Topics in Network Analysis
Spring 2021
Tuesdays 2:10-4:40pm, Zoom

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Overview

Political science is flush with examples of networks: countries are linked in a trade network, revolutionaries are linked in an information network, politicians are linked in a committee network, voters are linked in a friendship network, and the list goes on. Few agents of interest to political science— politicians, lobbyists, voters, protesters, rebels, migrants, employees, committees, countries— are truly independent actors, and a complete understanding of their actions requires an understanding of the networks that interconnect them.

The study of network analysis is concerned with detecting, measuring, analyzing, predicting, and learning the consequences of networks like these. Because the study is relatively new and has grown up in fields that range from computer science to neurobiology to sociology, an introduction necessarily spans a wide variety of subject areas. Creativity and a willingness to cross disciplinary boundaries will be rewarding. After all, revolutions are not so dissimilar from bank runs and epidemics. Voting behavior has analogues to criminal behavior. Congressional committees actually resemble broadway musical creative teams.

This course serves as an introduction to the study of networks by way of twelve core topics. No prior training in networks is assumed (though of course will be helpful), and early graduate training in statistics and game theory will suffice. We will begin with the tools to describe networks, move to a set of topics geared toward creating precise theories and testable predictions, and finally will cover topics concerned with empirical research design, including proper elicitation of networks and estimation of their consequences. Each topic could be the subject of an entire course; this course will scratch the surface of each and offer direction for pursuing greater depth.

Along the way we will be covering a variety of substantive topics and discussing the wealth of possibilities for original political science research. Classes will generally consist in guided discussions and short lectures so that we can flesh out best practice for political scientists studying networks. The more we can harness the variety of backgrounds and interests of everyone in the class, the more we will all take away.

Requirements

Participation: 15%

Readings are to be completed in time for class and thoughtful participation in discussions is expected. Some readings are quite technical and we will use class to distill them to their main points–constructive questions count as thoughtful participation.

Presentation: 10%

Starting in mid February, some classes will contain 15 minute presentation slots. Each student will sign up for one presentation slot to teach the class something relevant but not covered on the syllabus. The topic can be a model or research design from an article not on the syllabus, a resource for data, a demo of software, or something else that we would benefit from learning.

Problem Sets: 20%

There will be three problem sets throughout the semester to offer practice with some of the more technical material. I encourage you to work together, but be sure to write up your own answers.

Prospectus for Final Project: 5%

A 3-4 page memo due by email to the class **11:59pm, Friday April 23**. The prospectus should propose the topic for the final project in as much detail as possible. Class on April 27th will be devoted to very short presentations and collective feedback on project plans.

Final Project: 50%

A 15-20 page research paper submitted by email as a PDF due **11:59pm, Friday May 7**.

Schedule of Readings (subject to additions and substitutions)

Week 1: Introduction

1/26/21

Optional background reading:

> N.A. Christakis and J.H. Fowler. In the thick of it. In *Connected: The surprising power of our social networks and how they shape our lives*, pages 3–32. Little, Brown, 2009.

> D.A. Siegel. Social networks in comparative perspective. *PS: Political Science and Politics*, 44(1):51, 2011.

Week 2: Technical Details

2/2/21

> M.O. Jackson. Chapter 2: Representing and measuring networks. In *Social and economic networks*, pages 20–51. Princeton University Press, 2010.

> M. Newman. Who is the best connected scientist? a study of scientific coauthorship networks. *Complex networks*, pages 337–370, 2004.

Week 3: Theoretical Relevance of Networks

2/9/21

> M.S. Granovetter. The strength of weak ties. *American journal of sociology*, pages 1360–1380, 1973.

> M.S.Y. Chwe. Communication and coordination in social networks. *The Review of Economic Studies*, 67(1):1–16, 2000.

> Y. Bramoullé and R. Kranton. Public goods in networks. *Journal of Economic Theory*, 135(1):478–494, 2007.

> J. M. Larson. Networks and interethnic cooperation. *Journal of Politics*, 79(2):546–559, 2017.

> Z. Maoz, L. G. Terris, R. D. Kuperman, and I. T. What is the enemy of my enemy? causes and consequences of imbalanced international relations, 1816–2001. *The Journal of Politics*, 69(1):100–115, 2007.

Week 4: Network Agent-Based Models

2/16/21

> T.C. Schelling. Sorting and mixing: Race and sex. In *Micromotives and Macrobehavior*, pages 137–166. WW Norton, 2006.

> J. M. Larson and J. I. Lewis. Ethnic networks. *American Journal of Political Science*, 61(2):350–364, 2017.

> Z. Maoz and K. A. Joyce. The effects of shocks on international networks: Changes in the attributes of states and the structure of international alliance networks. *Journal of Peace Research*, 53(3):292–309, 2016.

> D. A. Siegel. When does repression work? collective action in social networks. *The Journal of Politics*, 73(4):993–1010, 2011.

Week 5: Practice with Network Agent-Based Models and Simulation

2/23/21   Download R, and install igraph package for R

Week 6: Observational Data

3/2/21

> N.A. Christakis and J.H. Fowler. The spread of obesity in a large social network over 32 years. *New England journal of medicine*, 357(4):370–379, 2007.

> R. Lyons. The spread of evidence-poor medicine via flawed social-network analysis. *Statistics, Politics, and Policy*, 2(1), 2011.

> C. Cruz, J. Labonne, and P. Querubín. Politician family networks and electoral outcomes: Evidence from the philippines. *American Economic Review*, 107(10):3006–37, 2017.

> J. M. Montgomery and B. Nyhan. The effects of congressional staff networks in the us house of representatives. *The Journal of Politics*, 79(3):745–761, 2017.

> C. Dorff, M. Gallop, and S. Minhas. Networks of violence: Predicting conflict in nigeria. *The Journal of Politics*, 82(2):476–493, 2020.

Week 7: Survey Data

3/9/21

N. Rao, M. Mobius, and T. Rosenblat. Social networks and vaccination decisions. *Working Paper*, 2007.

J.T. Scholz, R. Berardo, and B. Kile. Do networks solve collective action problems? credibility, search, and collaboration. *Journal of Politics*, 70(2):393–406, 2008.

A. Banerjee, A. G. Chandrasekhar, E. Duflo, and M. O. Jackson. The diffusion of microfinance. *Science*, 341(6144), 2013.

R. Ferrali, G. Grossman, M. R. Platas, and J. Rodden. It takes a village: Peer effects and externalities in technology adoption. *American Journal of Political Science*, 64(3):536–553, 2020.

Week 8: Online Social Media Data

3/16/21

S. Aral, L. Muchnik, and A. Sundararajan. Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks. *Proceedings of the National Academy of Sciences*, 106(51):21544–21549, 2009.

S. González-Bailón and N. Wang. Networked discontent: The anatomy of protest campaigns in social media. *Social Networks*, 44:95–104, 2016.

Z. C. Steinert-Threlkeld. Spontaneous collective action: Peripheral mobilization during the arab spring. *American Political Science Review*, 111(2):379–403, 2017.

J. M. Larson, J. Nagler, J. Ronen, and J. A. Tucker. Social media and protest participation: Evidence from 130 million twitter users. *Working Paper*, 2017.

Week 9: Experiments

3/23/21

E. Duflo and E. Saez. The role of information and social interactions in retirement plan decisions: Evidence from a randomized experiment. *The Quarterly Journal of Economics*, 118(3):815–842, 2003.

S. Judd, M. Kearns, and Y. Vorobeychik. Behavioral dynamics and influence in networked coloring and consensus. *Proceedings of the National Academy of Sciences*, 107(34):14978–14982, 2010.

J.H. Fowler and N.A. Christakis. Cooperative behavior cascades in human social networks. *Proceedings of the National Academy of Sciences*, 107(12):5334–5338, 2010.

P. Atwell and N. L. Nathan. Channels for influence or maps of behavior? a field experiment on social networks and cooperation. *American Journal of Political Science*, Forthcoming.

Week 10: Norms

3/30/21
  TBD

Week 11: Network Formation, Network Visualization

4/6/21

M.O. Jackson and A. Wolinsky. A strategic model of social and economic networks. *Journal of economic theory*, 71(1):44–74, 1996.

M. Fafchamps and F. Gubert. Risk sharing and network formation. *The American economic review*, 97(2):75–79, 2007.

S. J. Cranmer, P. Leifeld, S. D. McClurg, and M. Rolfe. Navigating the range of statistical tools for inferential network analysis. *American Journal of Political Science*, 61(1):237–251, 2017.

M. Grandjean. Gephi: Introduction to network analysis and visualization. `martingrandjean.ch/gephi-introduction/`, 2015.

Download Gephi

Week 12: Learning and Diffusion

4/13/21

M.H. DeGroot. Reaching a consensus. *Journal of the American Statistical Association*, 69(345):118–121, 1974.

A. Chandrasekhar, H. Larreguy, and J. P. Xandri. Testing models of social learning on networks: Evidence from a lab experiment in the field. *Working Paper*, 2016.

M. Mobius, T. Phan, and A. Szeidl. Treasure hunt: Social learning in the field. *Working Paper*, NBER, 2015.

J. M. Larson, J. I. Lewis, and P. Rodríguez. From chatter to action: How social networks inform and motivate in rural uganda. *Working Paper*, 2021.

Week 13: COVID-19

4/20/21
    TBD

> ***Friday, 4/23/21: Prospectus due by email to class 11:59pm***

Week 14

4/27/21
    Presentation of Paper Topics

> ***Friday, 5/7/21: PDF of Final Project due by email 11:59pm***