirect contacts and ties bring novel information, new ideas, and potential access to useful resources
- Relational structures
 - Relational structures provide pathways for assisting or hindering flows of knowledge, gossip, and rumor through a population.
 - Diffusion of new technology or STD in American cities.
- Effects on individuals, groups, and entire groups
 - Physical and mental health depends on one's network
 - Structural relations affect group level solidarity, fan conflict between groups,
 - It promotes shared norms and practices,

Social network analysis theories: structural relation is dynamic

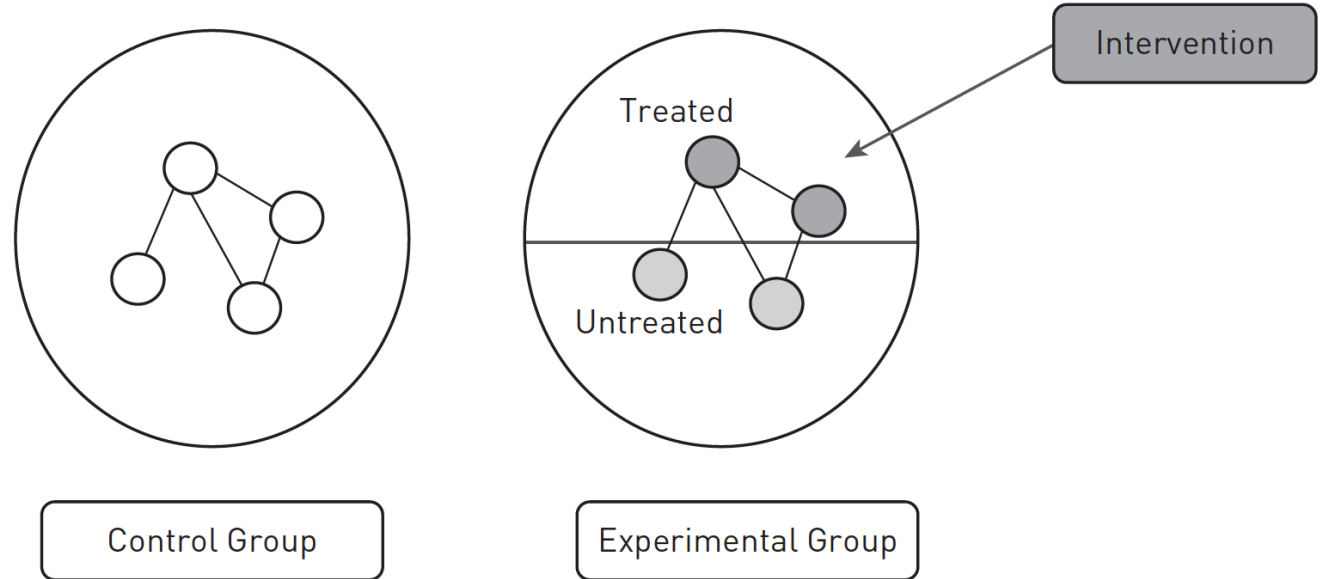
- Network structures are not static
- They are dynamic, and changing all the time,
 - Actors purposively or unintentionally change the structures in which they are embedded.
- Between corporations
 - Antecedent alliance between corporations create trust and strong bonds, affecting the governance structures used to manage the ties between the pairs of corporations in the later stage.
- Network analysis
 - Focusing on both the entities and structures, standing to make contribution to understanding the dynamic nature of the network structures.



Causality ambiguity

- Do smokers become friends?
- Or do friends become smokers?

FIGURE 1.8 • Illustration of the Partial Treatment Group Design



Questions for discussion

1. Imagine a network that describes which countries trade with each other. Who are the actors in this network? What are the ties?
2. Is a “marriage network” in which multiple families are tied with each other through marriages a directed or an undirected network? How about a network of friendship ties between classmates?
3. What are the differences between binary and valued social networks? Imagine a network of militarized conflict between nations. What do the ties represent in a binary network? In a valued network?
4. What is a bipartite network? Produce an example of a bipartite network. What are the main differences between a bipartite network and other types of (one-mode) networks?
5. Design a network study that can capture the informal advising network among employees in a workplace, and compare the network with the formal hierarchical structure depicting the hierarchical relations between those employees.
6. Discuss the three theoretical assumptions that undergird the social network analyses.
7. In a directed network of 50 actors/nodes, how many dyadic pairs and triadic pairs does it have?
8. Explain how you would use the partial treatment group design to determine whether a drug prevention program can curb the drug use among a group of students living in the same university dorm.