

Social Network Analysis

Syllabus

Northeastern University
POLS 7334, Fall 2020
Th. 2:00pm-4:00pm
Online: Canvas & Zoom

Professor: Nick Beauchamp

Email: n.beauchamp@northeastern.edu

Office Hours: M, Th 2:00-3:00 or by appointment (931 RP)

Course Description: Social networks have always been at the center of human interaction, but especially with the explosive growth of the internet, network analysis has become increasingly central to all branches of the social sciences. How do people influence each other, bargain with each other, exchange information (or germs), or interact online? A diverse array of deep questions about human behavior can only be answered by examining the social networks encompassing and shifting around us. Network analysis has emerged as a cross-disciplinary science in its own right, and has in fact proven to be of even greater generality and broader applicability than just the social, extending to ecology, physics, genetics, computer science, and other domains.

This course will examine key papers in the development of social network analysis, and will develop the theory and methodological tools needed to model and predict social networks and use them in social sciences as diverse as sociology, political science, economics, health, psychology, history, or business. The core of the course will be a series of substantive and seminal papers, shaped in large part by the interests of the students and their various backgrounds. Alongside this we will develop the essential tools of network analysis, from centrality, homophily, and community measurement, to random graphs, network formation, and information flow. The course will also provide an introduction to network modeling and analysis using R, and network visualization using R and Gephi.

Assignments:

This course will be closely focused on the research interests of the students. We will have multiple stages for developing research ideas into research papers, as well as multiple opportunities for students to present and discuss papers of interest to them from their own disciplines. The assignments will include:

1. *Reading responses.* Each student is responsible for a reading response each week. These are 1-2 page (single-spaced) essays discussing and critiquing a paper for that week, and should be uploaded no later than 1 full day before the class in which that paper is being discussed. You may choose any paper from that week's reading list to write about.
2. *Presentations.* Depending on the size of the class, students will make 3-4 presentations, of papers they suggest for the special topics weeks, and of their research project at various stages of development throughout the semester, including a final presentation of their work.
3. *Final Project.* This is a final research paper. This should be as complete a project as possible, but it is also understood that social network analysis may be just one component of a robust social science paper. We will work to make sure that as much of the network-science-oriented introduction, literature review, and empirical analysis is in place as possible to

comprise a significant portion of a research paper when not the entire thing.

Course Grading Criteria:

- Participation – 20%
- Reading Responses – 20%
- Presentations – 20%
- Final Project – 40%

Academic Honesty: Students are expected to do their own work for both homework and exams. For homework assignments, students are welcome to discuss problems and issues with each other using the online forums, but all submitted work should be the student's own. Students are not allowed to discuss the midterm or final exam with anyone, and all questions about the exams should be addressed to the instructors. Plagiarism, copying from other students, or submitting the work of someone not in the program are grounds for expulsion from the course.

Honor Code: All students must adhere to the Northeastern University honor code available here: <http://www.northeastern.edu/osccr/academic-integrity-policy> and in the graduate student handbook.

Special Accommodations: If you have specific physical, psychiatric or learning disabilities that may require accommodations for this course, please contact Northeastern's Disabilities Resource Center (DRC) at (617) 373-2675. The DRC can provide you with information and assistance to help manage any challenges that could affect your performance in the course. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

Schedule, Readings, and Assignments

1. Sep 10: Introduction to Networks
2. Sep 17: Components 1: Node Centrality
 - a. Bavelas, A., 1950. Communication patterns in task-oriented groups. *Journal of the acoustical society of America*.
 - b. Freeman, L.C., 1978. Centrality in social networks conceptual clarification. *Social networks*, 1(3), pp.215-239.
 - c. K.S. Cook, R.M. Emerson, and M.R. Gillmore. 1983. "The Distribution of Power in Exchange Networks: Theory and Experimental Results" *American Journal of Sociology* 89: 275-305.
 - d. Bonacich, P. (1987). Power and centrality: A family of measures. *American Journal of Sociology*, 92(5), 1170-1182.
 - e. Sergey Brin and Lawrence Page. The anatomy of a large-scale hypertextual Web search engine. In Proc. 7th International World Wide Web Conference, pages 107117, 1998.
3. Sep 24: Components 2: Edge Betweenness and Weak Ties
 - a. **First discussion of project ideas. Upload 3 ideas, at least ½ page each, to the Discussion board before the start of class.**
 - b. M. Granovetter. 1973. "[The Strength of Weak Ties.](#)" *American Journal of Sociology* 78: 1360-80.
 - c. E & K: Chapter 3: Strong and Weak Ties
<http://www.cs.cornell.edu/home/kleinber/networks-book/networks-book-ch03.pdf>
 - d. R. Burt. 1995. *Structural Holes: The Social Structure of Competition*. Belknap Press. 8-49.
 - e. Burt, R.S. (2004). [Structural holes and good ideas.](#) *American Journal of Sociology*, 110(2):349-399.
4. Oct 1: Structure 1: Homophily and community
 - a. Schelling, T.C., 1971. Dynamic models of segregation. *Journal of mathematical sociology*, 1(2), pp.143-186.
 - b. McPherson, M, Smith-Lovin, L., and Cook, J.M. (2001). [Birds of a feather: Homophily in social networks.](#) *Annual Review of Sociology*, 27:415-444.
 - c. Centola, D., 2011. An experimental study of homophily in the adoption of health behavior. *Science*, 334(6060), pp.1269-1272.
 - d. Kossinets, G. and Watts, D.J. (2009). [Origins of Homophily in an Evolving Social Network.](#) *American Journal of Sociology*, 115(2)405-450.
 - e. Girvan, M., & Newman, M. E. (2002). Community structure in social and biological networks. *Proceedings of the National Academy of Sciences*, 99(12), 7821-7826.
5. Oct 8: Structure 2: Small Worlds
 - a. Travers, J. and Milgram, S., 1969 "An Experimental Study of the Small World Problem." *Sociometry*, v. 32, n. 4: 425-443.

- b. D. Watts and S. Strogatz. 1998. "Collective dynamics of 'small-world' networks." *Nature* 393: 440-42.
 - c. Dodds, P.S., Muhamad, R., and Watts, D.J. (2003). [An experimental study of search in a global social networks](#). *Science*, 301:827-829.
 - d. Granovetter, M. (2003). [Ignorance, knowledge, and outcomes in a small world](#). *Science*, 301:773-774.
 - e. Kleinberg, J. (2000). [Navigation in a small world](#). *Nature*, 406:845.
6. Oct 15: Student project workshop
- a. **Upload a 2-3 page (single-space) proposal to Canvas Discussion board at least 1 day in advance. Present your proposal (with slides) and discuss in class.**
7. Oct 22: Structure 3: Polarization and Bubbles
- a. Huckfeldt, R., Mendez, J.M. and Osborn, T., 2004. Disagreement, ambivalence, and engagement: The political consequences of heterogeneous networks. *Political Psychology*, 25(1), pp.65-95.
 - b. Adamic, L.A. and Glance, N., 2005, August. The political blogosphere and the 2004 US election: divided they blog. In *Proceedings of the 3rd international workshop on Link discovery* (pp. 36-43). ACM.
 - c. Klar, S., 2014. Partisanship in a social setting. *American journal of political science*, 58(3), pp.687-704.
 - d. Bakshy, E., Messing, S. and Adamic, L.A., 2015. Exposure to ideologically diverse news and opinion on Facebook. *Science*, 348(6239), pp.1130-1132.
 - e. Mason, W. and Watts, D.J., 2012. Collaborative learning in networks. *Proceedings of the National Academy of Sciences*, 109(3), pp.764-769.
8. Oct 29: Special Topics 2: Politics, IR, or TBD
- a. Students will suggest papers. **Upload papers to Canvas Discussion board at least 1 week in advance.**
 - b. For Politics, you can start your search with the references here: <http://journals.sagepub.com/doi/abs/10.1177/1532673X09337771>
 - c. For IR, you can start your search with the references here: <https://www.cambridge.org/core/journals/international-organization/article/network-analysis-for-international-relations/DE2910979C1B5C44C4CC13F336C5DE97>
9. Nov 5: Processes 1: Social Media
- a. boyd, d. m., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, 13(1), article 11.
 - b. Ellison, N.B., Steinfield, C. and Lampe, C., 2007. The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication*, 12(4), pp.1143-1168.
 - c. Bakshy, E., Hofman, J.M., Mason, W.A., Watts, D.J. 2011. [Everyone's an Influencer: Quantifying Influence on Twitter](#), *Fourth International Conference on Web Search and Data Mining*.

- d. Hampton, K.N., Sessions, L.F. and Her, E.J., 2011. Core networks, social isolation, and new media: How Internet and mobile phone use is related to network size and diversity. *Information, Communication & Society*, 14(1), pp.130-155.
- e. Barberá, P., Wang, N., Bonneau, R., Jost, J.T., Nagler, J., Tucker, J. and González-Bailón, S., 2015. The critical periphery in the growth of social protests. *PloS one*, 10(11), p.e0143611.

10. Nov 12: Processes 2: Information Cascades

- a. Salganik, M.J., Dodds, P.S., and Watts, D.J. (2006). [Experimental study of inequality and unpredictability in an artificial cultural market](#). *Science*, 311:854-856.
- b. Friggeri, A., Adamic, L., Eckles, D., and Cheng, J., 2014. [Rumor Cascades](#). *Proceedings of the Eighth International AAAI Conference on Weblogs and Social Media*.
- c. Vosoughi, S., Roy, D., & Aral, S. (2018). [The spread of true and false news online](#). *Science*, 359(6380), 1146-1151.
- d. E & K: Chapter 16: Information Cascades; Chapter 19: Cascading Behavior in Networks
- e. **Informal discussion of student project progress and troubleshooting.**

11. Nov 19: Processes 3: Contagion and Causal Inference

- a. Christakis, N.A. and Fowler, J.H. (2007). [The Spread of Obesity in a Large Social Network over 32 Years](#) *New England Journal of Medicine*, 357:370-379.
- b. Cohen-Cole, E. and Fletcher, J.M. (2008). [Is obesity contagious? Social networks vs. environmental factors in the obesity epidemic](#) *Journal of Health Economics* 27(5):1382-1387
- c. E. Cohen-Cole and J. M. Fletcher (2008). [Detecting implausible social network effects in acne, height, and headaches: longitudinal analysis](#) *British Medical Journal*, 337.
- d. Fowler, J.H. and Christakis, N.A. (2008). [Estimating peer effects on health in social networks: A response to Cohen-Cole and Fletcher; and Trogdon, Nonnemaker, and Paisstar](#) *Journal of Health Economics* 27(5):1400-140.
- e. Shalizi, C.R. and Thomas, A.C. (2011). [Homophily and Contagion Are Generically Confounded in Observational Social Network Studies](#), *Sociological Methods & Research*, 40(2): 211-239.
- f. VanderWeele, T.J. (2011). [Sensitivity analysis for contagion effects in social networks](#) , *Sociological Methods & Research*, 40(2): 240–255.

Nov 26: Thanksgiving

12. Dec 3: Student project presentations 1.

- a. **Powerpoint presentations of near-finished projects.**

13. Dec 10: Student project presentations 2.

- a. **Powerpoint presentations of near-finished projects.**

Dec 14 **Final paper due, uploaded to Canvas.**