LECTURE 13A:HOMOPHILY AND SOCIAL INFLUENCE

COMP4641: Social Information Network Analysis and Engineering
Wednesday April 1st 2015

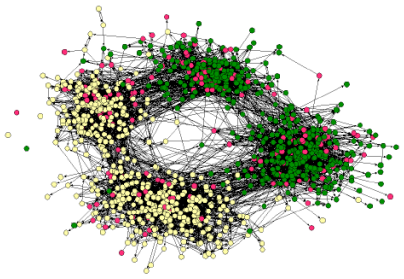
Homophily

- Agents in a social network have **other characteristics** apart from their links
  - Non-mutable: race, gender, age
  - Mutable: place to live, occupation, activities, opinions, beliefs
- Links and mutable characteristics co-evolve over time

Homophily

- When we take a snapshot in time, we observe that these node characteristics are correlated across links
  - E.g. Academics have often academic friends, etc.
- This phenomenon that people are linked to similar others is called **homophily**

Homophily at a U.S. High School



Homophily

- Mechanisms underlying Homophily
  - Selection
    - A and B have similar characteristics -> A and B form a link AB
  - Social Influence
    - A and B have a link -> B chooses the same (mutable) characteristic as A
    - E.g. A starts smoking, and B follows (peer pressure)

Social-Affiliation Network

- Network of persons and social *foci* (activities)

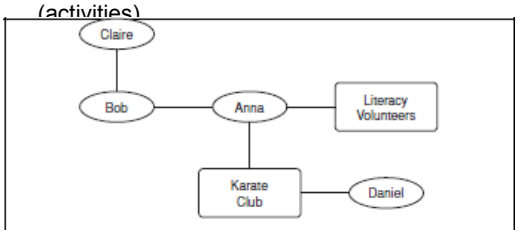
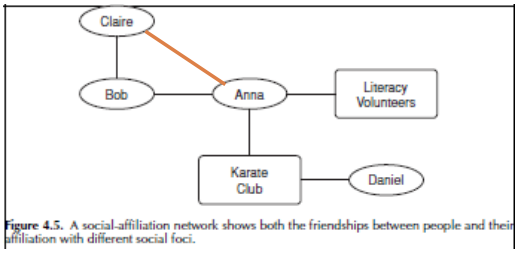


Figure 4.5. A social-affiliation network shows both the friendships between people and their affiliation with different social foci.

Triadic Closure



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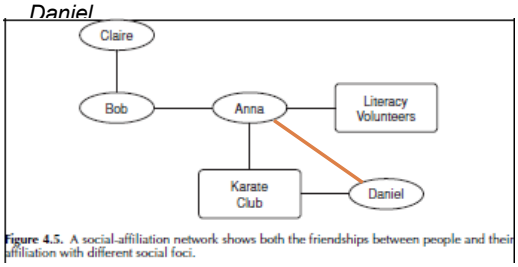
Focal Closure

- **Selection**: *Karate* introduces *Anna* to *Daniel*



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Membership Closure

- **Social Influence**: *Anna* introduces *Bob* to *Karate*

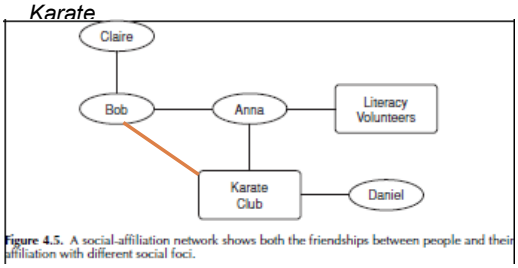


Figure 4.5. A social-affiliation network shows both the friendships between people and their affiliation with different social foci.

Homophily

- Both Selection and Social Influence drive homophily
- How important is each mechanism?
  - Important question: Different mechanism implies different policy,
    - e.g. Policy to prevent teenagers from smoking
    - Social Influence. Target "key players" and let them positively influence rest
    - Selection. Target on characteristics (e.g. family background) alone

Homophily

- Both Selection and Social Influence drive homophily
- How important is each mechanism?
  - Difficult question:
    - Requires longitudinal data
    - Requires observation of (almost) all characteristics
      - If a characteristic is not observed, then social influence effect is overestimated

Homophily

- Measuring the mechanisms behind homophily is a hot topic
  - Kossinets & Watts (2006): Detailed course and e-mail interaction data from university
  - Centola (2010, 2011): Experimental data on social influence controlling network structure
  - Sacerdote: Social influence among students after randomized dorm assignment

Homophily and Segregation

- Neighborhoods tend to be segregated according to race or culture
  - Ghetto formation
  - What is the mechanism behind that?

Segregation in Chicago

(a) *Chicago, 1940* (b) *Chicago, 1960*

Homophily and Segregation

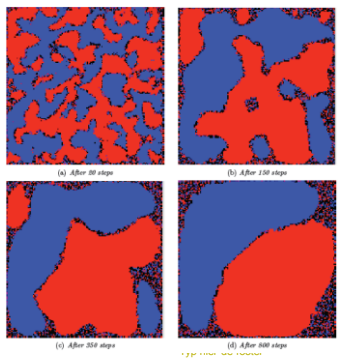
- Segregation model of Thomas Schelling
  - Agent-based model
    - Two different agents: X and O types
    - Agents live on a grid
    - **weak satisficing preferences for homophily**
      - At least *k* of the 8 neighbors of same type
    - Each period, agents who are not satisfied move to a location where they are

Schelling's model (*k*=3)

X	X				
X	O		O		
X	X	O	O	O	
X	O			X	X
	O	O	X	X	X
		O	O	O	

Schelling's model (*k*=3)

	X				
X	O		O		
X	X	O	O	O	
X	O		X	X	X
	O	O	X	X	X
		O	O	O	



(a) *After 50 steps* (b) *After 150 steps*

(c) *After 350 steps* (d) *After 800 steps*

Schelling's model

- Surprising relation between **micro-behavior** and **macro-outcomes**
  - Weak satisficing preferences for homophily sufficient to create complete segregation
  - Segregation arises due to miscoordination
    - There exists an allocation involving **complete integration satisfying all agents**, but individual decisionmaking does not lead to that outcome