

PM 542: Social Network Analysis

**Department of Preventive Medicine
Keck School of Medicine
University of Southern California**

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Time: Wednesdays, 10:00-2:00 pm
Location: Alhambra campus Room 7059
Office Hours: Virtual office hours (24/7)

Course Description

This course is an introduction to the theory, methods and procedures of network analysis with emphasis on applications to public health programs. The goal of the course is to provide a working knowledge of the concepts and methods used to describe and analyze networks so that professionals and researchers can understand the results and implications of this body of research. The course also provides the training necessary for scholars to conduct network analysis in their own research careers.

The course consists of readings, class discussions, computer and data analysis assignments, and a final paper. The data analysis assignments will be conducted using the UCINET V network analysis software available to students in the class. Individual student papers will use data that the student collects him/herself. The data collection and entry process will be quite simple and consist of identifying a group (a class, club, organization, etc.) that students can meet and then ask to complete a simple one page questionnaire.

Student Learning Objectives

Students who complete this course will be able to:

1. Read and comprehend concepts presented in the social network literature
2. Use network analysis as a research technique in their own research including knowledge of what concepts are applicable and how to collect and analyze this type of data.
3. Explain how network analysis contributes to theories or areas of study of interest to the student.

4. Develop a deeper understanding of how interpersonal and mass communication contribute to the formation of norms, social structure and decision-making, and hence an understanding of the essential elements necessary to launch community development, communication campaigns and/or health promotion projects.

Required Texts

1. Scott, J. (2000). Social network analysis: A handbook (2nd Ed.). Newbury Park, CA: Sage.
2. Valente, T. W. (1995). Network models of the diffusion of innovations. Cresskill, NJ: Hampton Press.
3. Supplementary reading packet.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be certain the letter is delivered to me as early in the semester as possible. DSP is located in on the University Park campus in STU 301 and is open 8:30 a.m. – 5:00 p.m., Monday through Friday. The phone number is (213) 740-0776.

Electronic Course Management

TOTALe (also known as BlackBoard) is the online learning portal through which many USC professors provide electronic copies of their course materials, including syllabuses, readings, and handouts. Students may obtain access TOTALe at learn.usc.edu and use their USC computer user name and password to access the "MyUSC" portal page. All courses that students are enrolled in that are using TOTALe will appear on the page as a link. Simply follow the link to access online course materials and grades.

Assignments

Proportion of Grade & due date

Week 3: Assignment 1: Matrix Calculation	5 %	1/25
Week 4: Assignment 2: Krackplot/Pajek Graph	5 %	2/01
Week 5: Assignment 3: UCINET Centrality	5 %	2/08
Week 6: Assignment 4: UCINET Groups	5 %	2/15
Week 7: Assignment 5: UCINET Positions	10 %	2/22
Week 8: Assignment 6: UCINET Networks	10 %	3/01
Week 9: Assignment 7: Diffusion Network Modeling	10 %	3/15
Week 10: Assignment 8: Data Analysis of Class Project 1	10 %	3/29
Week 11: Assignment 9: Data Analysis of Class Project 2	10 %	4/05
Week 15: Final Paper	30 %	4/26

Week by Week Outline

Week 1. Introduction & History (1/11/04): The first week is devoted to an overview and history of the development of network analysis as a field of study. Students will gain an understanding of the history of network research with discussions of (1) which academic disciplines fostered its early growth, how and why; (2) who are some of the major contributors to network analysis; and (3) where is network analysis today and in the future. The first week is also devoted to introducing the basic language of networks and providing an overview of the course.

Required Readings:

Scott: Chapters 1 & 2, pages 1-38

Chapters 1 & 2 of Valente, T. W. (in process) Modeling Influence: Social networks, behavior and health. Oxford University Press. Department of Preventive Medicine, School of Medicine, University of Southern California, Los Angeles, CA

Knoke & Kuklinski: 7-21

Recommended Readings:

Wellman, B. (1988). Chapters 1 & 2. In B. Wellman & S. D. Berkowitz (1988) Social structures: A network approach. Cambridge: Cambridge University Press.

Week 2. Models (1/18/04): What is a network? What is network analysis? The second week consists of an explanation of how a network is described. The lectures discuss how to create a sociogram, how matrices are used to represent networks and how network indices are computed from matrices.

Required Reading:

Chapters 1 & 2 of Valente, T. W. (in process) Modeling Influence: Social networks, behavior and health. Oxford University Press. Department of Preventive Medicine, School of Medicine, University of Southern California, Los Angeles, CA

Scott: Chapter 3 & 4 , pages 39--84

Namboodiri, (1982). Matrix Algebra. Newbury Park, CA: Sage. Chapter 1.

Marsden, P. V. (1990). Network data and measurement. Annual Review of Sociology, 16, 435-463.

Recommended Reading:

Burt, R. S. (1980). Models of network structure. Annual Review of Sociology, 6, 79-141.

Week 3. Diffusion (1/25/04): Network analysis has been a core methodology used to understand the diffusion of innovations including the diffusion of health behaviors such as

smoking, family planning, substance abuse, and so on. These lectures provide the student a basic understanding of how networks structure the diffusion of innovations and how network analysis has contributed to the understanding of diffusion.

Required Reading:

Valente: Chapter 1

Granovetter, M. (1973). The strength of weak ties. American Journal of Sociology, 78:1360-1380

Klovdahl, A. S. (1985). Social networks and the spread of infectious diseases: The AIDS example. Social Science Medicine, 21(11), 1203-1216.

Valente, T. W. (1996). The diffusion network game. Connections, 19(2), 30-37.

Valente, T. W (2005). Models and methods for innovation diffusion. In P. Carrington, J. Scott & S. Wasserman (Eds.) Models and Methods in Social Network Analysis. New York: Cambridge University Press.

Week 4. Centrality (2/01/04): Centrality is one of the most useful concepts in network analysis. Week 4 is devoted to discussing various centrality measures and the differences in their computation and application.

Required Reading:

Scott: Chapter 5, pages 85-99

Freeman, L. (1979). Centrality in social networks: Conceptual clarification. Social Networks. 1, 215-239.

Costenbader, E. & Valente, T. W. (2004). The stability of centrality when networks are sampled. Social Networks.

Recommended Reading:

Valente, T. W., & Foreman, R. K., (1998) Integration and radiality: Measuring the extent of an individual=s connectedness and reachability in a network. Social Networks, 20, 89-105.

Wasserman, S., & Faust, K. (1994). Chapter 6: Centrality and Prestige. In Social Network Analysis: Methods and Applications. Cambridge, UK: Cambridge University Press.

Week 5. Relational Models (2/8/04): Relational network models consist of the analysis of direct ties between individuals. Relational models are concerned with who knows whom and how the set of direct ties for an individual influences his/her behavior. Relational variables consist of constructs such as number of nominations sent, number of nominations received

and personal network density.

Required Reading:

Scott: Chapter 6, pages 103-125

Valente: Chapters 2 & 3

Valente, T. W., Watkins, S., Jato, M. N., Van der Straten, A., & Tsitsol, L. M. (1997). Social network associations with contraceptive use among Cameroonian women in voluntary associations. Social Science and Medicine, 45, 677-687.

Week 6. Structural Models (2/15/04): Structural network models focus on how social networks constitute sets of distinct positions or roles in the social space. Positional (or role) analysis represents the dominant theme and (some consider) the major insight of the network paradigm. The organizing principle is that an individual's behavior is determined by his/her position rather than who he/she is connected to.

Required Reading:

Scott: Chapter 7, pages 126-148

Burt, R. (1987). Social contagion and innovation: Cohesion versus structural equivalence. American Journal of Sociology, 92, 1287-1335.

Valente: Chapter 4

Week 7. Graphical displays (2/22/04): Viewing networks represents a major attribute of network analysis, just being able to see the structure. Tremendous advances in network graphing have occurred and are occurring given improvements in computer technology. This week we will learn how to use Pajek and Krackplot, two of the more common display programs.

Required Reading:

Freeman, L. C. (2000). Visualizing Social Networks Journal of Social Structure.

Available at:

<http://www.cmu.edu/joss/content/articles/volume1/Freeman.html>

McGrath, C., Krackhardt, D., & Blythe, J. (2003). Visualizing Complexity in networks: Seeing both the forest and the trees. Connections.

Mrvar, A., & Batagelj, V. (No Date). PAJEK software for network visualization.

Available at:

<http://vlado.fmf.uni-lj.si/pub/networks/pajek/default.htm>

Week 8. Thresholds (3/1/04): Thresholds models were first postulated by Granovetter in 1978 as a possible means to understand why collective behavior occurred in some situations but not others. Granovetter encouraged application of threshold theory to the diffusion of innovations and threshold theory provides a parsimonious explanation of how networks structure diffusion of innovations.

Required Readings:

Valente: Chapters 5, 7, & 8

Recommended Readings:

Granovetter, M. (1978). Threshold models of collective behavior. American Journal of Sociology, 83(6), 1420-1443.

Week 9. The Small World (3/8/04): One of the most popular uses of social network analysis has been the study of the "small world" phenomenon. People are always surprised when they know someone in common or having a connection with someone from seemingly disconnected means. This week we discuss research conducted to understand global connectivity and models used to explain the small world phenomenon.

Required Readings:

Milgram, Stanley. 1967. "The small world problem." *Psychology Today*, 22:561-67.

Pool, Ithiel de Sola and Manfred Kochen. 1978. "Contacts and influence." *Social Networks* 1: 5-51. (only read pages 5 to 29 and 49-51).

Travers, Jeffrey and Stanley Milgram. 1969. "An experimental study of the small world problem." *Sociometry* 32(4):425-443.

Watts, D. (2002). The Small World, pages 1-45.

Recommended Readings:

Killworth, Peter D. and H. Russell Bernard. 1978/79. "The reverse small-world experiment." *Social Networks*, 1:159-192.

Week 10. Social Capital 3/22/04: The connections, norms and trust that bind individuals and community have been referred to as social capital. Social capital has become a hotly debated topic in social sciences for its seeming ubiquity and importance to all aspects of life. Social network analysis provides the tools to measure social capital.

Required Readings:

Lin, N. (1999). Building a network theory of social capital. Connections,

22(1), 28-51.

Burt, R. S. (in press) The network structure of social capital. In R. I. Sutton & B. Staw (Eds.) Research in organizational Behavior. Greenwich, CT: JAI Press.

Van Meter, Karl M. 1999. "Social Capital Research Literature: Analysis of Keyword Content Structure and the Comparative Contribution of Author Names." 22(1):62-84.

Lomas, J. (1998). Social capital and health: Implications for public health and epidemiology. Social Science and Medicine, 47, 1181-1188.

Week 11. Critical mass and Geographic models (3/29/04): Critical mass models are the population level analog to thresholds. The critical mass has been defined as the point at which diffusion becomes self-sustaining. Many behavior change programs attempt to reach critical mass. Geographers have long made major contributions to diffusion theory and recently, with the advent of GIS, have made contributions to epidemiology. This week we will review some readings on spatial networks.

Required Readings:

Valente: Chapters 6 & 9

Klov Dahl, A. S., Potterat, J. J., Woodhouse, D. E., Muth, J. B., Muth, S. Q., and Darrow W. W. (1994). Social networks and infectious disease: The Colorado Springs study. Social Science Medicine, 38(1), 79-88.

Week 12. Ego-centric Networks (4/5/04): How do you measure ego-centric networks? What are some common instruments used and common measures created from ego-centric data such that one gets a sense of structure generalizable from sampled units?

Required Readings:

Marsden, P. V. (1987). Core discussion networks of Americans. American Sociological Review, 52, 122-131.

Campbell, K. E. and Lee, B. A. (1991). Name generators in surveys of personal networks. Social Networks, 13, 203-221.

Brewer, D. D. (1991). Forgetting as a Cause of Incomplete Reporting of Sexual and Drug Injection Partners. Sexually Transmitted Diseases, 26, 166-176.

Recommended Readings:

Burt, R. (1984). Network items and the general social survey. Social Networks, 6, 293-339.

Week 13. Ego-centric Networks (cont.) (4/12/04):

Required Readings:

Valente, T. W., & Vlahov, D. (2001). Selective risk taking among needle exchange participants in Baltimore: Implications for supplemental interventions. American Journal of Public Health, 91, 406-411.

Valente, T.W., & Saba, W. (1998). Mass media and interpersonal influence in a reproductive health communication campaign in Bolivia. Communication Research, 25, 96-124.

Valente, T. W., & Saba, W. (2001). Campaign recognition and interpersonal communication as factors in contraceptive use in Bolivia. Journal of Health Communication. 6(4), 1-20.

Week 14. Paper presentations (4/19/04)

Week 15. Paper presentations (cont.) (4/26/04)

Guidelines for Group Identification/Selection

In this class you are expected to collect some data from a small group in order to complete network analysis computations for the final paper. The group can be any collection of people as long as they seem like a group. Groups should have at least 15 members and no more than 50. Groups of about 20-30 are ideal from a practical standpoint. You will only need to interview the group once and the questionnaire will take less than 3-4 minutes to complete.

Examples of groups that have been used in the past:

1. A seminar class at the school
2. A dance or exercise class
3. A religious group
4. A school cooperative group
5. A dormitory hall
6. A school-based interest group

Students are encouraged to consult with the professor or TA for advice about their group identification/selection process. Students are required to submit a draft of their questionnaire to the professor before administering it.

Students should solicit the group's approval to interview them.

Guidelines for the Final Project

1. The paper you are expected to write should be no more than 20 pages including tables, figures, references and appendices (should you have any such as a copy of your questionnaire). The paper should be double-spaced throughout with font sizes no smaller than 10 pt.
2. The paper should consist of a scaled-down version of a journal submission. In other words, the paper should have the following sections: introduction, theory or literature review (this can be brief and lightly referenced); methodology and data; results; discussion; and conclusion; and references, tables, figures and appendices.
3. Your questionnaires should be short - no more than five or six questions which basically gather information on a couple of different networks such as friendship and advice and perhaps a demographic question or two to measure gender, or departmental affiliation. You can also collect the same network data with both nominations and roster techniques so that you can compare networks.

Typically your paper will consist of descriptive analysis of the networks you have measured and then an analysis of the centrality, group structure and positional structure of the networks. Optionally you may compare different networks that you have measured (advice versus friendship for example or roster versus nominations). You may then analyze your networks in terms of demographic data that you have collected: For example, does the network breakdown into groups based on gender or department affiliation? Finally, you may write on the potential for diffusion or behavior change to occur within the network or from outside the network.

For your questionnaires remember to:

- a. Include a disclaimer clause such as the following:

This questionnaire is completely voluntary and your participation is optional. Your responses will be kept strictly confidential and the responses will be converted to numeric form and not individually analyzed by anyone in this group. You may have the results presented back to you in one month in a manner which will not permit the identification of individual respondents in any way.

- b. Remember to include a space for the respondents to write their own names on the questionnaire so that you can identify them.