MMC 6936: Social Network Analysis (Spring 2019)
Location: WEIM 1098
Mondays 9:35 am – 12:35 pm

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Course Description

This course is an introduction to the theory, methods and procedures of network analysis with emphasis on applications to communication and social behavior. The goal of the course is to provide a working knowledge of the concepts and methods used to describe and analyze social 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 and practice careers.

The course consists of readings, class discussions, data analysis assignments, and a final project. The data analysis assignments will be conducted using the R platform. Previous experience with R is not necessary. The final project (an extended abstract) will involve the creation of a network using a dataset of the student's choice. Original data are preferred but secondary data are acceptable.

Course Objectives

1. Read and comprehend concepts presented in the social network literature
2. Understand theoretical and empirical issues in current research on social network analysis
3. Use network analysis as a research technique in their own research including knowledge of what concepts are applicable and how to collect and analyze social network data
4. Conduct network analyses of original or secondary social network data that contributes to the scholarly or professional development of the field

Grades

Your grades will include three parts

1. 10 Lab assignments 50 points (5 points each)
2. Final presentation 10 points
3. Final Paper 40 points

Required Course Materials

- Course materials will be posted on GitHub https://github.com/jieunshi/MMC6936
- As needed: Torfs, P & C Brauer. 2014. "A (very) Short Introduction to R." https://bit.ly/1YzHlYt

Tentative Schedule: Week by Week Outline

Week1 (Jan. 07)	Introduction
Week2 (Jan. 14)	Overview of social network analysis
	Holiday
Week3 (Jan. 28)	Network data collection & basic measurement
Week4 (Feb. 4)	Personal/Ego-centric networks
Week5 (Feb. 11)	Fundamental network concepts 1 (Centrality)
Week6 (Feb. 18)	Fundamental network concepts 2 (Groups)
Week7 (Feb. 25)	Fundamental network concepts 3 (Positions)
	Spring Break
Week8 (Mar. 11)	Network level measures
Week9 (Mar. 18)	Exponential random graph models (ERGM)
Week10 (Mar. 25)	Diffusion of innovations
Week11 (Apr. 1)	Digital media & networks
Week12 (Apr. 8)	Presentation
Week13 (Apr. 15)	Presentation
Week14 (Apr. 22)	Final project due

Week 1. Introduction (Jan 07)

- Part 1 (Concepts): Introduction to the course

- Part 2 (Application): Introduction to R
  - Required Action: Download both R and R studio

- No Lab for this week (Complete readings)

Week 2. Overview of Social Network Analysis (Jan 14)

- Part 1 (Concepts): An overview of social network analysis as a field of study: Introduces the basic language of networks and provides an overview of the course

  - Required Readings:
    Scott, J., & Carrington, P.J. (2011). The SAGE handbook of social network analysis. Chapters 1: Introduction. https://bit.ly/2Lb0EI6
    Marin, J., & Carrington, P. (2011). The SAGE handbook of social network analysis. Chapter 2: An introduction. https://bit.ly/2PzriuR

  - Recommended readings:
    Travers, J., & Milgram, S. (1969). An experimental study of the small world problem. Sociometry, 32(4), 425-443.
    Granovetter, M. (1973). The Strength of weak ties. American Journal of Sociology, 78(6), 1360-1380.

Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *science*, *323*(5916), 892-895.

- Part 2 (Application): Introduction to R
  - Required Action: Download both R and R studio (Follow Instructions).

- Lab 1 (Due before next class)

Week 3. Data Collection and Basic Measures (Jan 28)

- Part 1 (Concepts): What is a network? What is network analysis? The second week consists of an explanation of how a network is described. The four different types of network data (the general and specific versions of each) are presented. The lectures discuss how to create a sociogram, how matrices are used to represent networks and how network indices are computed from matrices.

  - Required Readings:
    Hanneman & Riddle: Chapter 23 https://bit.ly/2Ghqj37

  - Recommended readings:
    Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology, 16*, 435-463.
    Marsden: Chapter 25 https://bit.ly/2LdXDab

- Part 2 (Application): Using matrices and lists to represent social relations

- Lab 2 (Due before next class)

Week 4. Ego-centric Networks (Feb 4)

- Part 1 (Concepts): 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 sample units? What are the major hypotheses investigated using ego-centric data?

  - Required Readings:
    Valente: Chapter 4
    Burt, R.S. (1984). Network items and the general social survey, *Social Networks, 6*, 293-339.

  - Recommended readings:
    McPherson, M., Smith-Lovin, L., & Brashears, M. E. (2006). Social isolation in America: Changes in core discussion networks over two decades. *American sociological review*, *71*(3), 353-375.

Hampton et al. (2009). Social Isolation and New Technology. *Pew Research Center*. https://pewrsr.ch/1ijKskN

Merluzzi, J., & Burt, R. S. (2013). How many names are enough? Identifying network effects with the least set of listed contacts. *Social Networks, 35(*3), 331-337.

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.

- Part 2 (Application): Guest speaker
  EgoWeb 2.0 https://bit.ly/2BTUglB

- Lab 3 (Due before next class)

Week 5. Fundamental Network Concepts 1 – Centrality (Feb11)

- Part 1 (Concepts): 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. Attention is paid to calculation of degree centrality, closeness centrality, and betweenness centrality.

  - Required Readings:
    Valente : Chapter 5
    Hanneman & Riddle : Chapter 24 https://bit.ly/2QUMsbF

  - Recommended readings:
    Costenbader, E. & Valente, T. W. (2004). The stability of centrality measures when networks are sampled. *Social Networks, 25*, 283-307

- Part 2 (Application): How to compute various centrality measures

- Lab 4 (Due before next class)

Week 6. Fundamental Network Concepts 2 – Groups (Feb 18)

- Part 1 (Concepts): A group is a common term used casually but also containing formal mathematical descriptions. This week focuses on defining a group and what it means to belong to a group. Groups are most frequently conceived of as a relational network model. Some group definitions allow for multiple memberships (cliques) whereas others impose that their membership be mutually exclusive (community detection).

  - Required Readings:
    Valente: Chapter 6
    Freeman : Chapter 3 https://bit.ly/2Fdwm6P
  - Recommended readings:

Girvan M. and Newman M. E. J. (2002). Community structure in social and biological networks, *Proceedings of the National Academy of Sciences, 99*, 7821–7826.

- Part 2 (Application): Community detection

- Lab 5 (Due before next class)

Week 7. Fundamental Network Concepts 3 -Positions (Feb 25)

- Part 1 (Concepts): A defining characteristics of network research is the ability to identify positions in a network. Positions can be thought of as roles. Positions are defined by grouping together nodes that have the same links to other nodes. Nodes can occupy the same position without necessarily being directly connected to one another (in contrast to groups)

    - Required Readings:
      Scott : Chapter 7, pp. 126-148.
      Hanneman & Riddle: Chapter 12 https://bit.ly/2Ekv7D4

    - Recommended readings:
      Borgatti, S. P., & Everett, M. G. (1992). Notions of position in social network analysis. Sociological methodology, 1-35.

- Part 2 (Application): Position analysis

- Lab 6 (Due before next class)

Week 8. Network Level Measures (Mar 11) - Transitivity & Triads

- Part 1 (Concepts): Many network measures are individual ones, and they indicate a node's connectivity or positions in a network. Network analysis occurs at the network or macro level as well. Basic network level measures include size and density, however, there are many more. Network level measures can be used to describe and compare networks and understand their overall structure.

    - Required Readings:
      Scott : Chapter 7, pp. 126-148.
      Hanneman & Riddle: Chapter 12 https://bit.ly/2Ekv7D4

    - Recommended readings:
      Borgatti, S. P., & Everett, M. G. (1992). Notions of position in social network analysis. Sociological methodology, 1-35.
      Faust, K. (2010). A puzzle concerning triads in social networks: Graph constraints and the triad census, 32(3), 221-233.

- Part 2 (Application): Network structure measures

- Lab 7 (Due before next class)

Week 9. Exponential Random Graph Models (Mar 18)

- Part 1 (Concepts): The past few years has seen tremendous development in the implementation of statistical procedures for testing network properties. ERGM enable researchers to test hypotheses about network structure and the distribution of behaviors that explicitly accounts for the non-independence and structural dependence of social networks. Programs are in the infancy, and application just growing. For longitudinal data, the stochastic actor oriented behavioral (aka SIENA) model has been developed to test for social influence and selection.

  - Required Readings:

  Robins, G., Snijders, T., Wang, P., Handcock, M., & Pattison, P. (2007). Recent developments in exponential random graph (p*) models for social networks. Social Networks, 29, 192-215.

  - Recommended readings:

  Harrigan, N. (2009). Exponential random graph (ERG) models and their application to the study of corporate elites. Oxford UK: Center for research methods in the social sciences, Department of Politics and International Relations, University of Oxford.

  Robins, G., Pattison, P. Kalish, Y. & Lusher, D., (2007). An introduction to exponential random graph (p*) models for social networks. *Social Networks, 29*, p. 173-191

- Part 2 (Application): ERGM testing

- Lab 8 (Due before next class)

Week 10. Diffusion (Mar 25)

- Part 1 (Concepts): Network analysis has been a core methodology used to understand the diffusion of innovation. This week provides the students a basic understanding of how networks structure the diffusion of innovations and how network analysis has contributed to the understanding of diffusion.

  - Required Readings:

  Valente, T.W. (2010). Social networks and health: Models, methods, and applications. New York: Oxford University Press.

  - Recommended readings:

  Iyengar, R., Van den Bulte, C. & Valente, T. W. (2010). Opinion leadership and contagion in new product diffusion. Marketing Science, 30, 195-212.

Burt, R.S. (1987). Social Contagion and Innovation: Cohesion Versus Structural Equivalence. *American Journal of Sociology, 92*, 1287-1335

Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *New England Journal of Medicine, 357*(4), 370-379

- Part 2 (Application): Lab 10 (Due before next class)

Week 11. Online Networks (Apr 1)

- Part 1 (Concepts): The explosion in computer mediated communications and social media has made networks a common term. This week we discuss the difference between online and offline networks and explore ways SNA can be conducted on online networks.

  - Required Readings:

Centola, D. (2010). The spread of behavior in an online social network experiment. *science*, *329*(5996), 1194-1197.

Shin, J., Jian, L., Driscoll, K., & Bar, F. (2017). Political rumoring on Twitter during the 2012 US presidential election: Rumor diffusion and correction. *New media & society, 19*(8), 1214-1235.

  - Recommended readings:

Valente, T. W., Dyal, S. R., Chu, K. H., Wipfli, H., & Fujimoto, K. (2015). Diffusion of innovations theory applied to global tobacco control treaty ratification. *Social Science & Medicine, 145*, 89-97.

Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, communication & society, 15*(5), 662-679.

- Part 2 (Application): Discussion of final projects

Week 12. Presentation (Apr 8)

Week 13. Presentation (Apr 15)

Guidelines for the final project

This course requires an extended abstract which is no longer than five-pages excluding all tables, figures, references. The paper should be double-spaced throughout using a 12-point font size. The abstract should consist of a scaled-down version of a journal submission. In other words, the abstract should have the following sections: introduction, (literature review (brief and lightly referenced), methodology and data, results, discussion. Typically, your project will consist of descriptive analysis of the networks you have measured and then and an analysis of

the centrality, group structure, and position structure of the networks. Optionally you can also compare different networks of your interest.