



DCS/CSCI 2350: Social & Economic Networks

*Are the nodes linked to each
other kind of the same?*

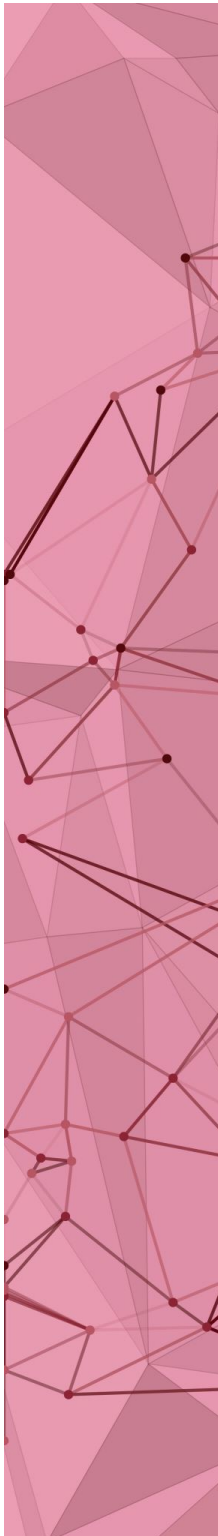
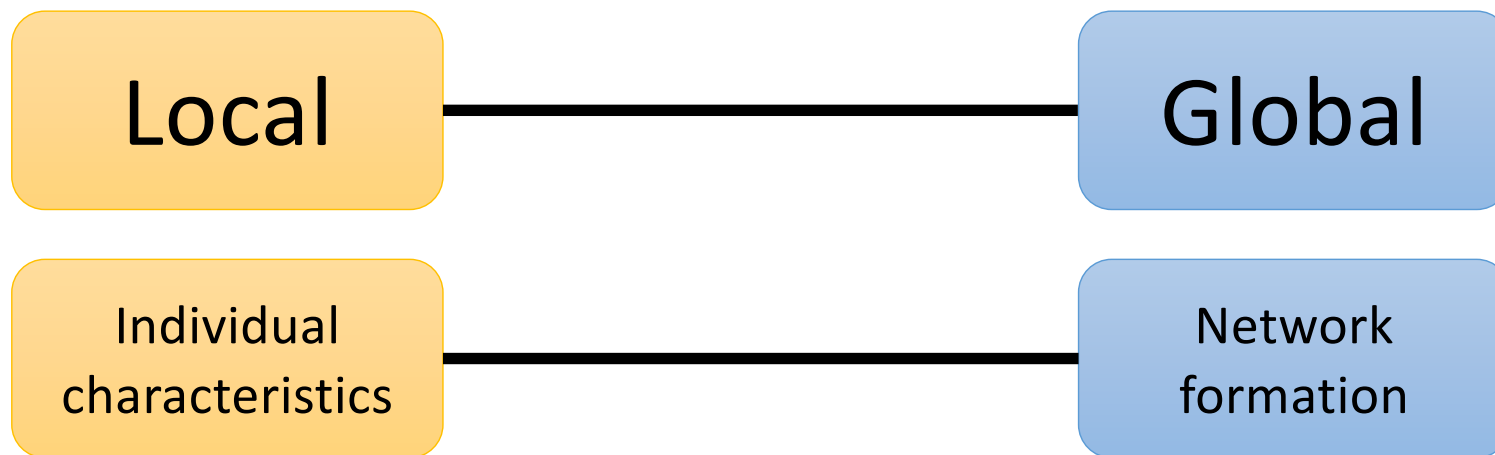
Homophily

Reading: Ch 4 of EK

Mohammad T. Irfan

Homophily

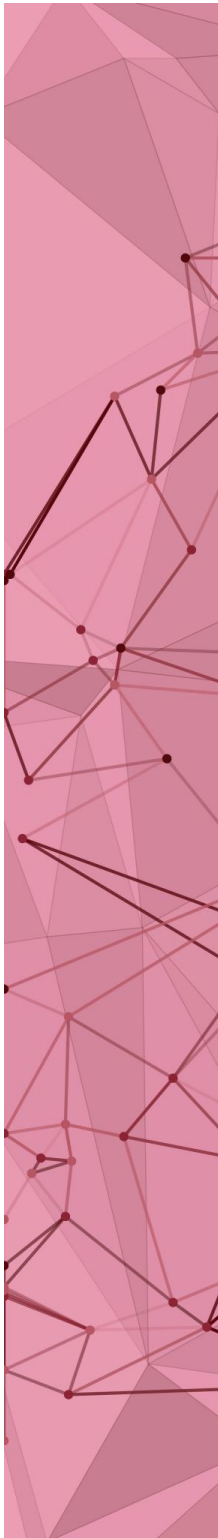
- What is it?
- How to measure it?
- How does it happen?
- Can we use it for something good?



What is homophily?

Principle that "We are like our friends"

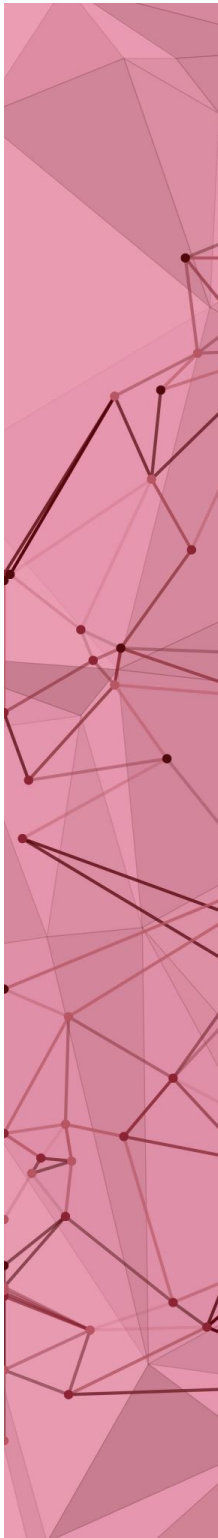
- Age
- Place of living
- Occupation
- Income
- Interests
- Beliefs
- Opinions

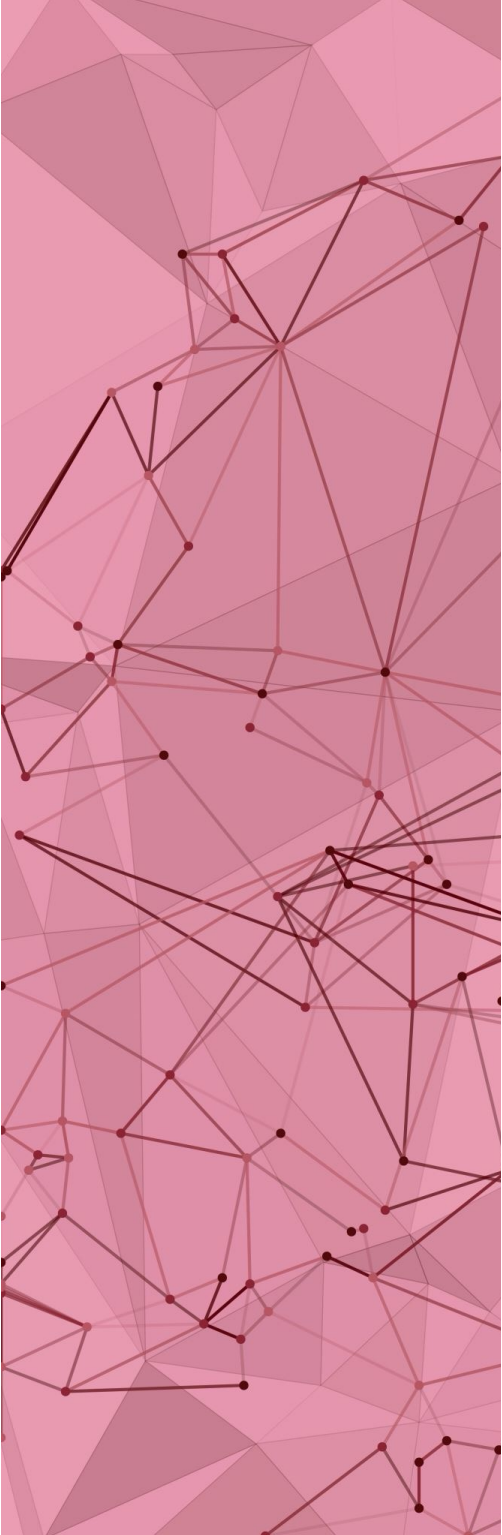


What is homophily?

Deeper meaning

- Intrinsic vs contextual link formation

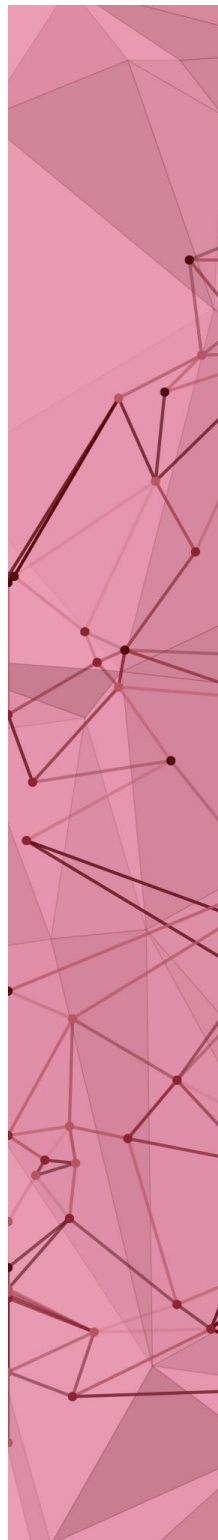
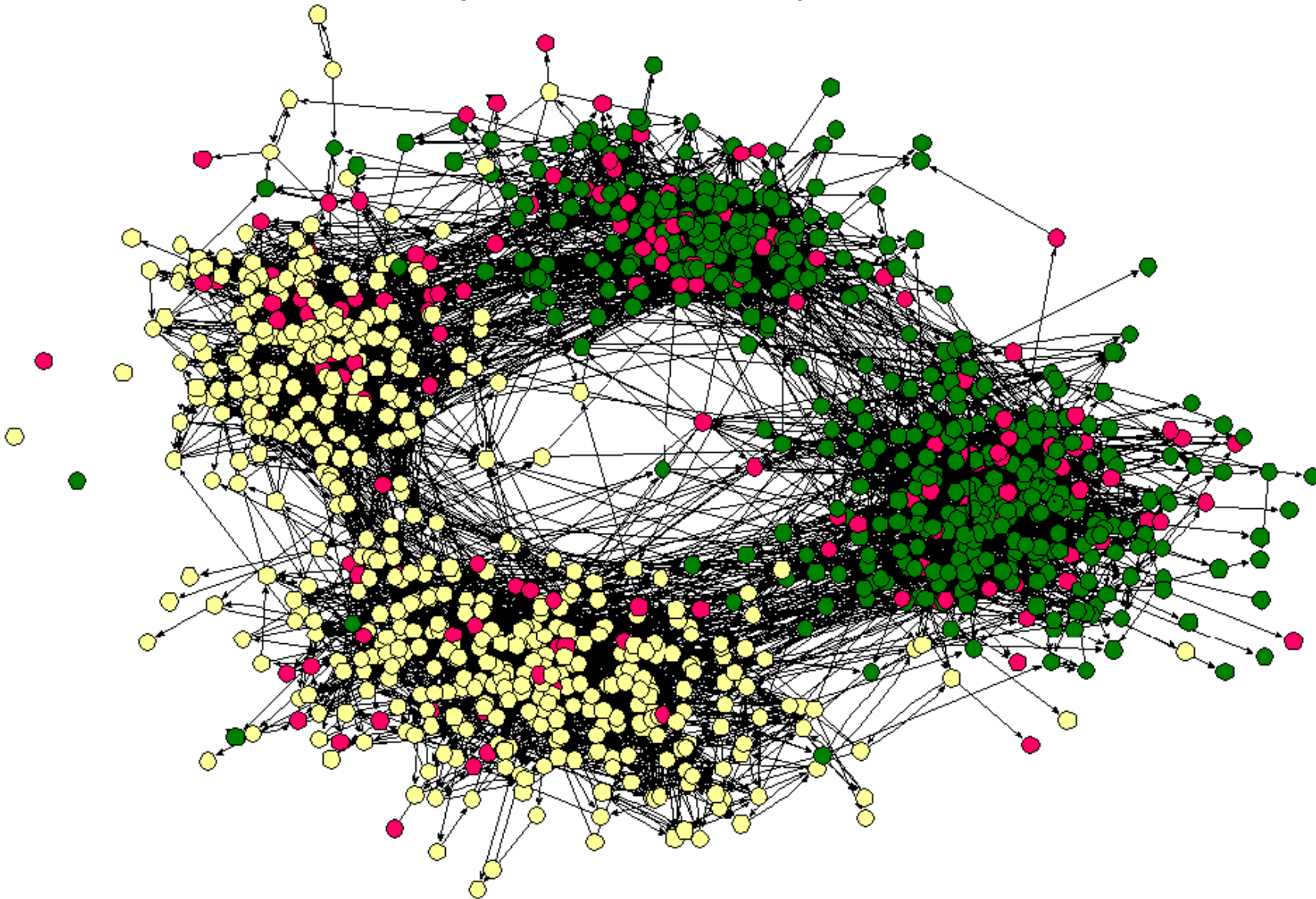




How to measure homophily?

Homophily test

Middle and high school friendship (Moody, 2001)





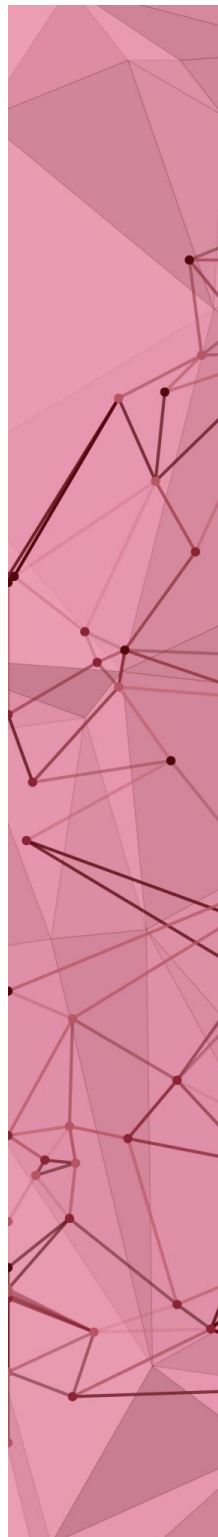
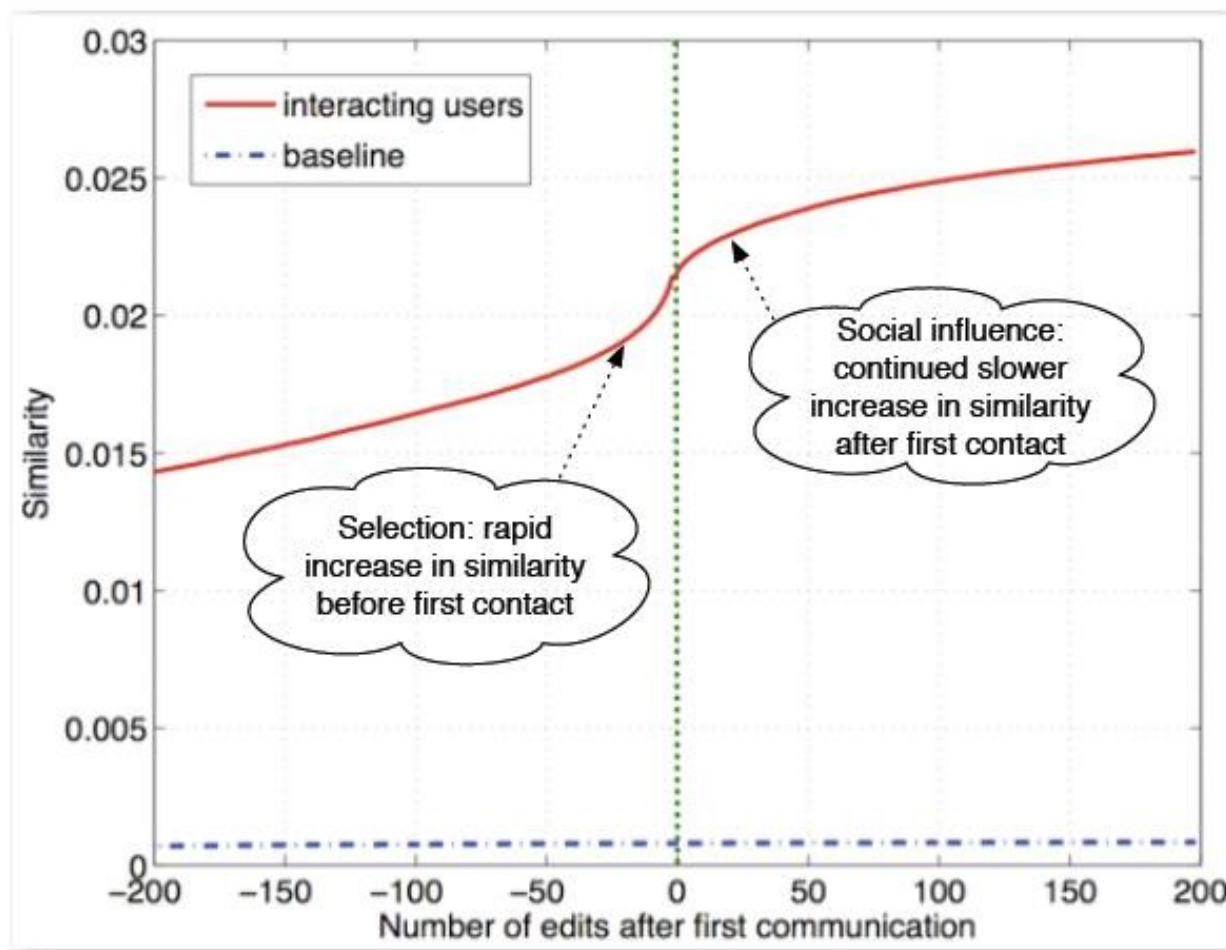
How does homophily happen?

Mechanisms of homophily

1. Selection
2. Social influence

Interplay: selection v. social influence in Wikipedia

$$\text{Similarity score} = \frac{\text{\# articles edited by both A AND B}}{\text{\#... edited by A OR B}}$$

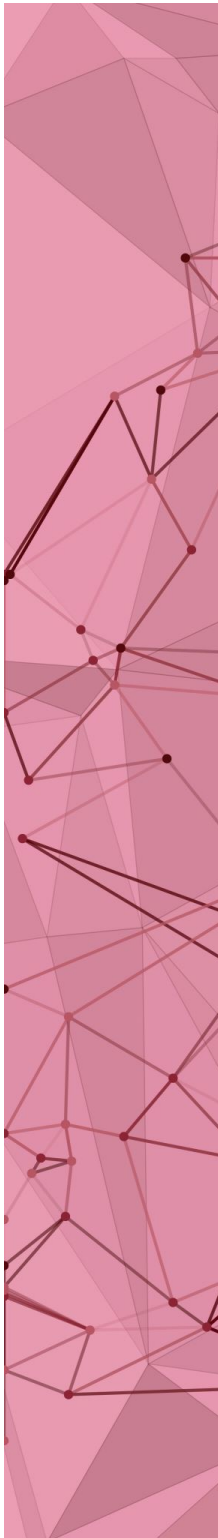


Example

Teenage drug usage

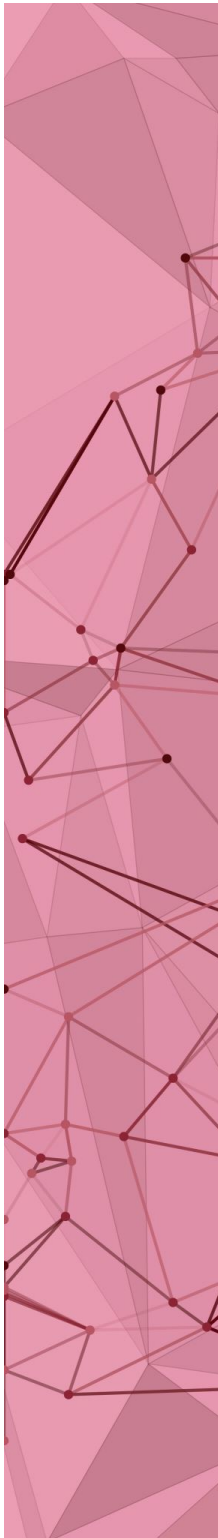
Selection or social influence?

Cohen & Kandel (1977)



Network effect and intervention

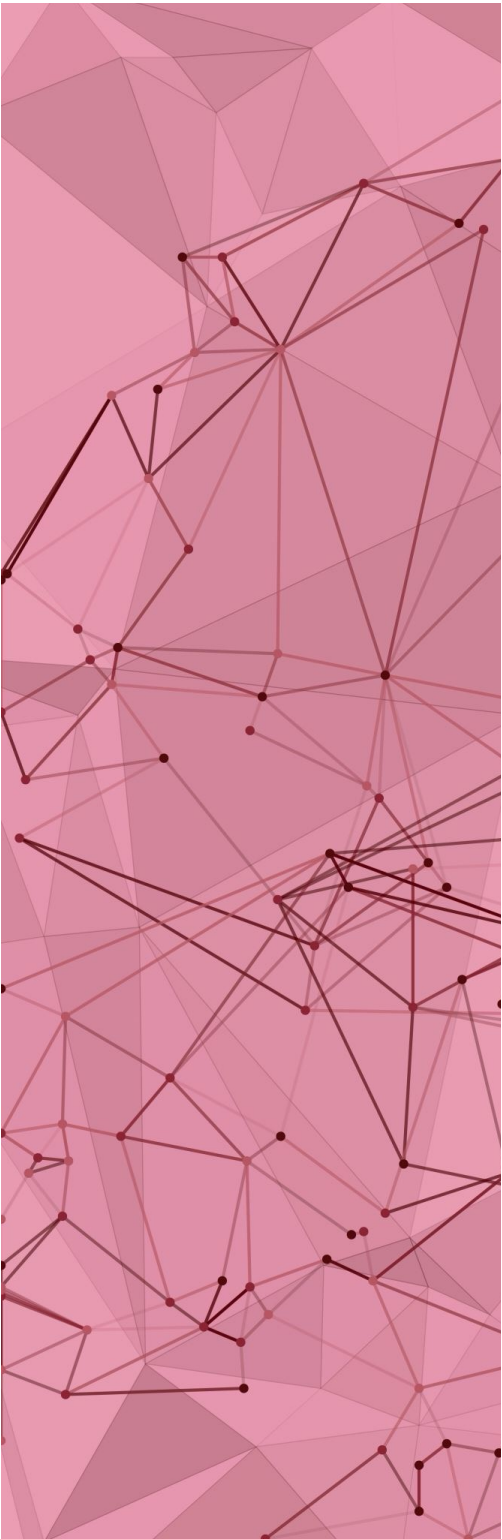
- Goal
 - Change the behavior of a few nodes so that they influence many others to change as well
- Need: social influence



Other topics on context in network

Affiliation network [OPTIONAL]





Can we “use”
homophily for
something good?

Are Your Friends Making You Fat?

By CLIVE THOMPSON

Published: September 10, 2009

EILEEN BELLOLI KEEPS very good track of her friends. Belloli, who is 74, was born in Framingham, Mass., which is where she met her future husband, Joseph, when they were both toddlers. (“I tripped her and made her cry,” recalls Joseph, a laconic and beanpole-tall 76-year-old.) The Bellolis never left Framingham, a comfortable, middle-class town 25 miles west of Boston — he became a carpenter and, later, a state industrial-safety official; and after raising four children, she taught biology at a middle school. Many of her friends from grade school never left Framingham, either, so after 60 years, she still sees a half dozen of them every six weeks.

[Enlarge This Image](#)

I visited the Bellolis at their home in Framingham last month, and when I asked Eileen about her old friends, she jumped up from her rose-colored rocking chair, ran to her cabinet and pulled down a binder filled with class photos and pictures from her school reunions. Every five years, she told me, she helps organize a reunion, and each time they manage to collect a group of about 30 students she has known since elementary and junior high school. She opened the binder and flipped through the pictures, each one carefully labeled with a label on the back listing

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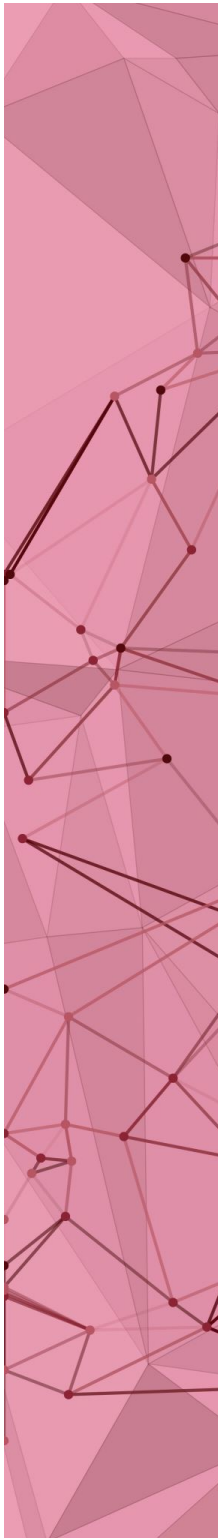
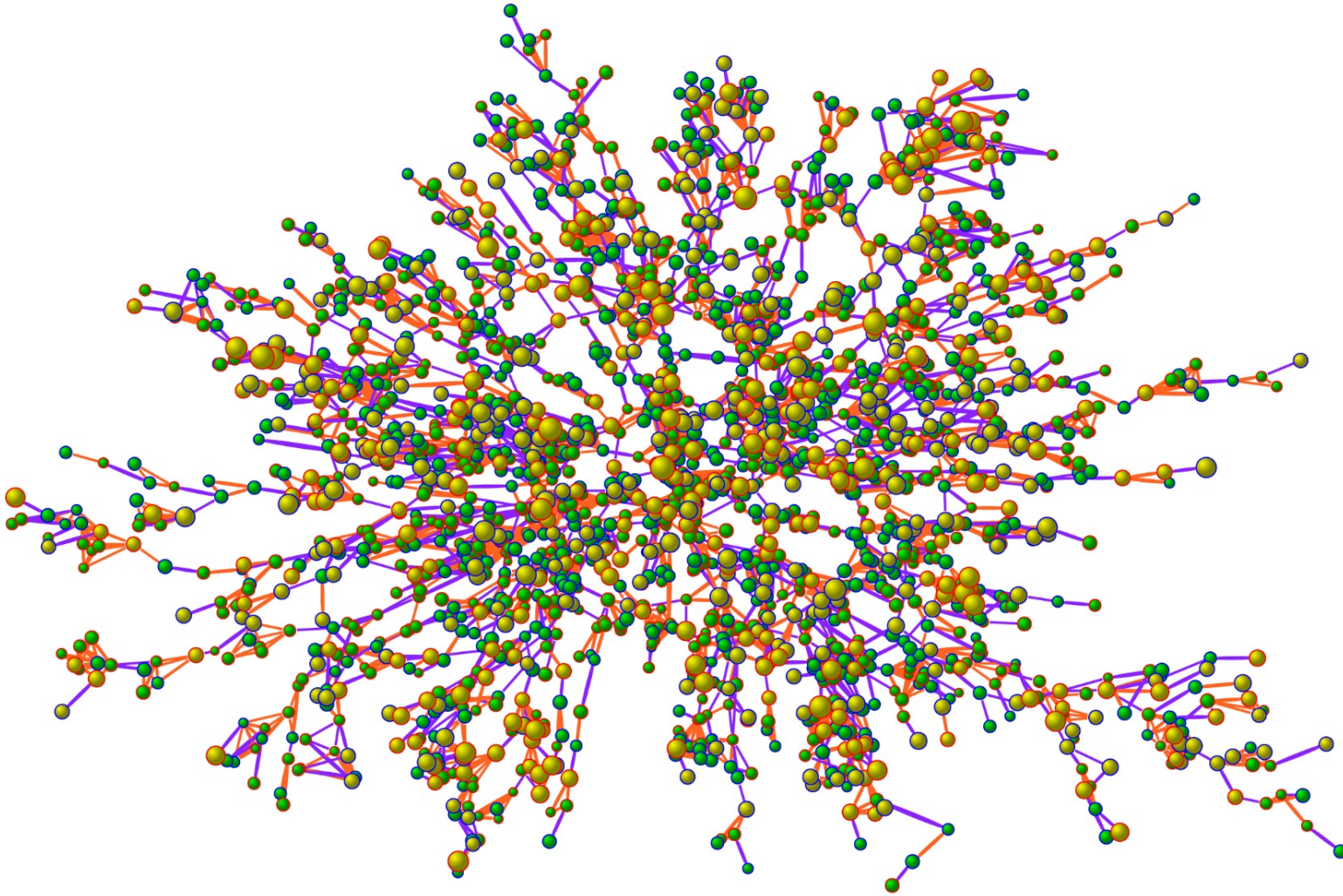
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Christakis & Fowler (2007): Obesity

Strong evidence of social influence in 32 years of data



Study Finds Big Social Factor in Quitting Smoking

By GINA KOLATA

Published: May 22, 2008

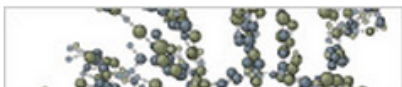
For years, smokers have been exhorted to take the initiative and quit: use a [nicotine](#) patch, chew nicotine gum, take a prescription medication that can help, call a help line, just say no. But a new study finds that stopping is seldom an individual decision.

[Enlarge This Image](#)

Oscar Hidalgo/The New York Times

Bonifacio Torres enjoys a cigarette alone in New York, but many smokers find they give up smoking as part of a group.

Multimedia



Smokers tend to quit in groups, the study finds, which means [smoking cessation](#) programs should work best if they focus on groups rather than individuals. It also means that people may help many more than just themselves by quitting: quitting can have a ripple effect prompting an entire social network to break the habit.

The study, by Dr. Nicholas Christakis of Harvard Medical School and James Fowler of the University of California, San Diego, followed thousands of smokers and nonsmokers for 32 years, from 1971 until 2003, studying them as part of a large network of relatives, co-workers, neighbors, friends and friends of friends.

 COMMENTS
(90)

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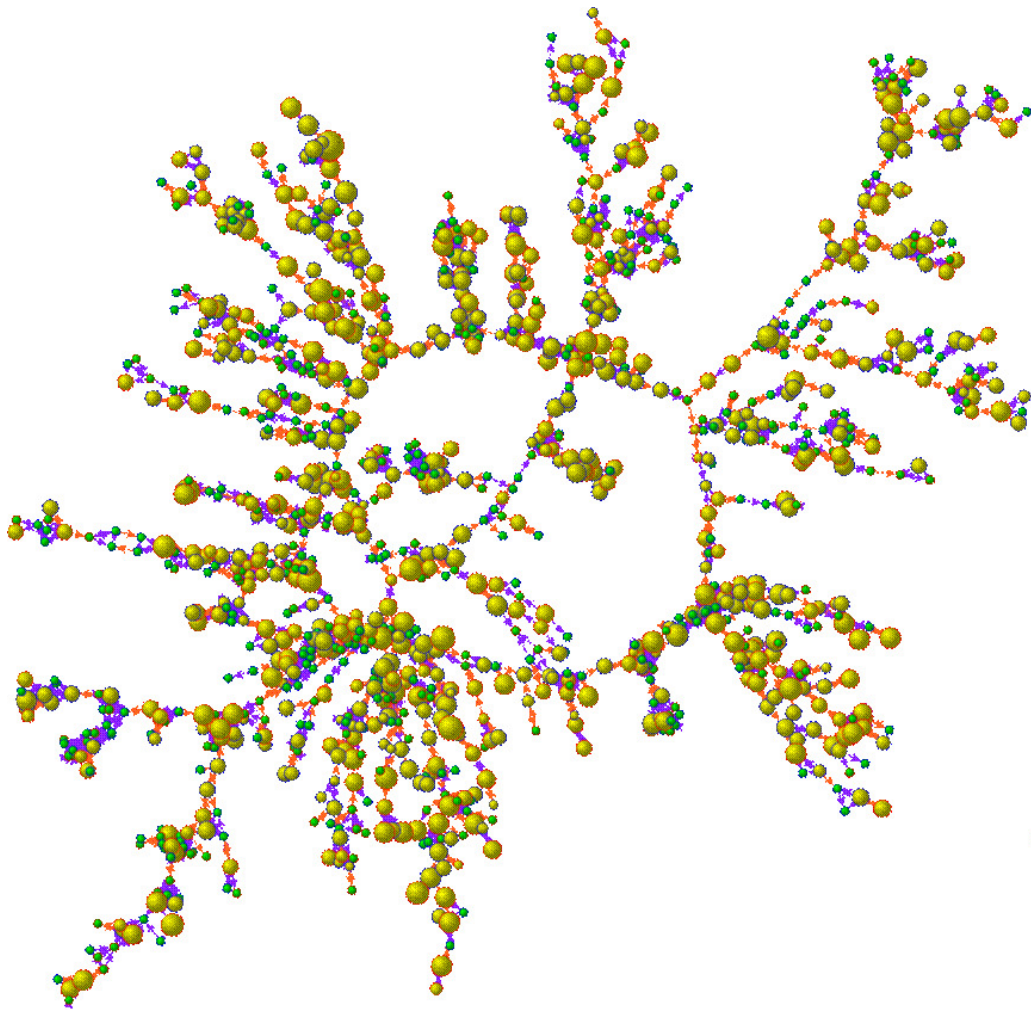
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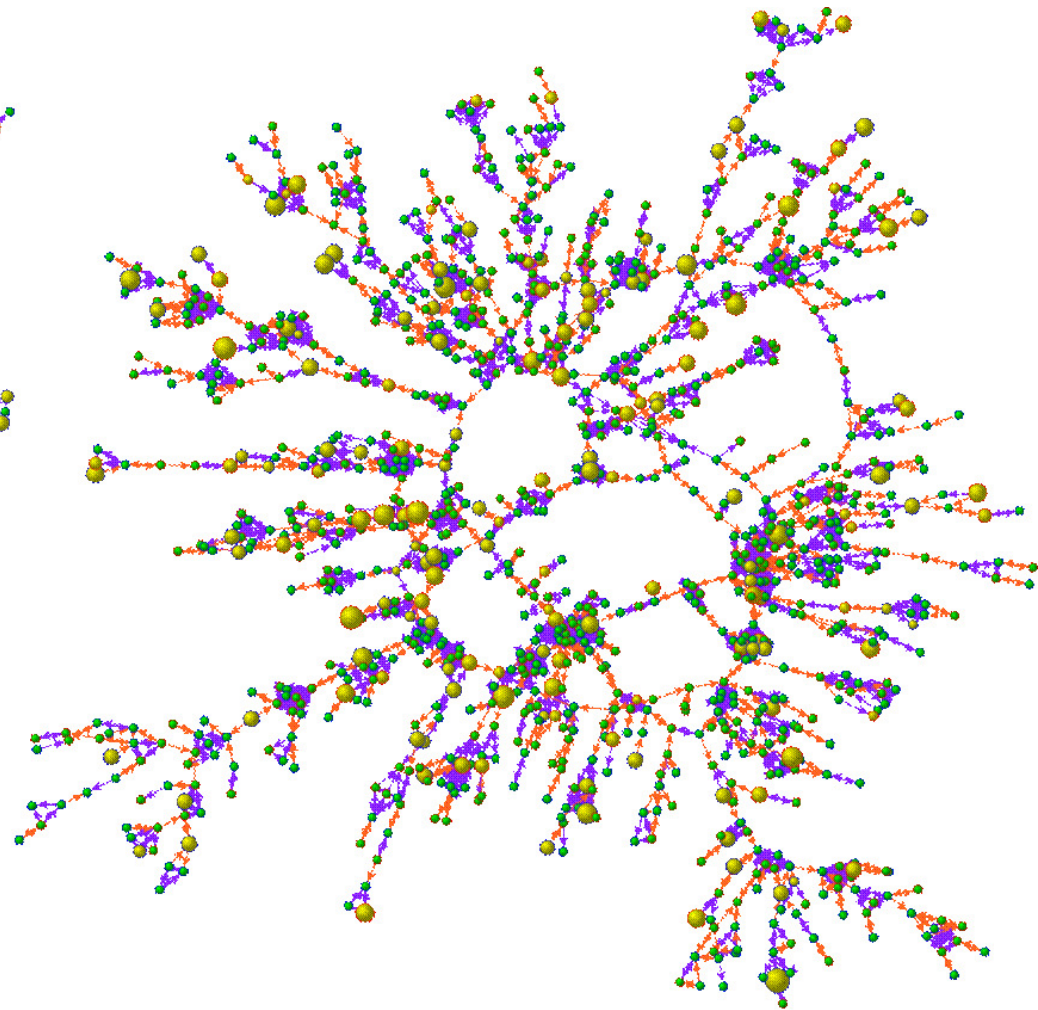
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Christakis & Fowler (2008)
Social network among
smokers (yellow) and non-smokers



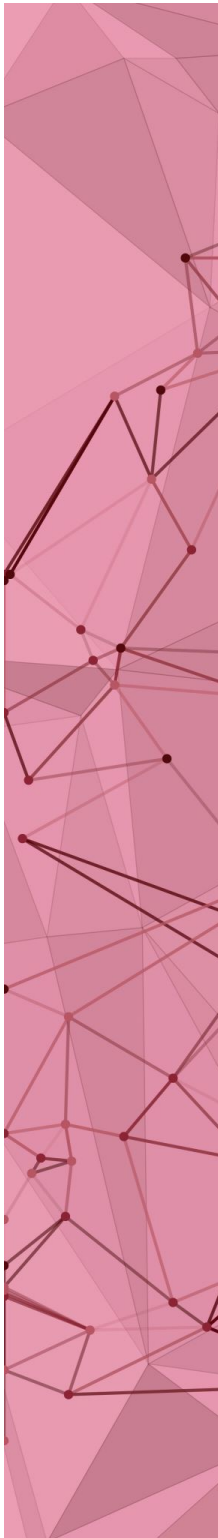
1971

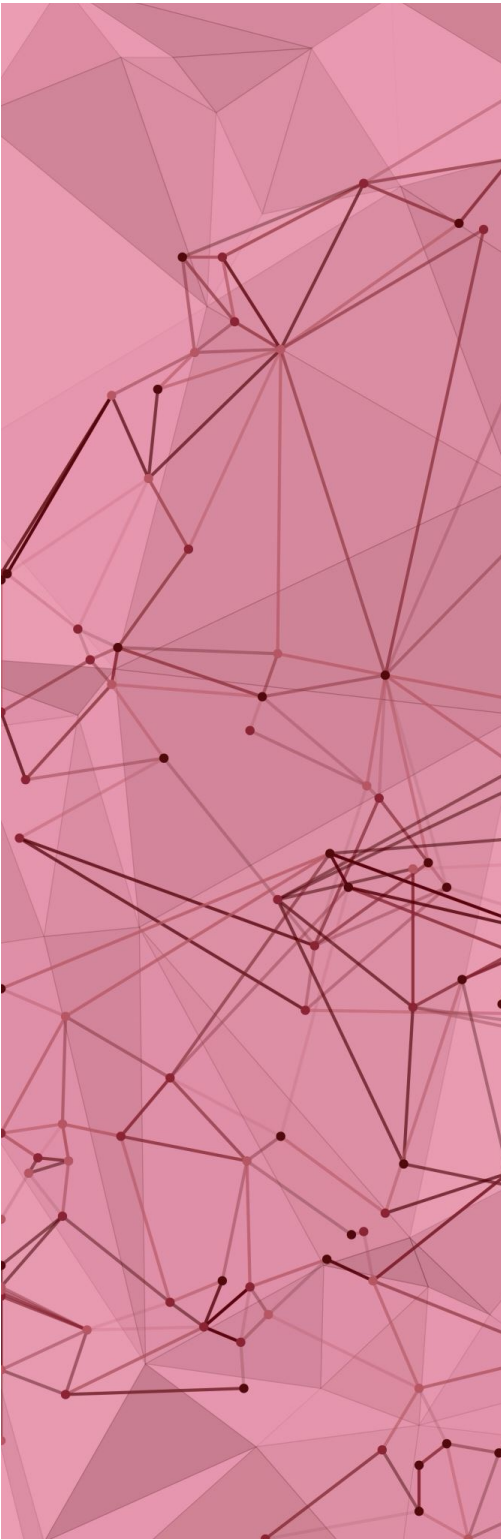


2000

Homophily: major contributors

- Sociologists Paul Lazarsfeld and Robert Merton (1950s)
 - Merton: “self-fulfilling prophecy”
- Economist Thomas Schelling (1970s)
 - Modeling residential segregation by race
 - Nobel Prize, 2005

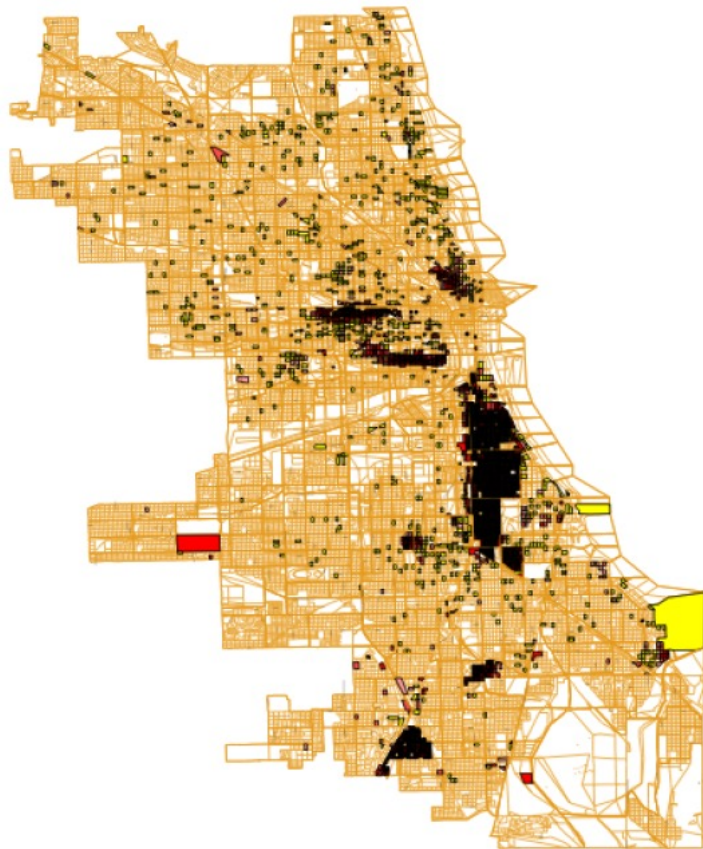




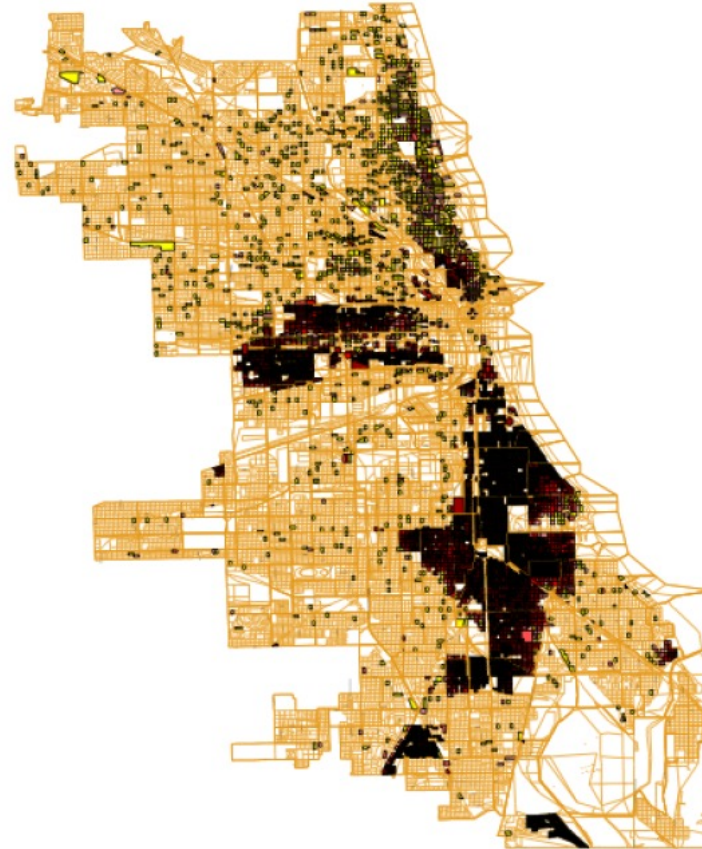
Effects of homophily: Segregation

To be covered after midterm

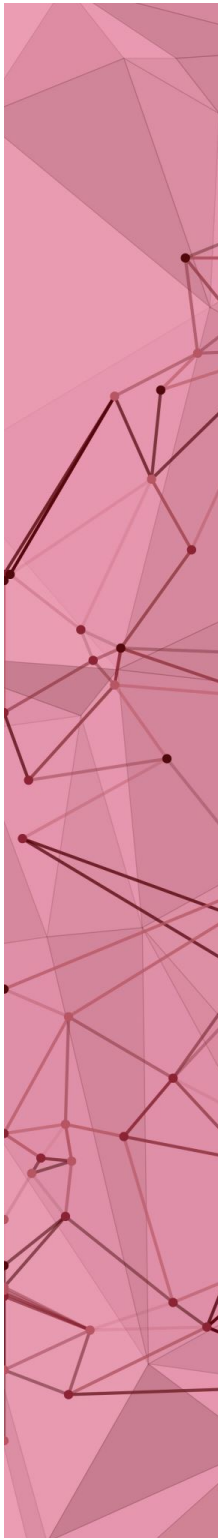
Residential segregation



(a) *Chicago, 1940*

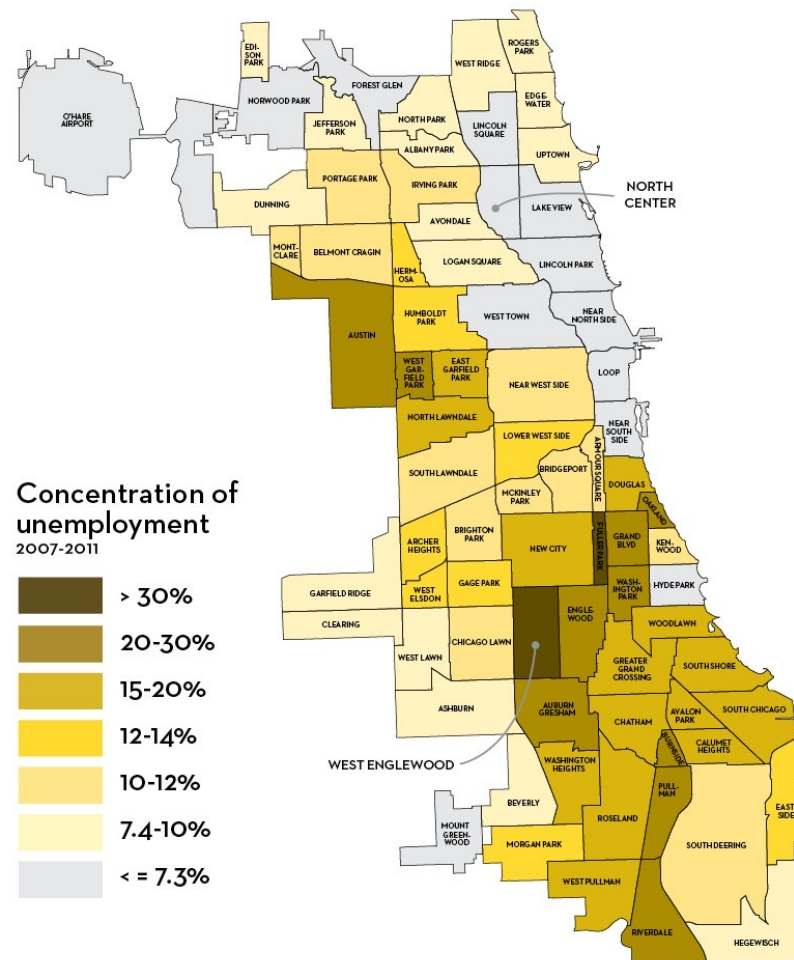
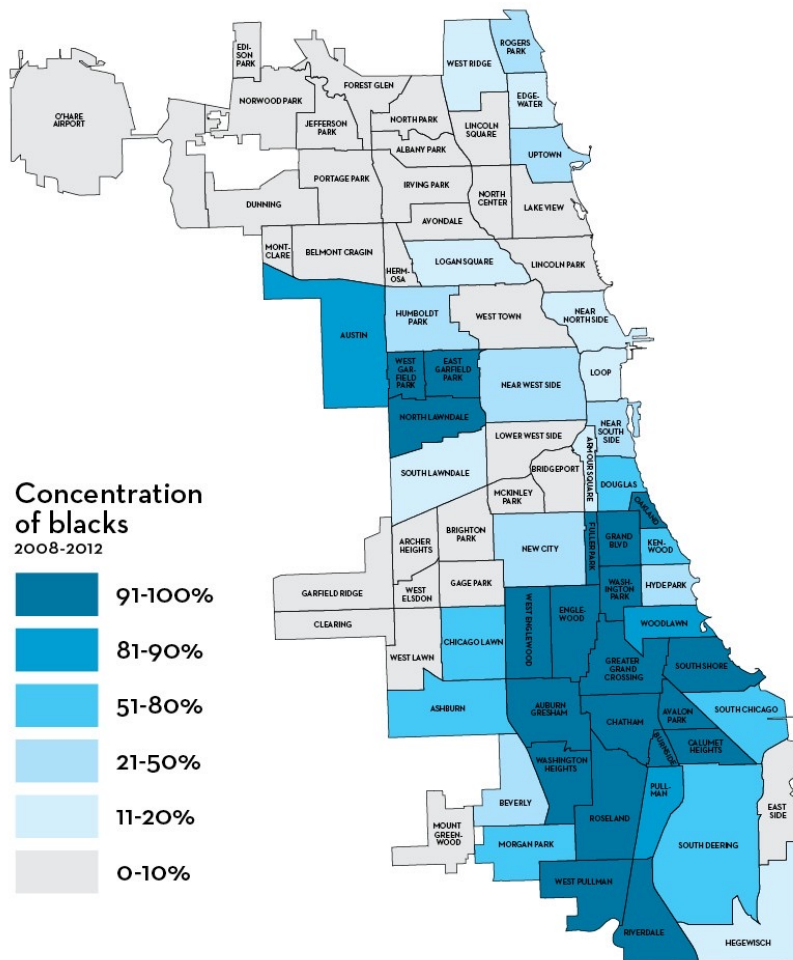


(b) *Chicago, 1960*



A city divided by race and by opportunity

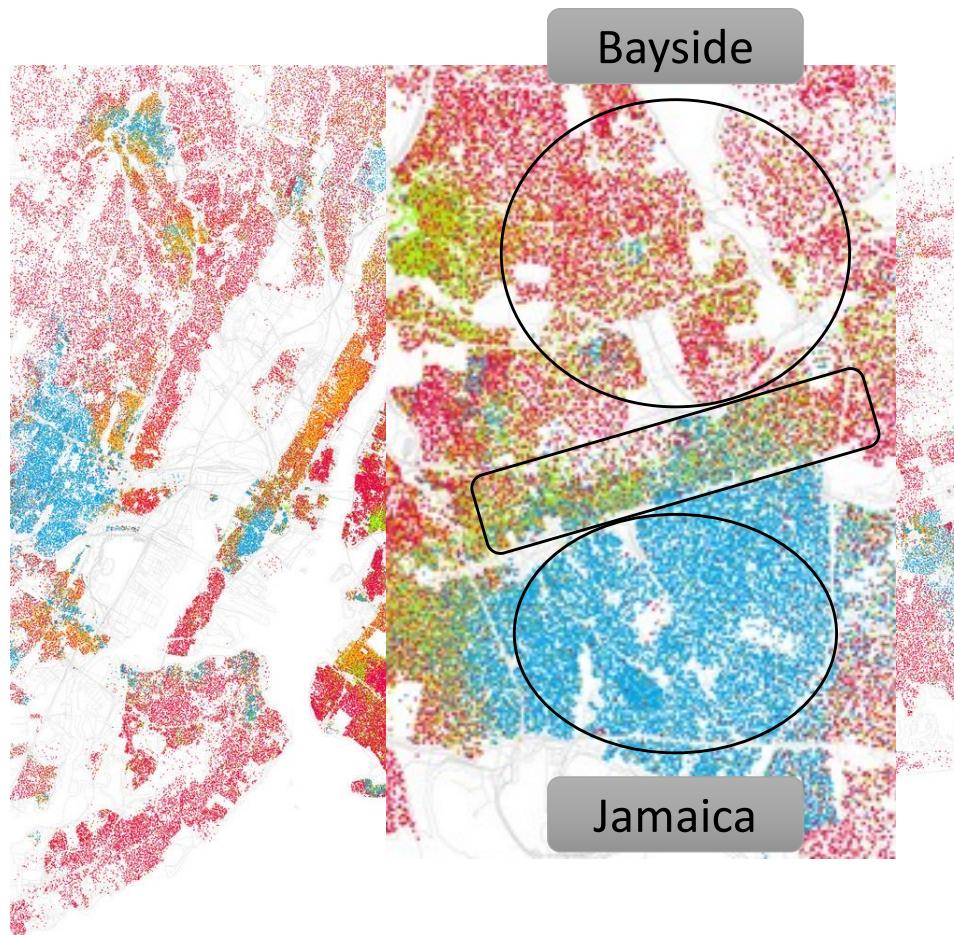
In West Englewood, the unemployment rate is nearly eight times what it is in North Center.



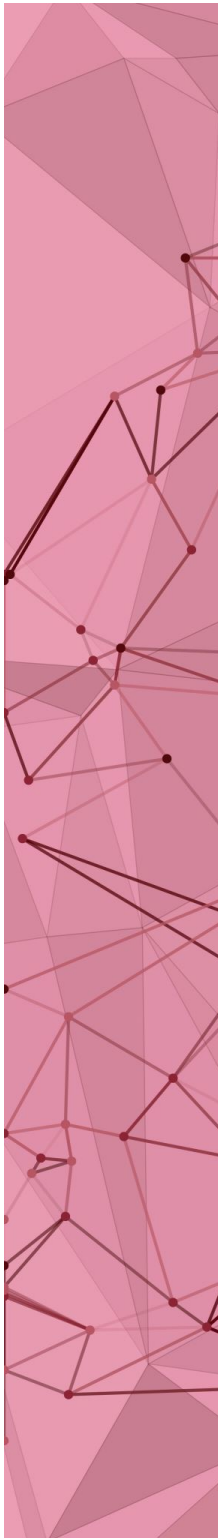
SOURCES: SOCIAL IMPACT RESEARCH CENTER ANALYSIS OF THE CENSUS BUREAU'S 2008-2012 AMERICAN COMMUNITY SURVEY; CHICAGO DEPARTMENT OF PUBLIC HEALTH

<https://www.chicagoreader.com/chicago/still-separate-unequal-and-ignored/Content?oid=16347785>

Residential segregation



New York (Eric Fischer, 2010)



Schelling's model (1970s)



Thomas Schelling
Nobel Prize (2005)

X1*	X2*				
X3	O1*		O2		
X4	X5	O3	O4	O5*	
X6*	O6			X7	X8
	O7	O8	X9*	X10	X11
		O9	O10	O11*	

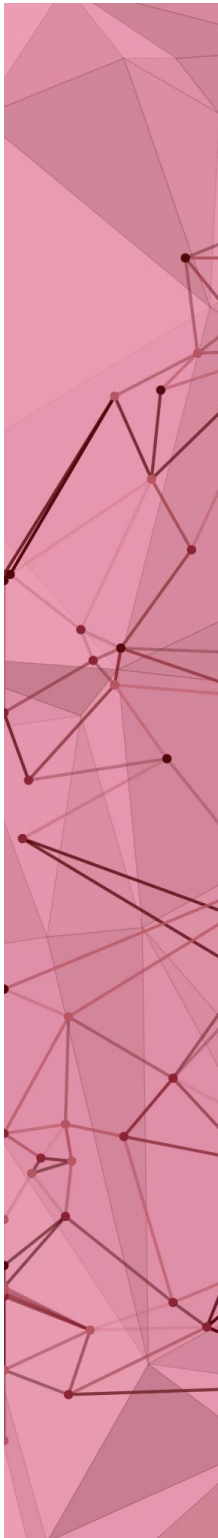
Threshold = 3

(a) *An initial configuration.*

(b) *After one round of movement.*

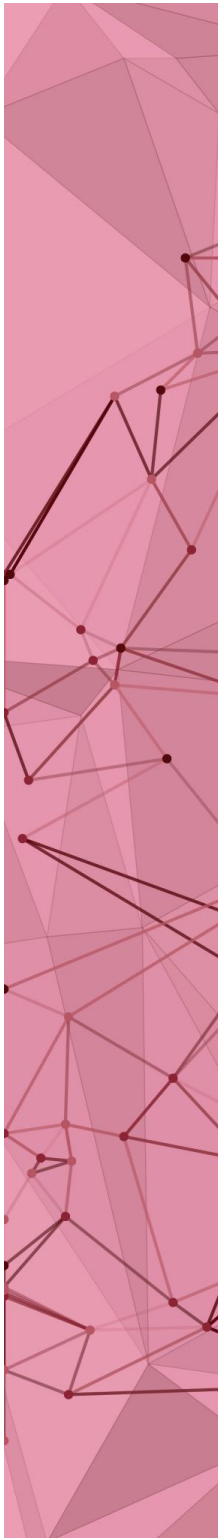
Misconception

- People move because they want to be majority
 - Correct: They want to avoid being extreme minorities



Simulation

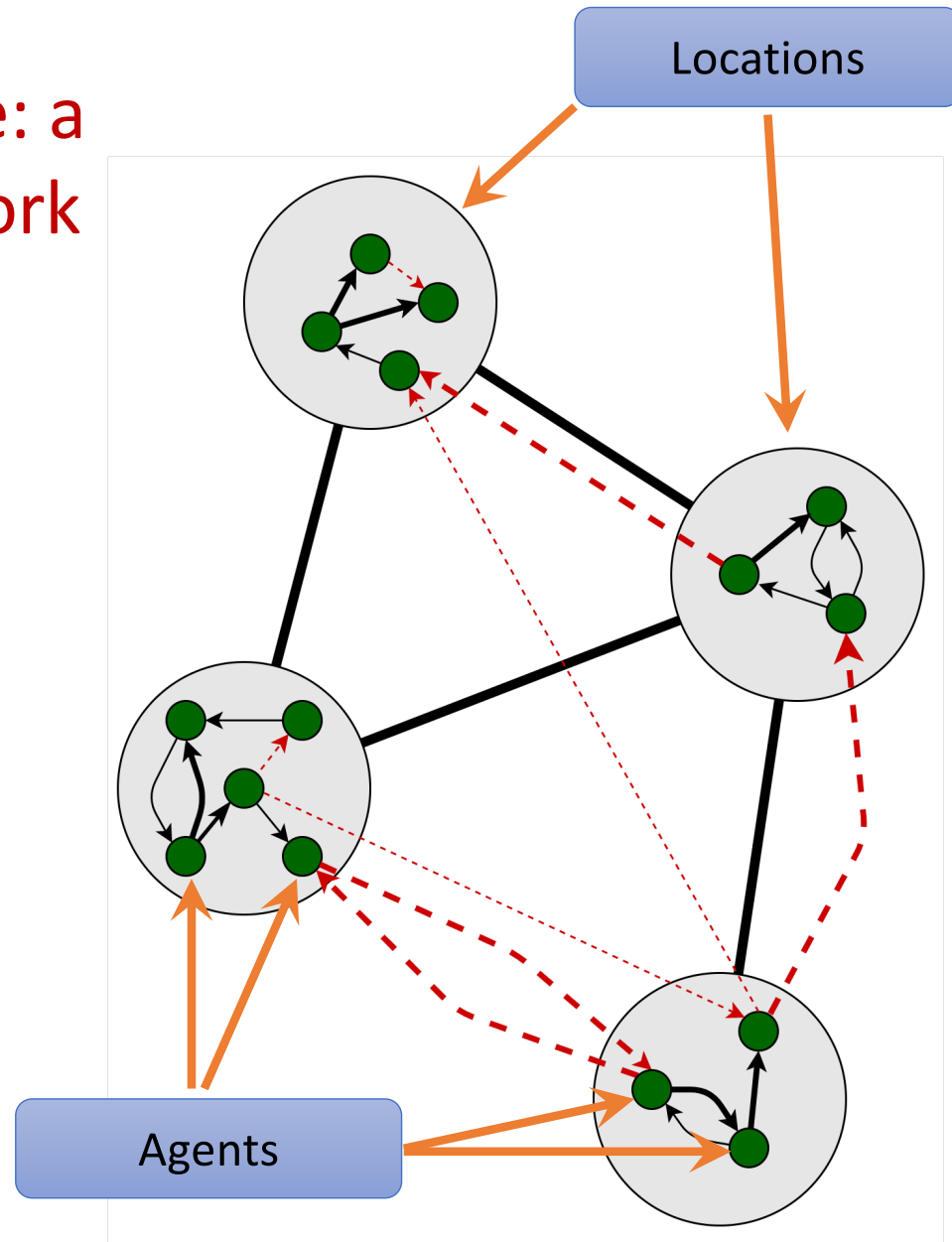
- NetLogo
- File → Models Library → Social Science →
Segregation



Schelling models with localized social influence: a game-theoretic framework

Chan, Irfan, Cuong (AAMAS 2019)

- Structure
 - Two networks
 - Multiple agents in the same location
 - Locations have capacity
- Behavior (strategic)
 - Social influence
 - Location effect



[Link to the paper](#)