

Sociology 275: Social Network Analysis

Fall 2005

Professor Peter V. Marsden

601 William James Hall
Thursdays, 3-5 p.m.

630 William James Hall
Office hours: Wednesdays, 3-5 p.m.

OVERVIEW

Social network analysis depicts social organization or social structure in terms of patterned social relationships linking social units. This course deals with major concepts and methods of social network analysis, touching on data collection but stressing data analysis. Some readings give applications of network approaches to selected substantive problems, but the emphasis of the seminar is on research methods.

Social network analysis takes seriously the proposition that behaviors of individual units or actors are to be understood in social context. It seeks to operationalize concepts such as "position", "role", or "social distance" that are sometimes used casually or metaphorically, and is generally skeptical about the use of categorical concepts or role labels, or of descriptions of social structure based on the aggregation of characteristics of individual units. There are many models and methods in social network analysis, but all share a conceptualization of social structure resting on relationships of units or actors.

During the past decade, the pace of development in network studies has been very rapid. This course will introduce foundations and tried-and-true approaches to network analysis, and also give some attention to recently-developed methods and techniques. A single semester allows us very limited time to accomplish this. We will have to be satisfied with sketchy coverage of some topics, while others--such as comparing networks, models for cognitive social structure data, network sampling and longitudinal network analysis--will be neglected almost entirely.

We will begin with "whole network data" that purport to measure the social ties linking all actors within some theoretically closed population. Here, we examine graph theoretic and visual representations of networks, the detection of cohesive subgroups, and indexes measuring the centrality and prominence of units within a network. In mid-semester, we will study "egocentric network data" that measure the "interpersonal environments" surrounding individual units. Here we discuss basic measures of network range, autonomy/"structural holes", and some indicators of individual "social capital." Later, we consider whole-network methods for "two-mode" networks recording affiliations between two distinct types of social units, and "blockmodels" or "positional analyses", a more general approach to the study of network subgroups.

Toward the end of the course, we examine recent advances in the development of statistical methods for network data (notably "p*" or "exponential random graph" models), and models for studying network-mediated diffusion and influence. At semester's end, we consider recent models for large social networks developed largely by physicists and applied mathematicians.

A note on preparation. “Network analysis” and “social networks” have become reasonably diverse areas involving many methodological approaches and substantive concerns. Though there is some primarily “qualitative” work in social networks, the bulk of it takes a quantitative angle, and this course will reflect that emphasis. Diverse elements of mathematics and statistics are used in social network analyses. Notwithstanding that, there are no specific quantitative prerequisites, but I trust that participants will be familiar with basic regression analysis and open-minded about quantitative material. I will try to convey important points without using complex mathematics, and offer pointers to those of you who want to go into them in more technical depth.

A note on focus. Network analysis is now applied within numerous substantive fields of social science. This course will examine applications in such fields as organizational analysis, community studies, and social epidemiology, among others. The emphasis of the course will be on analytic methods that apply in several substantive fields; it will not dwell on any particular substantive field. My experience is that students from diverse backgrounds participate in the course. I encourage you to use the written assignments to develop connections between course material and the substantive interests that draw you to network studies.

TEXTS

de Nooy, Wouter, Andrej Mrvar and Vladimir Batagelj. 2005. Exploratory Social Network Analysis with Pajek. New York: Cambridge University Press. (Hereafter NMB.)

A recent text introducing many common forms of network analysis with an emphasis on graphics/visualization. I recommend that it be read while working with the freely available network analysis software package Pajek.

Degenne, Alain and Michel Forsé. 1999. Introducing Social Networks. Thousand Oaks, CA: Sage Publications. (Hereafter DF.)

A more substantively and conceptually grounded, less technically oriented, introduction to network analysis.

Carrington, Peter J., John Scott, and Stanley Wasserman. 2005. Models and Methods in Social Network Analysis. New York: Cambridge University Press. (Hereafter CSW.)

A collection on recent advances in methods for studying social networks. We will be looking at most, but not all, of the chapters in CSW; some touch on statistical topics--network sampling and modeling longitudinal network data--that we will not be able to cover this term.

Watts, Duncan J. 2003. Six Degrees: The Science of a Connected Age. New York: Norton.

A relatively accessible discussion of recent research on networks pursued by applied mathematicians and physicists.

All of these books are on order at the Harvard Coop. All are also available via online sources, including Amazon.com, which on September 12 listed the following prices and shipping information for these four texts:

NMB: Paperback, \$39.99; Digital, \$32.00. Paperback usually ships in 24 hours.

DF: Paperback, \$44.95, usually ships in 24 hours.

CSW: Paperback, \$29.99; Digital, \$24.00. Paperback usually ships in 24 hours.

Watts: Paperback, \$10.85, usually ships in 24 hours.

We will look at other articles and chapters during the semester, most of which are listed below. These include both methodological papers and some research articles that draw on one or more network methods. I provide complete citations to these below. Clean copies of these articles will be on reserve in the Sociology/Social Relations Library on the first floor of William James Hall. Some of them are web-available; I will post a guide to electronically available resources on the course website: <http://www.courses.fas.harvard.edu/~soc275/>.

In the past I have often taught this course using the following book

Wasserman, Stanley and Katherine L. Faust. 1994. Social Network Analysis: Methods and Applications. New York: Cambridge University Press. (Hereafter WF.)

WF is the closest thing there is to a “standard” text on network analysis. Because it has been in print since 1994 (a new edition is currently in preparation), WF does not cover advances during the past decade. Nonetheless, its treatment of foundational techniques is extremely comprehensive, so I will provide references to it as “supplementary” readings on the reading list below.

I have *not* ordered WF at the Coop. Amazon.com lists it (paperback edition) at \$42.00, shipping within 24 hours.

COMPUTER PROGRAMS/SOFTWARE

Many applications of network methods involve substantial manipulation of quantitative data and extensive graphics. Some of this work can be performed using standard statistical software packages such as SPSS^x, SAS, or Stata; these packages often include multidimensional scaling and hierarchical clustering routines, for example. Some models for network effects can be studied using such software (for, e.g., spatial data analysis), while others require special stand-alone implementations. Software packages like GAUSS or SAS PROC IML (presumably R and S-plus, too, though I haven't worked with them) can be useful for inventive work.

A lot of network analysis and data manipulation is distinctive enough that special software is necessary or, at the least, very useful. This semester we will be doing a good deal of work with Pajek, since it is the software package covered in the de Nooy, Mrvar, and Batagelj book. A separate article about Pajek is

Batagelj, Vladimir and Andrej Mrvar. 1998. "Pajek -- Program for Large Network Analysis." Connections 21 (2): 47-57.

A widely-used, flexible suite of programs for network analysis is

Borgatti, Steven P., Martin G. Everett and Linton C. Freeman. 2002. UCINET 6. Harvard, MA: Analytic Technologies. (Currently they are shipping version 6.98 of this software.)

UCINET 6 runs on Windows computers; it is not configured for MacIntosh platforms. Public-use copies are available on Sociology Department computers in William James Hall. This software is available at a special student price (\$40) from its distributor, Analytic Technologies; consult them directly on the web at <http://www.analytictech.com/>. UCINET 6 comes packaged with a visualization package, NETDRAW.

Some guidance about UCINET may be presented during the semester, as may some examples involving it.

For certain statistical network models, a set of programs developed by Dutch researchers, StOCNET, may also be helpful. See <http://stat.gamma.rug.nl/stocnet/>.

A useful discussion of network software including Pajek, UCINET, and StOCNET (among other packages) is presented in the following chapter:

Huisman, Mark and Marijtje A.J. van Duijn. 2005. "Software for Social Network Analysis." Chapter 13 in CSW.

References to other useful web sites and software may be distributed from time to time during the semester.

REQUIREMENTS

In addition to attending seminar and doing the reading, the course requires that you work through several workshop exercises, prepare a midterm written assignment (literature review or book review), and submit a term paper at the end of the semester.

Workshop exercises will require that you make use of computer software to perform basic analyses on sets of social network data. They will be distributed periodically, and due after sessions that focus on the methods used in each exercise. Most will be drawn from the NMB book and will make use of Pajek. It is possible that some will require or encourage use of UCINET.

For the midterm written assignment, I ask that you either critically review a book that deals with social networks (see some suggestions below), or briefly review a substantive literature of interest to you that involves social networks (choose whichever you prefer). This assignment need not be linked closely to the largely methodological focus of the course sessions (unless you decide to focus on a methodological subject). It will be due on November 3 and I will circulate additional details before that.

The term paper could assume various formats, depending on where you stand in your graduate work. It could be a discussion of the use of network concepts and methods in an area of social science that is of interest to you. It could also be a paper that presents an analysis of network data, or a detailed proposal/prospectus for such a paper. I urge you to attempt an actual data analysis if at all possible, because you will learn more about network analysis by applying it than by proposing to apply it. One-page sketches of what you have in mind for the term paper should be submitted on December 8. The term papers themselves are due on January 13, 2006.

If there is sufficient interest on the part of participating students, I may organize an afternoon of oral presentations for papers-in-progress during early January, prior to the due date for final papers. Details on this will be settled later.

COMMENTS, ETC.

Grading. Grades will be based mainly on the mid-term written assignment and the paper submitted at the end of the term, with greater emphasis on the latter. I will also factor in what I learn about your knowledge of network concepts and methods from discussions in class, and my observations on your workshop exercises.

Appointments. Please feel welcome to use the office hours indicated above for consultations. I have especially set aside these times for conversations with students. I can arrange to meet with you at other times if these are not possible for you, but I have enough obligatory meetings and

such that I am sure we will both find scheduling easier if we begin with office hours. I regret that I cannot make appointments either immediately before or immediately after the seminar meets.

Submission of work. Please submit hardcopies of your written work. I cannot accept written assignments in electronic form.

Extensions and Incompletes. No extensions are permitted on the mid-term written assignment or workshop exercises. Extensions on the term paper must be requested in advance, and will be granted with reluctance. I strongly discourage you from taking incomplete grades in this course; as a rule, taking incompletes will unduly delay your progress through graduate school. While I concede that one can often produce a better paper by taking more time to produce it, it is usually preferable to produce a draft within a given time frame, get commentary, and improve the work later through revision.

SOURCES ON SOCIAL NETWORKS

Because students have quite diverse background and reasons for taking this course, I offer the following listing of some sources on the social network orientation for your reference purposes. Many of these go into more depth on substantive applications than the course will. You may find them useful as you develop your projects and areas of interest. Most of them include rather substantial bibliographies that will offer further leads. I make no claim that this is a complete bibliography; it certainly is slanted toward the areas of research that I read most often (sociology, organizational behavior, health). You may find a number of the sources useful as starting points for developing your papers.

Periodicals

Social Networks: An International Journal of Structural Analysis (1978-present). Edited by Linton C. Freeman and Ronald L. Breiger. Many of the more technical, methods-oriented articles about networks appear here. Available on-line through HOLLIS beginning in 1995.

Connections (1977-present). Edited by William D. Richards and Thomas W. Valente. Journal of the International Network for Social Network Analysis (INSNA). [Subscription to Connections carries membership in INSNA; see <http://www.insna.org/indexConnect.html> for information. Web version of current issue is available, as well as many past issues.]

Journal of Social Structure (2000-present). Edited by David Krackhardt. An electronic journal publishing a variety of work on social networks, some of which uses display options not available for print journals. Available free at <http://www.cmu.edu/joss/index.html>.

Books providing overviews:

- Berkowitz, S.D. 1982. An Introduction to Structural Analysis: The Network Approach to Social Research. Toronto: Butterworth's.
- Knoke, David. 1990. Political Networks: The Structural Perspective. New York: Cambridge University Press.
- Knoke, David and James H. Kuklinski. 1982. Network Analysis. Beverly Hills: Sage.
- Monge, Peter R. and Noshir S. Contractor. 2003. Theories of Communication Networks. New York: Oxford University Press.
- Scott, John. 2000. Social Network Analysis: A Handbook. Second Edition. Thousand Oaks, CA: Sage Publications. [Similar to DF book, mixes substantive and technically-oriented introduction to network analysis]

Collections:

- Burt, Ronald S. and Michael J. Minor (eds.). 1983. Applied Network Analysis: A Methodological Introduction. Beverly Hills: Sage. [collection of basic methods articles.]
- Diani, Mario and Doug McAdam (eds.). 2003. Social Movements and Networks: Relational Approaches to Collective Action. New York: Oxford. [collection on both individual-level and organizational-level networks within movements/collective action.]
- Doreian, Patrick and Frans N. Stokman, eds. Evolution of Social Networks. Special issues of the Journal of Mathematical Sociology, volume 21 (nos. 1-2, 1996) and volume 25 (no. 1, 2001).
- Flap, Henk and Beate Volker (eds.). 2004. Creation and Returns of Social Capital. London: Routledge. [reports emerging from Dutch research program on social capital in workplaces, education, communities; includes essays by other scholars about these subjects]
- Freeman, Linton C., Douglas R. White, and A. Kimball Romney (eds.). 1989. Research Methods in Social Network Analysis. Fairfax, VA: George Mason University Press. [collection of comparatively sophisticated methods articles from 1980 conference. Later (1992) reprinted by Transaction Books.]
- Holland, Paul W. and Samuel Leinhardt (eds.). 1979. Perspectives on Social Network Research. New York: Academic. [collection of papers from 1975 conference.]
- Leenders, Roger Th.A.J. and Shaul M. Gabbay (eds.). 1999. Corporate Social Capital and Liability. Boston: Kluwer Academic Publishers. [collection of recent articles on social capital in and around organizations, many of which rely on network analyses.]
- Leinhardt, Samuel (ed.). 1977. Social Networks: A Developing Paradigm. New York: Academic. [collection of relatively early articles cited by those developing the network approach.]
- Lin, Nan, Karen Cook and Ronald S. Burt (eds.). 2001. Social Capital: Theory and Research. New York: Walter de Gruyter. [collection of papers, mostly on labor markets and communities, presented at a 1998 conference.]
- Lin, Nan, Alfred Dean and Walter Ensel. 1986. Social Support, Life Events, and Depression. New York: Academic Press.

- Marsden, Peter V. and Nan Lin (eds.). 1982. Social Structure and Network Analysis. Beverly Hills: Sage. [collection of substantively-focused articles from 1981 conference.]
- Mitchell, J. Clyde (ed.). 1969. Social Networks in Urban Situations. Manchester, UK: Manchester University Press. [collection of conceptual articles and applications, based on the British social anthropological tradition; most “qualitative” book among those listed]
- Mizruchi, Mark S. and Michael Schwartz (eds.). 1987. Intercorporate Relations: The Structural Analysis of Business. New York: Cambridge University Press. [collection of papers on interlocking directorates, class cohesion, etc.]
- Morris, Martina (ed.) 2004. Network Epidemiology: A Handbook for Survey Design and Data Collection. New York: Oxford University Press. [Discussion of several large-scale surveys on networks and health, many concerned with network-mediated infectious disease transmission.]
- Wasserman, Stanley, and Joseph Galaskiewicz (eds.) 1994. Advances in Social Network Analysis: Research in the Social and Behavioral Sciences. Newbury Park, CA: Sage Publications. [1990s stock-taking of what has been learned from the network approach in several fields of application.]
- Weesie, Jeroen and Henk Flap (eds.). 1990. Social Networks Through Time. Utrecht, NL: ISOR/University of Utrecht. [collection based on 1988 conference.]
- Wellman, Barry (ed.) Networks in the Global Village: Life in Contemporary Communities. Boulder, CO: Westview Press. [collection of recent articles on personal networks and communities.]
- Wellman, Barry and S.D. Berkowitz (eds.). 1988. Social Structures: A Network Approach. New York: Cambridge University Press. [collection of conceptual and substantive articles which also attempts to link network studies and other forms of "structural" analysis.]
- Willer, David (ed.) Network Exchange Theory. Westport, CT: Praeger [collection of largely experimental work on social exchange networks.]

Some selected book-length theoretical, methodological, and substantive studies:

- Barabási, Albert-László. 2002. Linked: The New Science of Networks. Cambridge, MA: Perseus. [somewhat comparable to Watts, Six Degrees.]
- Burt, Ronald S. 1992. Structural Holes: The Social Structure of Competition. Cambridge, MA: Harvard University Press.
- Burt, Ronald S. 2005. Brokerage and Closure: An Introduction to Social Capital. New York: Oxford University Press.
- Doreian, Patrick, Vladimir Batagelj, and Anuška Ferligoj. 2005. Generalized Blockmodeling. New York: Cambridge University Press. [recent extended statement on positional analysis/blockmodels]
- Fischer, Claude S. 1982. To Dwell Among Friends: Personal Networks in Town and City. Chicago: University of Chicago Press.
- Friedkin, Noah E. 1998. A Structural Theory of Social Influence. New York: Cambridge University Press.
- Granovetter, Mark S. 1995. Getting a Job: A Study of Contacts and Careers. Second Edition

- (first published in 1974). Chicago: University of Chicago Press.
- Kilduff, Martin and Wenpin Tsai. 2003. Social Networks and Organizations. Thousand Oaks, CA: Sage.
- Knoke, David, Franz Urban Pappi, Jeffrey Broadbent and Yutaka Tsujinaka. 1996. Comparing Policy Networks: Labor Politics in the U.S., Germany, and Japan. New York: Cambridge University Press.
- Laumann, Edward O. and David Knoke. 1987. The Organizational State: Social Choice in National Policy Domains. Madison, WI: University of Wisconsin Press.
- Lin, Nan. 2001. Social Capital: A Theory of Social Structure and Action. New York: Cambridge University Press.
- Valente, Thomas W. 1995. Network Models of the Diffusion of Innovations. Cresskill, NJ: Hampton Press.
- Watts, Duncan J. 1999. Small Worlds: The Dynamics of Networks between Order and Randomness. Princeton, NJ: Princeton University Press. [Deals with similar themes as in Six Degrees, but at a higher technical level.]
- Weimann, Gabriel. 1994. The Influentials: People Who Influence People. Albany, NY: State University of New York Press.

TOPICS AND READINGS

The following provides reading lists and tentative dates on which topics will be covered. We will begin with the basics of representation and visualization for whole network data, and turn to descriptive methods for such data before considering egocentric data, two-mode data, and statistical methods. More specific guidance to readings will be given on separate handouts distributed during the semester.

Availability of readings: I will put one clean copy of each reading on reserve in the Sociology/Social Relations Library on the first floor of William James Hall. There will be one folder for each week. A second folder will be available from the staff assistant who works with me, Ms. Lauren Dye (ldye@wjh.harvard.edu) in room 682 of William James. You may borrow these to make copies for your own use. Additionally, I will post a document on the course website with links to those readings that are electronically available within the Harvard Library System.

Introduction and Overview (September 22)

DF, Introduction

Marsden, Peter V. 2000. "Social Networks." Pp. 2727-2735 in Edgar F. Borgatta and Rhonda J.V. Montgomery (eds.) Encyclopedia of Sociology. Second edition. New York: MacMillan.

Marsden, Peter V. 2004. "Network Analysis." Pp. 819-825 in Kimberly Kempf-Leonard (ed.) Encyclopedia of Social Measurement. San Diego, CA: Academic Press.

Wellman, Barry. 1983. "Network Analysis: Some Basic Principles." Pp. 155-200 in Randall Collins (ed.) Sociological Theory 1983. San Francisco: Jossey-Bass.

Recommended: Freeman, Linton C. 2004. The Development of Social Network Analysis: A Study in the Sociology of Science. Vancouver, BC: Empirical Press.

Fundamentals of Network Analysis; Designs and Graph Theory (September 29)

DF, Chapter 1 (pp. 21-27), Chapter 3

Marsden, Peter V. 1990. "Network Data and Measurement." Annual Review of Sociology 16: 435-463. Especially pp. 435-445

Marsden, Peter V. 2005. "Recent Developments in Network Measurement." Chapter 2 in CSW. Especially pp. 8-11.

Supplementary: WF, chapters 3-4.

Visualizing Network Data (October 6)

NMB, chapters 1-2

Freeman, Linton C. 2005. "Graphic Techniques for Exploring Social Network Data." Chapter 12 in CSW.

Freeman, Linton C. 2000. "Visualizing Social Networks." Journal of Social Structure 1. (Electronically available at <http://www.cmu.edu/joss/content/articles/volindex.html>)

Bartholomew, David J., Fiona Steele, Irini Moustaki, and Jane I. Galbraith. 2002. The Analysis and Interpretation of Multivariate Data for Social Scientists. London: Chapman and Hall/CRC. Chapters 3 ("Multidimensional Scaling") and 4 ("Correspondence Analysis")

Laumann, Edward O. and Franz U. Pappi. 1973. "New Directions in the Study of Community Elites." American Sociological Review 38: 212-230.

McGrath, Cathleen, Jim Blythe, and David Krackhardt. 1997. "The Effect of Spatial Arrangement on Judgments and Errors in Interpreting Graphs." Social Networks 19: 223-242.

Cohesion and Balance (October 13)

NMB, chapters 3-4

DF, chapters 4 (pp. 78-85), 7 (pp. 172-179)

Davis, James A. and Samuel Leinhardt. 1972. "The Structure of Positive Interpersonal Relations in Small Groups." Pp. 218-251 in Joseph Berger, Morris Zelditch, Jr., and Bo Anderson, Sociological Theories in Progress, volume 2. Boston: Houghton-Mifflin.

Ennett, Susan T. and Karl E. Baumann. 1993. "Peer Group Structure and Adolescent Cigarette Smoking: A Social Network Analysis." Journal of Health and Social Behavior 34: 226-236.

Friedman, Samuel R., Alan Neaigus, Benny Jose and others. 1997. "Sociometric Risk Networks and Risk for HIV Infection." American Journal of Public Health 87: 1289-1296.

Supplementary: WF, chapters 6-7.

Centrality and Centralization (October 20)

NMB, Chapters 6, 9

DF, chapter 6

Freeman, Linton C. 1979. "Centrality in Social Networks: I. Conceptual Clarification." Social Networks 1: 215-239.

Bonacich, Phillip. 1987. "Power and Centrality: A Family of Measures." American Journal of Sociology 92: 1170-1182.

Everett, Martin, and Stephen P. Borgatti. 2005. "Extending Centrality." Chapter 4 in CSW.

Brass, Daniel. 1984. "Being in the Right Place: A Structural Analysis of Individual Influence in an Organization." Administrative Science Quarterly 29: 518-539.

Podolny, Joel M. 1993. "A Status-Based Model of Market Competition." American Journal of Sociology 98: 829-872.

Supplementary: WF, chapter 5.

Egocentric Networks, Measurement, and Egocentric Network Data (October 27)

DF, Chapter 1 (pp. 16-21), Chapter 2

Marsden, Peter V. 1990. "Network Data and Measurement." Annual Review of Sociology 16: 435-463. Especially pp. 440-458.

Marsden, Peter V. 2005. "Recent Developments in Network Measurement." Chapter 2 in CSW. Especially pp. 10-23.

Marsden, Peter V. 1987. "Core Discussion Networks of Americans." American Sociological Review 52: 122-131.

Laumann, Edward O. and Yoosik Youm. 1999. "Racial/Ethnic Group Differences in the Prevalence of Sexually Transmitted Diseases in the United States: A Network Explanation." Sexually Transmitted Diseases 26: 250-261.

Brokerage, Social Capital and Structural Holes (November 3); midterm paper due

NMB, chapter 7

DF, chapter 5

Burt, Ronald S. 1997. "The Contingent Value of Social Capital." Administrative Science Quarterly 42: 339-365.

Marsden, Peter V. 1982. "Brokerage Behavior in Restricted Exchange Networks." Pp. 201-218 in Peter V. Marsden and Nan Lin (eds.) *Social Structure and Network Analysis*. Beverly Hills: Sage.

- Podolny, Joel M. and James N. Baron. 1997. "Resources and Relationships: Social Networks and Mobility in the Workplace." American Sociological Review 62: 673-693.
- Morgan, Stephen L. and Aage B. Sørensen. 1999. "Parental Networks, Social Closure, and Mathematics Learning: A test of Coleman's Social Capital Explanation of School Effects." American Sociological Review 64: 661-681.

Positional Analysis and Blockmodels (November 10)

NMB, chapter 12

DF, chapter 4 (pp. 86-106)

- Doreian, Patrick, Vladimir Batagelj and Anuška Ferligoj. 2005. "Positional Analyses of Sociometric Data." Chapter 5 in CSW.
- White, Harrison C., Scott A. Boorman and Ronald L. Breiger. 1976. "Social Structure from Multiple Networks. I. Blockmodels of Roles and Positions." American Journal of Sociology 81: 730-779.
- Borgatti, Stephen P. and Martin G. Everett. 1992. "Notions of Position in Social Network Analysis." Pp. 1-35 in Peter V. Marsden (ed.) Sociological Methodology 1992. Oxford, UK: Basil Blackwell, Ltd.
- Breiger, Ronald L. 1981. "Structures of Economic Interdependence Among Nations." Pp. 353-380 in Peter M. Blau and Robert K. Merton (eds.) Continuities in Structural Inquiry. Beverly Hills: Sage.
- Bartholomew, David J., Fiona Steele, Irini Moustaki, and Jane I. Galbraith. 2002. The Analysis and Interpretation of Multivariate Data for Social Scientists. London: Chapman and Hall/CRC. Chapter 2 ("Cluster Analysis").

Supplementary: WF, chapters 9-10.

Analyzing and Representing "Two-Mode" Network Data (November 17)

NMB, chapter 5

Breiger, Ronald L. 1974. "The Duality of Persons and Groups." Social Forces 53: 181-190.

Borgatti, Stephen P. and Martin G. Everett. 1997. "Network Analysis of 2-Mode Data." Social Networks 19: 243-269.

Faust, Katherine. 2005. "Using Correspondence Analysis for Joint Displays of Affiliation Networks." Chapter 7 in CSW.

Faust, Katherine. 1997. "Centrality in Affiliation Networks." Social Networks 19: 157-191.

Supplementary: WF, chapter 8.

Thanksgiving Day Holiday – No seminar meeting (November 24)

Statistical Models for Networks: Overview (December 1)

- Wasserman, Stanley and Garry Robbins. 2005. "An Introduction to Random Graphs, Dependence Graphs, and p^* ." Chapter 8 in CSW.
- Anderson, Carolyn J., Stanley Wasserman and Bradley Crouch. 1999. "A p^* Primer: Logit Models for Social Networks." *Social Networks* 21: 37-66.
- Crouch, Bradley and Stanley Wasserman. 1997. "A Practical Guide to Fitting p^* Social Network Models Via Logistic Regression." *Connections* 21: 87-101.
- van Duijn, Marijtje A.J., Tom A.B. Snijders and Bonne J.H. Zijlstra. 2004. " p_2 : A Random Effects Model with Covariates for Directed Graphs." *Statistica Neerlandica* 58: 234-254.
- Lazega, Emmanuel and Marijtje van Duijn. 1997. "Position in Formal Structure, Personal Characteristics, and Choices of Advisors in a Law Firm: A Logistic Regression Model for Dyadic Network Data." *Social Networks* 19: 375-397.
- Bearman, Peter S., James Moody and Katherine Stovel. 2004. "Chains of Affection: The Structure of Adolescent Romantic and Sexual Networks." *American Journal of Sociology* 110: 33-91.

Supplementary: WF, chapter 15.

Diffusion and Influence (December 8); paper plans due

- NMB, chapter 8
- DF, chapter 7 (pp. 159-172)
- Valente, Thomas W. 2005. "Network Models and Methods for Studying the Diffusion of Innovations." Chapter 6 in CSW.
- Marsden, Peter V. and Noah E. Friedkin. 1994. "Network Studies of Social Influence." Pp. 3-25 in Stanley Wasserman and Joseph Galaskiewicz (eds.) *Advances in Social Network Analysis*. Newbury Park, CA: Sage.
- Coleman, James, Elihu Katz and Herbert Menzel. 1957. "The Diffusion of an Innovation Among Physicians." *Sociometry* 20: 253-270.
- Rothenberg, Richard B., John J. Potterat, Donald E. Woodhouse and others. 1998. "Social Network Dynamics and HIV Transmission." *AIDS* 12: 1529-1536.

The Small World Problem and the "Invasion of the Physicists" (December 15)

- Watts, *Six Degrees*
- DF, chapter 1 (pp. 13-16).
- Travers, Jeffrey and Stanley Milgram. 1969. "An Experimental Study of the Small World Problem." *Sociometry* 32: 425-443.
- Watts, Duncan J. 1999. "Networks, Dynamics, and the Small World Phenomenon." *American Journal of Sociology* 105: 493-527.
- Bonacich, Philip. 2004. "The Invasion of the Physicists" (review essay). *Social Networks* 26: 285-288.

Concluding Materials (read according to your leisure and inspiration)

Doreian, Patrick. 2001. "Causality in Social Network Analysis." Sociological Methods and Research 30: 81-114.

Klov Dahl, Alden S. 2005. "Social Network Research and Human Subjects Protection: Towards More Effective Infectious Disease Control." Social Networks 27: 119-137.

Borgatti, Stephen P. and José-Luis Molina. 2005. "Toward Ethical Guidelines for Network Research in Organizations." Social Networks 27: 107-117.

DUE DATES

Workshop exercises will be distributed from time to time on Thursdays, and will be due on the following Thursday.

November 3: Book reviews/literature reviews due.

December 8: Term paper plans due.

January 13: Term papers due.