PA 594: Social Network Analysis

Fall 2020

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Class time and room: Wednesdays 3-5:50 pm, Online Via Zoom

Office Hours: Happy to meet at any time. Email me to set up a convenient time.

I. RATIONALE AND COURSE OBJECTIVES:

Children develop friendships with their classmates. Organizations collaborate to deliver public services. Nations develop trade agreements and go to war. Intravenous drug users share needles. The individual actors in each of these examples are members of a broader social system or network. Unlike other methods of social inquiry that assume observations are independent, social network analysis highlights the interdependency among the actors. Studies of social networks have demonstrated the important role that peer influence and network structure play in shaping a wide range of social and organizational outcomes including innovation adoption, performance, belief formation, and criminal behavior.

This course serves as an introduction to the methods, theory, and research designs associated with social network analysis. The course will cover tools and procedures of network data collection and management, visualization techniques, and approaches for analyzing both ego network and whole network data. Students will be exposed to several major software packages for network analysis, but the majority of the course will be conducted in R. No prior experience with R or networks is necessary. But if you are new to R some additional work outside of class learning the basics of the programming language will be needed.

Academic Integrity: As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional

integrity. All members of the campus community—students, staff, faculty, administrators—share the responsibility of insuring that these standards are upheld so that such an environment exists. Instances of academic misconduct by students shall be handled pursuant to the Student Disciplinary Policy. The Student Disciplinary Policy is available online at https://dos.uic.edu/wp-content/uploads/sites/262/2018/10/DOS-Student-Disciplinary-Policy-2018-2019-FINAL.pdf.

Special Needs: UIC and the Department of Public Administration are committed to maintaining a barrier-free environment so individuals with disabilities can fully access programs, services and all activities on campus. The Office of Disability Services works to ensure the accessibility of UIC programs, classes, and services to students with disabilities. Services are available for students who have documented disabilities, including vision or hearing impairments and emotional or physical disabilities. Students with disability/access needs or questions may contact the Office of Disability Services at (312) 413-2183 (voice) or (312) 413-0123 (TTY only). Please feel free to contact me if you need any special accommodations.

Diversity and Inclusion: It is my goal that people from diverse backgrounds and perspectives be included in and served by this course, the Department of Public Administration, and the University of Illinois at Chicago. I believe that the diversity that the students bring to this class is a resource that can be used to improve student learning and perspectives. Course materials and activities are designed to be respectful of all types of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, values, and culture. It is my intent that this class be an environment where all students feel safe to express their perspectives and opinions. Please let me know if something said or done by me, the TA, guest lecturers, or other students, is troubling or causes discomfort or offense. If this occurs, please feel free to discuss the situation with me privately, to raise your concern in class, or to let me know about the issue through a trusted sources (e.g., another student or faculty member or your academic advisor).

Campus Advocacy Network: Under the Title IX law you have the right to an education that is free from any form of gender-based violence and discrimination. Crimes of sexual assault, domestic violence, sexual harassment, and stalking are against the law and can be prevented. For more information or for confidential victim-services and advocacy contact UIC's Campus Advocacy Network at 312-413-1025 or visit http://can.uic.edu/. To make a report to UIC's Title IX office, contact Rebecca Gordon, EdD at TitleIX@uic.edu or (312) 996-5657.

II. SOFTWARE REQUIREMENTS

We will be using the R programming language. R is quickly becoming the statistical package of choice for social scientists and offers several advantages over other software programs. R provides broad coverage and availability of new, cutting-edge statistical applications (no need to wait for a new release of the software), allows one to conduct different types of analysis (i.e. text analysis, spatial analysis, QCA, etc…) using the same software, and offers the widest range of network applications and tools. Learning R will also facilitate your understanding of the literature in your field as more and more people are reporting their results and providing replication datasets in R. An active and engaged group of users provide quality support available through listservs, Stack Exchange, etc. R allows you to easily write your own functions to perform tasks unique to your data that would otherwise be quite time intensive. Lastly, R is free.

III. TEXTS

Borgatti, Stephen P., Martin G. Everett, and Jeffrey C. Johnson. 2018. *Analyzing Social Networks*. Thousand Oaks, CA: Sage Publications. [first edition is fine]

Luke, Douglas A. 2015. *A User's Guide to Network Analysis in R*: Springer.

*Articles and other readings will be posted on Blackboard

Other network texts that may be of interest to you (though not needed for this course):

Carrington, Peter J., John Scott, and Stanley Wasserman. 2005. *Models and Methods in Social Network Analysis*, *Structural analysis in the social sciences ; 27*. Cambridge ; New York: Cambridge University Press.

Harris, Jenine K. 2014. *An Introduction to Exponential Random Graph Models*. Thousand Oaks, CA: Sage.

Kadushin, Charles. 2012. *Understanding Social Networks : Concepts, Theories, and Findings*. New York: Oxford University Press.

Kilduff, Martin, and David Krackhardt. 2008. *Interpersonal Networks in Organizations: Cognition, Personality, Dynamics, and Culture*, *Structural Analysis in the Social Sciences*. Cambridge: Cambridge University Press.

Kilduff, Martin, and Wenpin Tsai. 2003. *Social Networks and Organizations*. London: Sage.

Lusher, Dean, Johan Koskinen, and Garry Robins. 2013. *Exponential Random Graph Models for Social Networks: Theory, Methods, and Applications*. New York: Cambridge University Press.

Monge, Peter R., and Noshier S. Contractor. 2003. *Theories of Communication Networks*. New York: Oxford University Press.

Prell, Christina. 2011. *Social Network Analysis: History, Theory and Methodology*. Thousand Oaks, CA: Sage Publications Limited.

Robins, Garry. 2015. *Doing social network research: Network-based research design for social scientists*: Sage.

Scott, John, and Peter Carrington, eds. 2011. *The Sage Handbook of Social Network Analysis*. London: Sage Publications.

Scott, John. 2017. *Social network analysis*: Sage.

Valente, Thomas W. 2010. *Social networks and health: Models, methods, and applications*: Oxford University Press.

Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*, *Structural analysis in the social sciences ; [8]*. Cambridge: Cambridge University Press.

IV. REQUIREMENTS AND GRADES

You are expected to do all assigned readings and come to class prepared to engage in the week's topics. Your grade will depend on your performance on weekly assignments (due at the beginning of class) and one final exam (given during finals week). Your grade in this course will be calculated as follows:

Component	Percentage of overall grade
Weekly Assignments (5)	40
Final Exam	50
Class Participation	10

V. WEEKLY SCHEDULE (readings subject to change)

**SCHEDULE OF CLASSES AND ASSIGNMENTS IS SUBJECT TO CHANGE. IN THE EVENT OF ANY CHANGE IN ASSIGNMENT, TOPIC, OR DUE DATE, I WILL POST NOTICE IN THE ANNOUNCEMENTS ON BLACKBOARD AND UPLOAD A CORRECTED SYLLABUS.*

NOTE: READING LOAD IS HEAVY IN THE FIRST TWO WEEKS AND THEN REDUCES SIGNIFICANTLY FOR THE REMAINDER OF THE SEMESTER.

Week 1 – October 21

Topics: The network perspective. Why study networks? What types of questions can we ask and answer with network data? Basic terms and definitions. For students who have not used R before, we will spend the last part of class introducing the R programming language and the R-Studio IDE. See also the R resources folder on Blackboard. I encourage new R users to watch the LinkedInLearning Video "Learning R" and read through the initial chapters in the free online book, "R for Data Science."

***Please download R and R Studio onto your laptops before class. I will make sure that everyone is up and running with R at the end of the class.

Readings:

Borgetti et al. Chapters 1 -3

Borgatti, Stephen P., Ajay Mehra, Daniel J. Brass, and Giuseppe Labianca. 2009. Network Analysis in the Social Sciences. *Science* 323 (5916):892-895.

Recommended Readings:

Borgatti, Stephen P., and Daniel S. Halgin. 2011. On Network Theory. *Organization Science* 22 (5):1168-1181.

Borgatti, Stephen P., and Pacey C. Foster. 2003. The Network Paradigm in Organizational Research: A Review and Typology. *Journal of Management* 29 (6):991-1013.

Butts, Carter T. 2008. network: A Package for Managing Relational Data in R. *2008* 24 (2):36.

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

Kilduff, Martin, and Daniel J. Brass. 2010. Organizational Social Network Research: Core Ideas and Key Debates. *The Academy of Management Annals* 4 (1):317-357.

Prell, Christina. 2011. *Social Network Analysis: History, Theory and Methodology*. Thousand Oaks, CA: Sage. Chapters 2 and 3.

Watts, Duncan J. 2004. The "new" science of networks. *Annu. Rev. Sociol.* 30:243-270.

Videos:

Nicholas Christakis Ted Talk: https://www.ted.com/talks/nicholas_christakis_the_hidden_influence_of_social_networks

Martin Everett: https://www.youtube.com/watch?v=Lyi5BAkStDQ

Week 2 – October 28

Topics: Network based research designs and data collection. Linking network data with actor attribute data. Effective network visualization techniques. Dealing with Network Data in R.

Readings:

Borgatti et al. Chapters 4 and 5

Luke Chapters 1 - 5

Recommended Readings:

Borgatti et al. Chapter 7

Borgatti, Stephen P., and Jose-Luis Molina. 2005. Toward Ethical Guidelines for Network Research in Organizations. *Social Networks* 27 (2):107-117.

Butts, Carter T. 2009. Revisiting the Foundations of Network Analysis. *Science* 325 (5939):414-416.

Marsden, Peter V. 1990. Network data and measurement. *Annual review of sociology* 16 (1):435-463.

Robins, Garry. 2015. *Doing social network research: Network-based research design for social scientists*: Sage. Chapters 1-4.

Scott, John. 2017. *Social network analysis*: Sage. Chapters 4 and 10

Scott, John, and Peter Carrington, eds. 2011. *The Sage Handbook of Social Network Analysis*. London: Sage Publications. Chapter 37.

Valente, Thomas W. 2010. *Social networks and health: Models, methods, and applications*: Oxford University Press. Chapter 3.

Week 3 – November 4

Topics: Structural holes, centrality, and social capital. Nodal attributes as predictors in standard linear regression models.

Readings:

Borgatti et al. Chapter 10

Luke Chapter 7

Gould, Roger V, and Roberto M Fernandez. 1989. Structures of Mediation: A Formal Approach to Brokerage in Transaction Networks. *Sociological Methodology*:89-126.

Recommended Readings:

Adler, Paul S., and Seok-Woo Kwon. 2002. Social Capital: Prospects for a New Concept. *The Academy of Management Review* 27 (1):17-40.

Bonacich, Phillip. 1987. Power and Centrality: A Family of Measures. *The American Journal of Sociology* 92 (5):1170-1182.

Burt, Ronald S. 2001. "Structural Holes Versus Network Closure as Social Capital." In *Social Capital: Theory and Research*, edited by Nan Lin, Karen Cook and Ronald S. Burt, 31-56. New Brunswick, New Jersey: Transaction Publishers.

Burt, Ronald. 2004. Structural Holes and Good Ideas. *American Journal of Sociology* 110 (2):349-399.

Coleman, James S. 1988. Social Capital in the Creation of Human Capital. *American Journal of Sociology* 94:S95-S120.

Jackson, Matthew O. 2010. *Social and economic networks*: Princeton university press. Chapter 2

Nahapiet, Janine, and Sumantra Ghoshal. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. *The Academy of Management Review* 23 (2):242-266.

Portes, Alejandro. 1998. Social Capital: Its Origins and Applications in Modern Sociology. *Annual Review of Sociology* 24 (1):1-24.

Week 4 – November 11

Topics: Network formation (random networks, scale free, etc.) Quadratic assignment procedure; network regression. Introduction to ERGMs.

Readings:

Borgatti et al. Chapter 8

Luke Chapter 11

Krackhardt, David. 1988. Predicting With Networks: Nonparametric Multiple Regression Analysis of Dyadic Data. *Social Networks* 10:359-381.

Recommended Readings:

Barabási, Albert-László, and Réka Albert. 1999. Emergence of Scaling in Random Networks. *Science* 286 (5439):509-512.

Contractor, Noshir S., Stanley Wasserman, and Katherine Faust. 2006. Testing Multitheoretical, Multilevel Hypotheses About Organizational Networks: An Analytic Framework and Empirical Example. *Academy of Management Review* 31 (3):681-703.

Goodreau, Steven M., James A. Kitts, and Martina Morris. 2009. Birds of a Feather, or Friend of a Friend? Using Exponential Random Graph Models to Investigate Adolescent Social Networks. *Demography* 46 (1):103-125.

Krackhardt, David. 1987. QAP Partialling as a Test of Spuriousness. *Social Networks* 9:171-186.

Lubell, Mark, John Scholz, Ramiro Berardo, and Garry Robins. 2012. Testing Policy Theory with Statistical Models of Networks. *Policy Studies Journal* 40 (3):351-374.

McPherson, Miller, Lynn Smith-Lovin, and James M. Cook. 2001. Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology* 27:415-444.

Robins, Garry, Pip Pattison, Yuval Kalish, and Dean Lusher. 2007. An Introduction to Exponential Random Graph (p*) Models for Social Networks. *Social Networks* 29 (2):173-191.

Week 5 – November 18

Topics: Exponential Random Graph Models; Model Diagnostics and Model Fit.

Readings:

Robins, G., Pattison, P., Kalish, Y., & Lusher, D. (2007). An Introduction to Exponential Random Graph (p*) Models for Social Networks. *Social Networks, 29*(2), 173-191.

Robins, Garry, Jenny M. Lewis, and Peng Wang. 2012. Statistical Network Analysis for Analyzing Policy Networks. *Policy Studies Journal* 40 (3):375-401.

Recommended Readings:

Lusher, D., Koskinen, J., & Robins, G. (2013). *Exponential Random Graph Models for Social Networks: Theory, Methods, and Applications*. New York: Cambridge University Press.

Harris, J. K. (2014). *An Introduction to Exponential Random Graph Models*. Thousand Oaks, CA: Sage.

Week 6 – November 25

Topics: Introduction to RSIENA; Longitudinal network models; coevolution models

Readings:

Luke Chapter 12

Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to Stochastic Actor-Based Models for Network Dynamics. Social Networks, 32(1), 44-60. doi:10.1016/j.socnet.2009.02.004

Steglich, C., Snijders, T. A. B., & Pearson, M. (2010). Dynamic Networks and Behavior: Separating Selection from Influence. Sociological Methodology, 40(1), 329-393. doi:10.1111/j.1467-9531.2010.01225.x

Recommended Readings:

Ripley, R. M., Snijders, T. A. B., Boda, Z., Vörös, A., & Preciado, P. (2018). *Manual for RSiena*. Retrieved from Oxford:

Week 7: December 2

Topics: Whole network measures; small world networks; triad census. Structural equivalence. Review for final exam.

Readings:

Borgatti et al. Chapter 9

Borgatti et al. Chapter 12 (just skim)

Recommended Readings:

Burt, Ronald S. 1987. Social Contagion and Innovation: Cohesion versus Structural Equivalence. *American Journal of Sociology* 92 (6):1287-1335.

Provan, Keith G., Amy Fish, and Joerg Sydow. 2007. Interorganizational Networks at the Network Level: A Review of the Empirical Literature on Whole Networks. *Journal of Management* 33 (3):479-516.

Travers, Jeffrey, and Stanley Milgram. 1969. An Experimental Study of the Small World Problem. *Sociometry* 32 (4):425-443.

Watts, Duncan J, and Steven H Strogatz. 1998. Collective dynamics of small-world networks. *Nature* 393 (6684):440.

Videos:

The Power of Six Degrees: https://www.youtube.com/watch?v=2rzxAyY7D7k

Finals Week

Take Home Final Exam