

Soc 229 Seminar on Social Networks

Professor: James Moody

Meeting Time: F 10:15 – 12:50 (for now!)

Place: Social Psych 331 (Thompson – for now!)

“To speak of social life is to speak of the association between people – their associating in work and in play, in love and in war, to trade or to worship, to help or to hinder. It is in the social relations men establish that their interests find expression and their desires become realized.”

-- Peter M. Blau, 1964

Overview:

This seminar focuses on theoretical and substantive themes within *social network analysis*. The theoretical heart of this approach to social science is that actors are interdependent, and that social structure emerges from regularities in this interdependence. In this seminar, we will couple the substantive and theoretical development of social network analysis with methodological tools to implement network research. By the end of the course, you should (1) know the major theoretical ideas supporting network research, (2) be able to collect social network data and, (3) be able to analyze and interpret social network data.

Social network research is unique in the extent to which methodological tools derive directly from substantive theories. As such, class time will be split almost 50-50 on methodological and substantive (theory, application, and examples) issues, with each substantive topic tied to a new method or analysis strategy. Substantive topics will include work on sexual behavior, organizational performance, delinquency, power, friendship, and much more.

Requirements:

The main requirement of this seminar is a *research paper* that uses the methods or ideas of social network analysis. This may be a revision of previous work (an MA paper, another course paper, etc.) or a new paper. If this is a revision of a previous paper, you need to show that the addition of network ideas or methods significantly contributes to the revision. You may collaborate with up to 2 other students (3-authors total) on your final paper. The second requirement for the class is *a set of homework assignments* designed to build familiarity with the software and analysis techniques. Assignments are self-graded with the solutions posted on the course webpage, they are due the next class day (so an assignment listed on class 2 is due on class 3). Finally, since this is a seminar, *in-class participation is necessary*.

Texts:

The main **text** for the class is:

- Wasserman and Faust (1994): *Social Network Analysis*. Cambridge University Press. This book will provide the main methodological and background reading for the course. The three other methods/general texts are Kolaczyk (2009), Easley & Kleinberg (2010), or Jackson (2008). These are great books ... feel free to work from them if you like.

I also recommend the following:

- Kadushin, Charles (2010): *Making Connections: An introduction to social network theory, concepts and findings*. This is a great “what and why” book – not a “how to” book, particularly for students with little social networks background.

- Martin, John Levi (2009): *Social Structures*. This is a theory book on how types of relations constrain/construct types of aggregate social structures.
- Kolaczyk, Eric D. 2009 *Statistical Analysis of Network Data*. Springer. This is a statistics oriented book, great for those who want to really dig into the modeling challenges raised by network data.
- Easley, David & Jon Kleinberg. 2010. *Networks, Crowds and Markets: Reasoning about a Highly Connected World*. A new book on “network science” by two leading thinkers in the field. Focusing on the work coming out of complexity & physics, it covers graph theory, games & models of networks from a different frame than Wasserman & Faust.
- Barabasi, Albert-László *Linked: The New Science of Networks*. Provides an overview from the point of view of physicists, who have recently started thinking about networks (and social networks as part of that).
- Freeman, Linton. *The Development of Social Network Analysis* by Linton Freeman. A great history of the sociological development of the field.
- Jackson, Matthew O. 2008. *Social and Economic Networks*. Brings economic modeling/theory to networks.

Most papers we are reading will be linked to on-line sources from the class web-page version of this syllabus. If there are password protected .pdf files, the password is moodynets .

Software:

I will provide sample code, instruction and so forth in a number of software programs. The main ones are:

- 1) UCI-NET. This is the industry standard social network analysis program. The most recent version is available for about \$40 from Analytic technologies. Orders may be placed by web, mail, telephone, fax, or e-mail. Web: www.analytictech.com. E-mail: sales@analytictech.com. You can also use it in “trial mode” for quite some time...
- 2) Access to SAS, including IML, and a set of programs I have written called SPAN (Sas Programs for Analyzing Networks), which contains a set of useful routines. The SPAN program is free, and can be downloaded from here: <http://www.soc.duke.edu/~jmoody77/Span/span.zip> *this is the main software source I will instruct in.*
- 3) PAJEK. A program for analyzing and visualizing large networks. It is free. You can download the most recent version of PAJEK at: <http://vlado.fmf.uni-lj.si/pub/networks/pajek/default.htm>. A good book on the “how to” of PAJEK is *Exploratory Network Analysis With PAJEK*, Cambridge Press
- 4) **R**. The R platform is necessary for the statistical models of networks we will be exploring, but can also be used as a general network analysis program. I will provide links to tutorials on R for many of the topics we cover and more detailed examples for the statistical modeling projects. For those who like to program in **R**, the main modules to review are “SNA” (Carter Butts), “Statnet” (Handcock et al), and iGraph (Csardi). R is free.

Online resources

- 1) *Class web page*. This is where the most up-to-date version of the syllabus will always be, and links to all of the course material. <http://www.soc.duke.edu/~jmoody77/s884/index.htm>

- 2) International Network for Social Network Analysis (INSNA) home page
<http://www.insna.org/>

Readings:

I list way more reading than we'll actually cover. I can't help it; there's just too much great work being done right now. The primary foci will be indicated with an astray (*).

Schedule:

Class 1: Introduction, Basics & Overview (Sep 2)

Summary: First day of class. Discuss syllabus, go over the history of social network research, general trends in the field and some basic elements of how social network data differ from data social scientists are used to collecting. We then cover base data elements, format & graph drawing/exploration,

Reading:

- Background & Theory:
 - *Wasserman & Faust, Chapter 1
 - *Borgatti, S.P et al "[Network Analysis in the Social Sciences](#)" *Science* 323, 892 (2009).
 - *Butts, Carter T. "[Revisiting the Foundations of Network Analysis](#)" *Science* 325, 414 (2009)
 - Kadushin: [Intro](#) & [Chapter 1](#), [Chapter 2](#) & [Chapter 3](#)
 - Martin, J. [Front matter](#) & [Chapter 1](#).

- Data & Programs
 - *Wasserman & Faust, Chapters 3 & 4

Assignments: [Family as Social Network & Substantive implications](#), [Matrix manipulations](#), [graph translation exercise](#), [network drawing](#).

Recommended /Background Reading:

Barabási, Albert-László *Linked: The New Science of Networks*
Freeman, Linton *The Development of Social Network Analysis*
Borgatti, S.P. "[A quorum of graph theoretic concepts](#)"
Wellman, Barry: "[Structural Analysis: From method and metaphor to theory and substance](#)"
Emirbayer, M. 1997. "[Manifesto for Relational Sociology](#)." *American Journal of Sociology* 103:281-317.
Any number of reviews of network science, see for example SCIENCE VOL 325.

Class 2. Collecting Network Data & Two-Mode networks (Sept 9)

Summary: What are the best ways to collect network data? What are the tradeoffs involved in different network data designs, how does data collection quality affect results? How do we collect data in ethically responsible ways? Since people form relations through overlapping associations, they not only create a network of people, but also a network of associations. This is captured through the duality of persons and groups, and provides a powerful way to identify network processes through commonly available (often archival) data.

Reading:

- Ethics of Network Data Collection
 - *Breiger, Ronald L. 2005. "[Introduction to special issue: ethical dilemmas in social network research](#)" *Social Networks* p89-93
 - *Klov Dahl, Alden S. 2005. "[Social network research and human subjects protection: Towards more effective infectious disease control](#)" *Social Networks* p119-137
 - Kadushin, C. [Chapter 10](#)

- Strategies for & Examples of Network data Collection
 - *Marsden, P.V. 1990. "[Network data and measurement.](#)" *Annual Review of Sociology* 16:435-63
 - Bearman & Parigi "Cloning Headless Frogs and Other Important Matters: Conversation Topics and Network Structure" *Social Forces*
 - Borgatti : <http://www.analytictech.com/networks/data.htm>
 - *Grannis, Rick. "[Six Degrees of 'Who Cares?'](#)" *American Journal of Sociology* 115:991-1017
 - *Salathe, Marcel, Maria Kazandjieva, Jung Woo Lee, Philip Levis, Marcus W. Feldman, and James H. Jones. 2010. "[A high-resolution human contact network for infectious disease transmission](#)" *PNAS* 107:22020-22025

- 2-mode network data:
 - *Breiger, R. L. 1974. "[The Duality of Persons and Groups.](#)" *Social Forces* 53:181-90.
 - *Wasserman & Faust *Chapter 8 (skim)*.
 - Moody, James. 2004. "[The Structure of a Social Science Collaboration Network](#)" *American Sociological Review* 69:213-264 (skim, will present)
 - Burris, Val (2005) "[Interlocking Directorates and Political Cohesion among Corporate Elites](#)" *American Journal of Sociology*

Assignments: Constructing a dual (person-through-group) network, paper topic due.

Background Reading:

- Baldassarri, D and Mario Diani. (2007) The Integrative Power of Civic Networks. *American Journal of Sociology* 113:3, 735-780
- Bearman, P. and K. Everett. 1993. "The Structure of Social Protest." *Social Networks* 15:171-200.
- Bell, D. C. et al "Partner naming and forgetting: Recall of network members" *Social Networks* p279-299

- Bernard, W. H., P. Killworth, and L. Sailer. 1979. "Informant accuracy in social networks. Part IV: A comparison of clique-level structure in behavioral and cognitive network data." *Social Networks* 2: 191-218.
- Butts. 2003. "Network inference, error and informant (in)accuracy: a Bayesian approach," *Social Networks* 25:2: 103-140.
- Eagle, N. A. Pentland, and D. Lazer (2009), "Inferring Social Network Structure using Mobile Phone Data", *Proceedings of the National Academy of Sciences (PNAS)*.
- Faust, K. 2009. "Triadic configurations in limited choice sociometric networks: Empirical and theoretical results" *Social Networks*
- Frank, K. et. al () "The Social Dynamics of Mathematics Coursetaking in High School" *AJS*
- Freeman, L. A.K. Romney, S.C. Freeman. 1989. "Cognitive Structure and Informant Accuracy," *American Anthropologist* 89.
- Kadushin, C. "Who benefits from network analysis: ethics of social network research" *Social Networks* p139-153
- Killworth, P.D and H. R. Bernard. 1976. "Informant accuracy in social network data," *Human Organization* 35(8): 269-286.
- Vehovar, V et al "Measuring ego-centered social networks on the web: Questionnaire design issues" *Social Networks* p213-222

Class 3. [Local Networks](#) (Sept 23)

Summary: The building blocks of a network are the sets of relations each person is embedded within. Today we discuss how positions can be defined in terms of (a) the *composition* of local network alters and (b) the *pattern* of relations among local ties. We identify sources of such data in the literature and ask how they provide resources (i.e. social capital).

Reading:

- Local Network Composition
 - *McPherson, Miller, Lynn Smith-Lovin, and James M. Cook. 2001. "[Birds of a Feather: Homophily in Social Networks](#)." *Annual Review of Sociology* 27:415-44
 - Fischer, Claude: *To Dwell Among Friends*, Chapters 3, 8, 9, 12, 14 (don't worry, they are short and easy!)
 - DiPrete, Thomas A., Andrew Gelman Tyler McCormic Julien Teitler & Tian Zheng. "[Segregation in Social Networks based on Acquaintanceship and Trust](#)" *American Journal of Sociology* 116: 1234-1283.
 - *Henry, Adam Douglas, Pawel Pralat and Cun-Quan Zhang. 2011. "[Emergence of Segregation in evolving social networks](#)" *PNAS* 108:8650-8610
- Local Network Patterns
 - *McPherson, Smith-Lovin, Brashears "[Social isolation in America: Changes in Core Discussion Networks over Two Decades](#)" *American Sociological Review*
 - Fischer, CS (2009) "[Comment: The 2004 GSS Finding of Shrunken Social Networks: An Artifact?](#)" Claude S. Fischer *American Sociological Review*
 - McPherson, Smith-Lovin, Brashears (2009) "[Reply: Models and Marginals: Using Survey Evidence to Study Social Networks](#)" (ASR)
 - *Burt, R. *Structural Holes*, [Chapter 1](#) (skim [chapter 2](#)).
- Social Capital

- *Coleman, J. 1988. "[Social Capital in the Creation of Human Capital](#)"
American Journal of Sociology 95: 95-120
- *Granovetter, Mark. 1973. "[The Strength of Weak Ties.](#)" *American Journal of Sociology* 78:1360-80.
- *Moody, James and Pamela Paxton. 2009. "[Building Bridges: Linking Social Capital and Social Networks to Improve Theory and Research.](#)" *American Behavioral Scientist* 52: 1491-1506.
- *Eagle, Nathan Michael Macy and Rob Claxton. 2010. "[Network Diversity and Economic Development](#)" *Science* 328:1029-1031

Assignments: Ego-Network Characteristics.

Background Reading:

- Bidar, Clair "Evolutions of personal networks and life events" *Social Networks* p359-376
- Burt, R. 2010. *Neighbor Networks: Competitive Advantage Local and Personal* Oxford University Press
- Burt, R. 2004. "[Structural Holes and Good Ideas](#)" *American Journal of Sociology* 110:349-400
- Buskens, V & van de Rijt, Arnout "Dynamics of Networks if Everyone Strives for Structural Holes" *American Journal of Sociology*
- Cornwell, B., Laumann, E.O. and Schumm. 2009. "[The Social Connectedness of Older Adults: A National Profile](#)" *American Sociological Review*
- Cowan, Robin & Nicolas Jonard. (2007) "Structural holes, innovation and the distribution of ideas." *Journal of Economic Interaction and Coordination* 2:2, 93-110
- Everett & Borgatti (19xx) "Ego network betweenness" *Social Networks* p31-38
- Fernandez-Mateo, Isabel () "Who Pays the Price of Brokerage? Transferring Constraint through Price Setting in the Staffing Sector" *American Sociological Review*
- Granovetter, Mark. (1974) *Getting a job; a study of contacts and careers.* Harvard University Press
- Kalish & Robins. () "Psychological predispositions and network structure: The relationship between individual predispositions, structural holes and network closure" *Social Networks* p56-84
- Kalmijn, M et al "Homogeneity of social networks by age and marital status: A multilevel analysis of ego-centered networks" *Social Networks* p25-43
- Lee, Nancy Howell (1969) *The search for an abortionist.* University of Chicago Press
- Lin, Cook & Burt 2001. *Social Capital: Theory & Research* (intro chapter)
- Lizardo, Omar () "How Cultural Tastes Shape Personal Networks" *American Sociological Review*
- Marsden, Peter: "Core discussion networks of Americans"
- Martin, J.L. "Persistence of close personal ties over a 12-year period" *Social Networks* p331-362
- McFarland, D & RJ Thomas. 2008. Bowling Young: How Youth Voluntary Associations Influence Adult Political Participation *American Sociological Review*
- Mizruchi, Mark & Linda Brewster Stearns "Getting Deals Done: The Use of Social Networks in Bank Decision-Making" *American Sociological Review* 2001 66:647-671

- Moore, G. 1990. "Structural Determinants of Men's and Women's Personal Networks." *American Sociological Review* 55:726-35.
- Renzulli, L. A., H. Aldrich, and J. Moody. 2000. "Family Matters: Gender, Networks, and Entrepreneurial Outcomes." *Social Forces*.
- Tiwana, Amrit. (2008) "Do bridging ties complement strong ties? An empirical examination of alliance ambidexterity." *Strategic Management Journal* 29:3,251-272
- Van Der Gaag, Martin & Tom Snijders "The Resource Generator: social capital quantification with concrete items" *p1-29 Social Networks*
- van Duijn, M. A. J., J. T. van Busschbach, and T. A. B. Snijders. 1999. "Multilevel Analysis of Personal Networks As Dependent Variables." *Social Networks* 21:187-209.
- Wellman, B. and S. Wortley. 1990. "Different Strokes From Different Folks: Community Ties and Social Support." *American Journal of Sociology* 96:558-88.
- Wellman, B., R. Y. Wong, D. Tindall, and N. Nazer. 1997. "A Decade of Network Change: Turnover, Persistence and Stability in Personal Communities." *Social Networks* 19(1):27-50.

Class 4. [Centrality](#). (Sept 30)

Summary: Another conception of "position" in a social network deals with where an actor resides within a network. Falling under the broad heading of centrality, a series of measures are identified that highlight individuals positions in the network.

Reading:

- Theory & Measurement
 - *W&F Chap. 5.
 - *Friedkin, N. E. 1991. "Theoretical Foundations for Centrality Measures." *American Journal of Sociology* 96:1478-504.
 - *Borgatti, S. P. 2005. "[Centrality and network flow](#)" *Social Networks* p55-71
 - Bonacich, P. 1987. "[Power and Centrality: A Family of Measures](#)." *American Journal of Sociology* 92:1170-1182.
 - Borgatti & Everett. 2006. "[A Graph-theoretic perspective on centrality](#)" p466-484 *Social Networks*
- Application (Read one of these)
 - Rossman, Gabriel, Nicole Esparza and Phillip Bonacich. 2010. "[I'd like to thank the Academy, Team Spillovers, and Network Centrality](#)" *American Sociological Review* 75:31-51.
 - Friedkin, N. E. 1993. "[Structural Basis of Interpersonal Influence in Groups: A Longitudinal Case Study](#)." *American Sociological Review* 58:861-72.
 - Baker, W. E. and R. R. Faulkner. 1993. "[The Social Organization of Conspiracy: Illegal Networks in the Heavy Electrical Equipment Industry](#)." *American Sociological Review* 58:837-60.

Assignments: Calculate and compare different measures of centrality on the same network.

Background Reading:

- Bell, D. C., J. S. Atkinson, and J. W. Carlson. 1999. "Centrality Measures for Disease Transmission Networks." *Social Networks* 21:1-21.

- Bolland, J. M. 1988. "Sorting Out Centrality: An Analysis of the Performance of Four Centrality Models In Real and Simulated Networks." *Social Networks* 10:233-53.
- Bonacich, P. 1987. "Power and Centrality: A Family of Measures." *American Journal of Sociology* 92:1170-1182.
- Brandes, U "On variants of shortest-path betweenness centrality and their generic computation" *Social Networks* p.36-145
- Clifton, Allan. Eric Turkheimer, Thomas F. Oltmanns () "Personality disorder in social networks: Network position as a marker of interpersonal dysfunction *Social Networks*" *Pages* 26-32
- Freeman, L. C. . 1978-1979. "Centrality in Social Networks." *Social Networks* 1:215-39.
- Freeman, L. C. 1977. "A Set of Measures of Centrality Based on Betweenness." *Sociometry* 40:35-41.
- Friedkin, N. E. 1991. "Theoretical Foundations for Centrality Measures." *American Journal of Sociology* 96:1478-504.
- Kolaczyk, E.D David B. Chua, Marc Barthélemy "Group betweenness and co-betweenness: Inter-related notions of coalition centrality" *Social Networks* p190-203
- Rothenberg, R. B., J. J. Potterat, W. W. Woodhouse, S. Q. Darrow, S. Q. Muth, and A. S. Klovdahl. 1995. "Choosing a Centrality Measure: Epidemiologic Correlates in the Colorado Springs Study of Social Networks." *Social Networks: Special Edition on Social Networks and Infectious Disease: HIV/AIDS* 17:273-97.
- Zemljč, Barbara & Valentina Hlebec () "Reliability of measures of centrality and prominence" *Social Networks* p73-88

Class 5. [Micro Models of Networks: Homophily, Balance & Hierarchy \(Oct 14\)](#)

Summary: We have now seen the basic structures of informal networks and details of local networks. What interpersonal process could generate these features? Can we identify local level mechanisms that would generate such structures? Will also introduce the problem of statistical measurement of network attributes & the difficulties inherent in modeling such.

Reading:

- *W&F chap 6 & 14 (skim 14)
- *Davis, J. A. 1963. "[Structural Balance, Mechanical Solidarity, and Interpersonal Relations.](#)" *American Journal of Sociology* 68:444-62.
- *Chase, Ivan. "[Social process and hierarchy formation in small groups: A comparative perspective.](#)" *American Sociological Review*
- *Faris, Robert and Diane Felmlee. 2011. "[Status Struggles: Network Centrality and Gender Segregation in same- and cross- gender Aggression](#)" *American Sociological Review* 76: 48-73.
- *Marvel, Seth A., Jon Kleinberg, Robert D. Kleinberg, and Steven H. Strogatz. 2011. "[Continuous-time model of structural balance](#)" *PNAS* 108:1771-1776
- Chalizi, Cosma R. & Andrew C. Thomas. 2011. "[Homophily & Contagion are Generically Confounded in Observational Social Network Studies](#)" *Sociological Methods & Research* 40:211-239.
- Gould, Rodger (2002). "[The Origins of Status Hierarchies: A formal theory and Empirical Test.](#)" *American Journal of Sociology.* 107:1143-1178

- Krackhardt, D. 1994. "[Graph Theoretical Dimensions of Informal Organizations.](#)" *Computational Organizational Theory*, Editor Kathleen Carley and Michael Prietula. Hillsdale, N.J: Lawrence Erlbaum Associates.
- Doreian, P., R. Kapuscinski, D. Krackhardt, and J. Szczypula. 1996. "A Brief History of Balance Through Time." *Journal of Mathematical Sociology* 21(1-2):113-31.

Assignments: Identify transitivity levels in a network, triad distribution.

Background Reading:

- Doreian, P., R. Kapuscinski, D. Krackhardt, and J. Szczypula. 1996. "A Brief History of Balance Through Time." *Journal of Mathematical Sociology* 21(1-2):113-31.
- Faust, K. () "Triadic configurations in limited choice sociometric networks: Empirical and theoretical results" *Social Networks* p273-282
- Fowler, J.H. & Jeon S. (2008) "The authority of Supreme Court precedent" *Social Networks* P16-30
- Han, Shin-Kap. 2003. "Tribal Regimes in Academia: A Comparative Analysis of Market Structure Across Disciplines," *Social Networks* 25:251-280
- Johnsen, E. C. 1986. "Structure and Process: Agreement Models for Friendship Formation." *Social Networks* 8:257-306.
- Johnsen, E. C. 1985. "Network Macrostructure Models for the Davis-Leinhardt Set of Empirical Sociomatrices." *Social Networks* 7:203-24.
- Kogut, Bruce. (2008) Introduction to complexity: emergence, graphs, and management studies. *European Management Review* 4:2, 67-72
- Martin, J.L. 2005 "Is Power Sexy?" *American Journal of Sociology.* 111:408-446

Class 6. Network Topology: Distance, Small Worlds & Cohesion (Oct 21)

Summary: Much of the power of networks comes from the inter-connection of local networks into wider populations. Based on what we know of local networks and people's involvement in activities, what should networks look like at the global level?

Reading:

- *Watts, Duncan J. (1999) "[Networks, Dynamics, and the Small-World Phenomenon](#)" *American Journal of Sociology.* v. 105:493-527.
- *Moody, James & Douglas R. White. 2003. "[Structural Cohesion and Embeddedness](#)" *American Sociological Review* 68:103-127
- *Bothner, Matthew S., Edward Bishop Smith and Harrison C. White. 2010. "[A model of Robust Positions in Social Networks](#)" *American Journal of Sociology* 116: 943-992.
- *Uzzi, Brian and Jarrett Spiro. 2005. "[Collaboration and Creativity: The Small World Problem.](#)" *American Journal of Sociology* 111:2, 447-504

Kadushin, C. [Chapter 7](#)

Travers, J. and S. Milgram. "[An experimental study of the small world Problem](#)" *Sociometry* 32:425-443

Bearman, Farris, & Moody, "[Blocking the Future](#)" *Social Science History* 23:501-533

- Powell, WW, DR White, KW Koput, and JO Smith. 2006. "[Network Dynamics and Field Evolution: The Growth of Interorganizational Collaboration in the Life Sciences](#)" *American Journal of Sociology* 110: 1132–205
- Aral, Sinan & Marshall van Alstyne. 2011. "[The Diversity-Bandwidth Trade-Off](#)" *American Journal of Sociology* 117:90-171

Assignments: Small-world connectivity test. How many people do you know?
Identifying components, reachability, distance. Calculating biased network statistics.
Measuring cohesion in a network.

Background Reading:

- Bruce Kogut. (2008) Introduction to complexity: emergence, graphs, and management studies. *European Management Review* 4:2, 67-72
- Fararo, T. J. 1981. "Biased Networks and Social Structure Theorems." *Social Networks* 3:137-59.
- Fararo, T. J. and J. Skvoretz. 1987. "Unification Research Programs: Integrating Two Structural Theories." *American Journal of Sociology* 92:1183-209.
- Klov Dahl, A. S. 1985. "Social Networks and the Spread of Infectious Diseases: The AIDS Example." *Social Science Medicine* 21:1203-16.
- Mizruchi, M. S. et al () "The Conditional Nature of Embeddedness: A Study of Borrowing by Large U.S. Firms, 1973–1994" (ASR)
- Newmann, M. E. J. 1999. "Models of the Small World"
- Pool, I. d. S. and M. Kochen. 1978. "Contacts and Influence." *Social Networks* 1:5-51.
- Rapoport, A. and W. J. Horvath. 1961. "A Study of a Large Sociogram." *Behavioral Science* 6:279-91.
- Schnettler, S. 2009. "A structured overview of 50 years of small-world research" *Social Networks*
- Watts, Duncan J. 1999. *Small Worlds: The Dynamics of Networks between Order and Randomness*. Princeton University Press

Class 7. Sub-Groups: Communities & Roles (Oct 28)

Summary: Primary groups are common in social interaction. How important are these groups and how do we identify them? We will go over multiple methods for identifying a primary group.

Reading:

- Communities/Groups
 - *Wasserman & Faust Ch 9
 - *Freeman, L. C. 1992. "[The Sociological Concept of "Group"](#): An Empirical Test of Two Models." *American Journal of Sociology* 98:152-66. (OnLine)
 - *Feld, S. L. 1981. "[The Focused Organization of Social Ties](#)." *American Journal of Sociology* 86:1015-35.
 - *Frank, K. A. and J. Y. Yasumoto. 1998. "[Linking Action to Social Structure Within a System: Social Capital Within and Between Subgroups](#)." *American Journal of Sociology* 104:642-86. (OnLine)
 - *Mucha, Peter J., Thomas Richardson, Kevin Macon, Mason A. Porter, and Jukka-Pekka Onnela. 2010. "[Community Structure in Time-Dependent, Multiscale and Multiplex Networks](#)" *Science* 328:876-878
 - *Newman, MEJ. 2006. "[Modularity and Community Structure in Networks](#)" PNAS

Vedres, Balazs and David Stark. 2010. "[Structural Folds: Generative Disruption in Overlapping Groups](#)" *American Journal of Sociology* 115:1150-1190
Porter, Onnela & Mucha 2009. "[Communities in Networks](#)"

- Roles / Positions
 - *Nadel, *A Theory of Social Structure* Chapter 4.
 - *W&F Chapter 10. Blockmodeling
 - White, H. C., S. A. Boorman, and R. L. Breiger. 1976. "Social Structure From Multiple Networks I." *American Journal of Sociology* 81:730-780.
 - *Bearman, P. 1997. "Generalized Exchange." *American Journal of Sociology* 102(5):1383-415.
 - Borgatti, S. (1999) "Models of Core-Periphery Structure" *Social Networks* 21:375-395
 - Hillman, H. (2007) "Mediation in Multiple Networks: Elite Mobilization before the English Civil War" *American Sociological Review*
 - Montgomery, JD. "The structure of norms and relations in patronage systems" *Social Networks* p565-584

Assignments: Identify cohesive groups in test data, blockmodels

Background Reading:

- Alba, R. D. 1973. "A Graph-Theoretic Definition of a Sociometric Clique." *Journal of Mathematical Sociology* 3:113-26.
- Baker, W. E. and R. R. Faulkner. 1993. "The Social Organization of Conspiracy: Illegal Networks in the Heavy Electrical Equipment Industry." *American Sociological Review* 58:837-60.
- Borgatti, S. P. 1999. "Models of Core / Periphery Structures." *Social Networks* 21:375-95.
- Brieger, Ronald L. 1976. Career Attributes and Network Structure: A Blockmodel Study of a Biomedical Research Specialty *American Sociological Review*, Vol. 41: 117-135.
- Burt, R. S. 1978. "Cohesion Versus Structural Equivalence As a Basis for Network Sub-Groups." *Sociological Methods and Research* 7:189-212.
- Burt, R. S. 1987. "Social Contagion and Innovation: Cohesion Versus Structural Equivalence." *American Journal of Sociology* 92:1287-335.
- Burt, R. S. 1987. "Social Contagion and Innovation: Cohesion Versus Structural Equivalence." *American Journal of Sociology* 92:1287-335.
- Burt, R. S. 1990. "Detecting Role Equivalence." *Social Networks* 12:83-97.
- Burt, R.S. 1990. "Detecting Role Equivalence." *Social Networks* 12:83-97.
- Carroll, C. () "Canonical correlation analysis: Assessing links between multiplex networks" *Social Networks* p310-330
- Doreian, P. () "A multiple indicator approach to blockmodeling signed networks" *Social Networks* p247-258
- Feld. 1991. "Why Your Friends Have More Friends Than You Do." *American Journal of Sociology* 96:1464-77.
- Fershtman, M. 1997. "Cohesive Group Detection in a Social Network by the Segregation Matrix Index." *Social Networks* 19:193-207.
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- Mizruchi, M. S. 1993. "Cohesion, Equivalence and Similarity of Behavior: a Theoretical and Empirical Assessment." *Social Networks* 15:275-307.
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- Moody, James. 2002. "Peer Influence Groups: Identifying dense clusters in large networks. *Social Networks*. 2001; 23:261-283."
- Padgett, J. F. and C. K. Ansell. 1993. "Robust Action and the Rise of the Medici, 1400-1434." *American Journal of Sociology* 98:1259-319. (its long, skim for content and method)
- Rossem, R. V. 1996. "The World System Paradigm As General Theory of Development: A Cross-National Test." *American Sociological Review* 61:508-27.
- Salome, A et al () "Core/periphery structure models: An alternative methodological proposal" *Social Networks* p442-448
- Smith, D. A. and D. R. White. 1992. "Structure and Dynamics of the Global Economy: Network Analysis of International Trade 1965-1980." *Social Forces* 70:857-93.
- T. S. Evans, R. Lambiotte. (2009) Line graphs, link partitions, and overlapping communities. *Physical Review E* 80:
- Vaisey, Stephen (2008) "Structure, Culture, and Community: The Search for belonging in 50 Urban Communes" *American Sociological Review*
- White, D. R. and K. P. Reitz. 1989. "Re-Thinking the Role Concept: Homomorphisms on Social Networks." Pp. 429-88 in *Research Methods in Social Network Analysis*, Editors L. C. Freeman, D. R. White, and A. K. Romnet. Fairfax, VA: George Mason University Press.

Class 8. Diffusion & Peer Influence Models (Nov 4)

Summary: Networks are conduits for the flow of information and influence. Thus, the behavior of individuals is often a complex interaction of individual and interpersonal effects. This is a large and growing section of the field, particularly relevant in political/opinion and health research.

Reading:

- Peer Influence
*Friedkin, N.E. 1998 *A Structural Theory of Social Influence* Cambridge

- Friedkin, N. E. and K. S. Cook. 1990. "Peer Group Influence." *Sociological Methods and Research* 19(1):122-43. [shorter summary of argument in his book]
- *N. A. Christakis and J. H. Fowler (2007) "[The Spread of Obesity in a Large Network](#)" *New England Journal of Medicine* 357:370-379
- Soc Net exchange on causal models & diffusion.
- Cohen, J. M. 1983. "[Peer Influence on College Aspirations](#)." *American Sociological Review* 48:728-34. (optional)
- Baldassarri and Bearman (2007) "[Dynamics of Political Polarization](#)" *American Sociological Review*
- *Aral, Sinan, Lev Muchnik, and Arun Sundararajan 2009. "[Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks](#)" PNAS 2009 106: 21544-21549;

- Diffusion/Cascades
 - *Moody R21 proposal on networks & diffusion.
 - *Moody, James. The Importance of Relationship Timing for Diffusion. *Social Forces*. 2002; 81:25-56.
 - *DiMaggio & Garip. "[How Network Externalities can Exacerbate Intergroup Inequality](#)" *American Journal of Sociology* 116:1887-1933.
 - *Centola, Damon. 2010. "[The Spread of Behavior in an Online Social Network Experiment](#)" *Science* 2010: 1194-1197.
 - Fowler, James H. and Nicholas A. Christakis. 2010. "[Cooperative Behavior Cascades in Human Social Networks](#)" PNAS 107:5334-5338
 - Durrett, Rick. 2010. "[Some features of the spread of epidemics and information on a random graph](#)" PNAS 107: 4491-4498

Assignments: Calculate peer influence measures for example data.

Background Reading:

- Centola and Macy. (2007) Complex Contagions and the Weakness of Long Ties. *American Journal of Sociology* 113:3, 702-734
- Haynie, Dana. Delinquent peers Revisited: Does Network Structure Matter? *American Journal of Sociology*. 2001; 106:1013-1057.
- Kandel, D. B. "On Processes of Peer Influences in Adolescent Drug Use." *Alcohol and Substance Abuse in Adolescence*, Editor B. Stimmel. New York: Haworth Press.
- Mikolajczyk, RT & Mirjam Kretzschmar () "Collecting social contact data in the context of disease transmission: Prospective and retrospective study designs" *Social Networks* p127-135
- Paez et al () "Weight matrices for social influence analysis: An investigation of measurement errors and their effect on model identification and estimation quality" *Social Networks* p309-317

Class 20. Statistical Modeling of Social Networks I, Random Graph Models (Nov 11)

Summary: Recent statistical developments have made it possible to model networks statistically, allowing us to incorporate uncertainty from measurement and sampling. In this session we discuss the frame for statistical modeling networks and identify the ERGM method for doing so.

Reading:

Snijders, Tom A. B. 2011. "[Statistical Models for Social Networks](#)" Annual Review of Sociology 37:131-153

Robins, G. et al (2006) "[An introduction to exponential random graph \(\$p^*\$ \) models for social networks](#)" *Social Networks* p173-191 (Part of a special issue)

STATNET Tutorial (online) & *J. of Statistical Software* review issue ([links here](#)).

Read one of:

Morris, Martina et al (2009) "Concurrent Partnerships and HIV Prevalence disparities by race: Linking science and public health." *American Journal of Public Health*. 99:1023-1031.

Wimmer, Andreas and Kevin Lewis. 2010. "[Beyond and Below Racial Homophily: ERG Models of a Friendship Network Documented on Facebook](#)" *American Journal of Sociology* 116:583-642

Assignments: Calculate ERGM on an example graph.

Background Reading:

This is a quickly growing field with roots in random graph theory. Good background can be had by reading Bayesian modeling books and statistical graph theory work. Some current/classics relevant to sociology here:

Anderson, C., Wasserman, S., and Crouch, B. (1999). A p^* primer: Logit models for social networks. *Social Networks*. 21,37-66 (online)

Duijn, Gille & Handcock () "A framework for the comparison of maximum pseudo-likelihood and maximum likelihood estimation of exponential family random graph models" *Social Networks* p52-62

Krivitsky, Handcock, Raftery & Hoff (2009) "Representing degree distributions, clustering, and homophily in social networks with latent cluster random effects models" *Social Networks*

Pattison, P., and Wasserman, S. 1999. Logit models and logistic regressions for social networks: II. Multivariate relations. *British Journal of Mathematical and Statistical Psychology*. 52, 169-193

Robins, Pattison & Wang () "Closure, connectivity and degree distributions: Exponential random graph (p^*) models for directed social networks" *Social Networks* p105-117

Wang, Sharpe Robins & Pattison (*) "Exponential random graph (p^*) models for affiliation networks" *Social Networks* p12-25

Wasserman, S. and P. Pattison. 1996. "Logit Models and Logistic Regressions for Social Networks: I. An Introduction to Markov Graphs and P^* ." *Psychometrika* 61:401-25.

Class 10. Statistical Modeling of Social Networks II, Dynamics & Latent Space Models (Nov 18)

Reading:

Snijders, TAB 1996 "Stochastic Actor-Oriented Models for Network Change" *Journal of Mathematical Sociology* 21: 149-172

Substantive SIENA paper TBA.

Ward/Hoff bit using latent networks

Moody, James. "Static Representations of Dynamic Networks." (manuscript).

- Moody, James, Daniel A. McFarland and Skye Bender-DeMoll. 2005. "Dynamic Network Visualization: Methods for Meaning with Longitudinal Network Movies." *American Journal of Sociology* 110:1206-1241
- Schaefer, David R., John Light, Laura D. Hanish, Carol L. Martin and Richard A. Fabes. 2010. "[Fundamental Principles of Network Formation among Preschool Children.](#)" *Social Networks* 32:61-71.

Schaefer SN piece on dynamics of transitivity...

Assignments: Create SoNIA movie of network

Background Reading:

- Akbar Zaheer, Giuseppe Soda. (2009) Network Evolution: The Origins of Structural Holes. *Administrative Science Quarterly* 54:1, 1-31
- Hughes et al (2009) "Power and Relation in the World Polity: The INGO Network Country Score, 1978-1998" *Social Forces*
- Hummell, H. J. and W. Sodeur. 1990. "Evaluating Models of Change in Triadic Sociometric Structures." Pp. 281-305 in *Social Networks Through Time*, Eds Jeroen Weesie and Henk Flap. Utrecht, Netherlands: ISOR.
- K. G. Provan, K. Huang, H. B. Milward. (2009) The Evolution of Structural Embeddedness and Organizational Social Outcomes in a Centrally Governed Health and Human Services Network. *Journal of Public Administration Research and Theory*
- Michelle Shumate, Janet Fulk, Peter Monge. (2005) Predictors of the International HIV/AIDS INGO Network Over Time. *Human Communication Research* 31:4, 482-510
- Morgan, D. L., M. B. Neal, and P. Carder. 1997. "The Stability of Core and Peripheral Networks Over Time." *Social Networks* 19(1):9-25.
- Peter Monge, Marshall Scott Poole. (2009) The Evolution of Organizational Communication. *Journal of Communication* 58:4, 679-692
- R. Cowan, N. Jonard, J.-B. Zimmermann. (2006) Evolving networks of inventors. *Journal of Evolutionary Economics* 16:1-2, 155-174
- Suitor, J. J., B. Wellman, and D. L. Morgan. 1997. "It's About Time: How, Why and When Networks Change." *Social Networks* 19(1).
- Weesie, J. and H. Flap. 1990. *Social Networks Through Time*. Utrecht, Netherlands: ISOR.

Class 23. New Frontiers: Summary discussion of what's new in the field (Dec 2)

Summary: Student reports on new substantive work.

Reading:

Assignments: Report/present on final projects.

Background Reading:

Topics not covered this term:

Social Exchange

Summary: Networks provide constraints and opportunities for actors. In an exchange setting, this structure will lead to differences in power. We contrast direct exchange and generalized exchange.

Reading:

Martin, [Chapter 3](#)

Cook, K. S., R. M. Emerson, M. R. Gillmore, and T. Yamagishi. 1983. "The Distribution of Power in Exchange Networks: Theory and Experimental Evidence." *American Journal of Sociology* :275-305.

Lawler, E. J. and J. Yoon. 1993. "Power and the Emergence of Commitment Behavior in Negotiated Exchange." *American Sociological Review* 58:465-81.

Assignments: Identify power status of a set of example networks.

Background Reading:

Barrera, D () "The impact of negotiated exchange on trust and trustworthiness" *Social Networks* p508-526

Blau, Peter s. *Exchange and power in Social Life*

Doğan, Gönül () "The stability of exchange networks" *Social Networks* p118-125,

Lawler, E. J. () "Social Exchange and Micro Social Order" *American Sociological Review*

Molm, LD et al (*) "Building Solidarity through Generalized Exchange: A Theory of Reciprocity" *American Journal of Sociology*

Schaefer, D.R. () "Resource Variation and the Development of Cohesion in Exchange Networks" *American Sociological Review*

Van Assen and van de Rijt () "Dynamic exchange networks" *Social Networks* p.266-278

Vande Rijt, A & Assen () "Theories of network exchange: Anomalies, desirable properties, and critical networks" *Social Networks* p259-271

Willer, D. 1999. *Network Exchange Theory*. Westport, Connecticut: Praeger.

Willer, R. () "Groups Reward Individual Sacrifice: The Status Solution to the Collective Action Problem" *Robb Willer American Sociological Review*

Ziegler, R. () "What makes the Kula go round?: A simulation model of the spontaneous emergence of a ceremonial exchange system" *Social Networks* p107-126