

ORGB 7XX: Social Network Analysis for Social Science Research

Winter Term (DRAFT)

Professor: Brian Rubineau
Office: 333 Bronfman
E-mail: brian.rubineau@mcgill.ca
Phone: 514-398-5663
Office hours: TBD or by appointment

Course Description:

This doctoral seminar provides an introduction to social network analysis methods for social science research. Students will develop an understanding of the particular analytical concerns when dealing with network data, the implications of different network data collection and analytical approaches and whether and how network analysis may be useful in advancing students' individual research. Students will also gain practical experience with social network analysis techniques. The class only requires basic graduate backgrounds in statistics, org theory, and computer familiarity. There will be a final project of conducting a network analysis on a question and with data relevant to students' own research.

Course Objectives:

The class will cultivate knowledge of theory, research literacy, and analysis skills regarding social network analysis for social science research. The class will cover a set of network-related concepts (e.g., social capital, social influence) and students will gain the skills to perform some of the social network analysis techniques used in research about those concepts.

Course Information:

Class time: TBD
Class location: TBD
Course website: MyCourses.mcgill.ca

Course Readings

The readings for this course will be papers and chapters available online (mostly through the course website). The general format for the assigned readings is that for each topic, there will be two sets of readings: One set of readings focuses on the theory and methodology of a particular topic, and a second set of readings are examples of applications of such research.

Recommended Books

Below is a list of books that are NOT REQUIRED, but highly recommended for any of you planning to pursue social network analysis in your own research.

"How To" Books

Wasserman, S. and K. Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press.

An encyclopedic volume of methods. Continues to be the "bible" of the field.

Scott, J. 2000. *Social Network Analysis: A Handbook (2nd Ed.)*. Los Angeles: Sage. A good introductory text mapping well to the first 1/3 of the class.

Knoke, D. and S. Yang. 2008. *Social Network Analysis, 2nd Ed.* Thousand Oaks, CA: Sage. A short and dense description of many methods.

Collections Giving Excellent Overviews of Theory and Methods:

Scott, J. and P. J. Carrington. 2011. *The Sage Handbook of Social Network Analysis*. Thousand Oaks, CA: Sage.

Carrington, P. J., Scott, J., and Wasserman, S. 2005. *Models and methods in Social Network Analysis*. Cambridge, UK: Cambridge University Press. A very useful resource.

Course Grades

The course will include weekly assignments (reading memos and network exercises), presentations, student-led discussions, and a final paper. Grades will be determined as follows;

10%	In-Class Discussion
10%	Weekly reaction memos
10%	Weekly network exercises
10%	Presentation of the network exercise (at least 2)
10%	Student-led discussion (at least 1)
10%	Final paper presentation
40%	Final Paper

In-Class Discussion: All students are expected to actively participate in class discussions.

Weekly reaction memos: All students will write short (about 2, no more than 3 pages) memos giving your thoughts, reactions and critiques of the example readings in the context of the theory and methods readings. **These are due 24 hours BEFORE class (i.e., by 8:40 a.m. Monday morning).** Please post your memos to the class course website. That way, the instructor and students leading the discussion can review these prior to meeting.

Weekly network exercises: All students will complete a set of social network exercises. Post to the class online forum the results/output from these exercises and/or a detailed description of the attempt. Students not successfully completing the exercise should be sure to document a variety of attempts to do so. **These are due before the beginning of class (i.e., by 8:40 a.m. Tuesday morning).** You are encouraged to collaborate on these assignments. A group can submit a single write-up, but must indicate each contributor and their contributions within the write-up.

Presentation of network exercise (at least 2): Each class, two students will walk through their process and results for that week's network exercise. Students may use whatever presentation methods (e.g., projecting from a computer, overheads, handouts) they prefer. Presenting incomplete exercises is completely acceptable, and an opportunity for the class to learn from each others' successes and mistakes.

Student-led discussion (everyone will do one): Lead a discussion based on your reactions to the readings. Students leading a discussion should prepare a short discussion guide (about 1, and not more than two pages), with enough copies to hand out to the class at the beginning of the discussion session.

The goal of the guide is to help foster discussion. The guide's main emphasis should be relevant to the network ideas in that week's readings. A guide should NOT summarize each article/chapter. Rather, it should extract and emphasize core themes, principles, issues, controversies. Your goal is to stimulate the class' critical interpretation and evaluation of the theories, methods, and substantive applications of network concepts and principles.

Structurally, a guide might consist of several bullet points and/or questions that highlight the topics and problems that you expect the class to discuss. Try to be balanced, noting strengths as well as weaknesses of the assigned readings. Look for opportunities to integrate ideas from other sources, including those from preceding weeks, and suggest potential ways to advance inquiry through novel approaches to the topic. The particular guide format you choose is up to you. Here are some questions to ponder when preparing it (not all questions will be appropriate for all topics):

- What are the key network theories, concepts and propositions in this field?
- What alternative theoretical perspectives compete to explain important constructs or behaviors?
- How could network ideas improve our knowledge and understanding of the topic?
- What structural patterns or relational processes are crucial for better understanding?
- What are the origins of network relationships and what are their consequences?
- How close is the fit between theoretical concepts and network measures or data collection procedures?

- What improvements in network research designs to study this topic are feasible?
- Have researchers used (in)appropriate network methods to test their hypotheses?
- Given inevitable empirical limitations, are analysts' conclusions warranted or suspect?

Research Presentation: All students will present their progress on their final paper to the class during one of the last two class meetings.

Final Paper: In all cases, students should use the final paper as an opportunity to make progress on their own research. The final paper may be a revision/augmentation of a previous paper. Students wishing to use this final paper for other classes may do so, but need to talk with the professors of both classes to make sure the final paper meets all the necessary requirements. Although this paper can take on a variety of formats, the preferred format is a “middle” of a research paper using social network analysis. That is, a paper with only a brief introduction to the research question, and focusing on presenting the data, methods, results, and interpretation of findings. Students that do not have their own network data, but seeking experience with a particular method are encouraged to try the method on an existing similarly-structured dataset (the professor can assist you in identifying such a dataset). Students may also choose to write final papers on theory, augmenting or critiquing existing methods, developing new methods, or address debates in the field. Students pursuing a non-data analysis option will have alternative deliverables over the course of the semester than the ones indicated herein.

Class Policies

- **Academic integrity.** McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see <http://www.mcgill.ca/integrity> for more information.)
- **Late assignments.** There is no credit for late weekly memos / exercises. Please plan accordingly.
- **Collaborative and Independent work.** Students are welcome and encouraged to work with and assist each other on all assignments EXCEPT those concerning your final paper.
- **Language.** In accordance with McGill University's Charter of Students' Rights, students have the right to submit in English or in French any written work that is to be graded.
- In event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

Class Structure

Most class meetings will follow the following format:

1. Student-led discussion about the assigned readings
2. Two presentations of network exercises
3. Introduction to next week's topics

We will likely have at least one break between sections.

Software

The class will be taught using R software, packages, and analytical tools. One of the early classes will be a workshop on the basics of using R.

R, with the statnet, igraph, latentnet, and rSiena package libraries.

R is a very powerful, free, and growing open-source statistical package. It is command-line based, and takes a little learning (using the SAT analogy format, SPSS:Stata::Stata:R), but an investment in learning R will pay dividends in being able to use the many other statistical and plotting/graphing packages developed for R beyond social network analysis (e.g., HLM, event history analysis, discrete choice modeling, demography methods).

Some useful starting points:

The statnet site w/R installation info: <http://csde.washington.edu/statnet/>

A good place to get started: <http://www.statnetproject.org/resources.shtml>

A list of other users guides: (first link on the main page)
http://www.statnetproject.org/users_guide.shtml
(updated tutorial at the bottom of the list)

Other recommended package libraries for R: foreign (e.g., to import SPSS data), psych, and MASS.

Schedule of Topics and Due Dates

Notes: Memos are due to be posted to the course website before 8:40am on the Monday before class.

Network exercises are due to be posted to the course website before 8:40am on Tuesday before class.

1. Week 1: Introduction to Networks & Network Theory
2. Week 2: R workshop & Basic Network Measures using R
3. Week 3: Network Measures: Nodes, Ties and Graphs

First Due Date: 3 Research questions

4. Week 4: Network Structure
5. Week 5: Centrality & Status

Second Due Date: Data description with summary of network data in R.

6. Week 6: Social Capital & Brokerage
7. Week 7: Clustering: Boundaries and Network Data Reduction

Third Due Date: Final question, Description of Method and Analysis Strategy

8. Week 8: Contagion, Diffusion & Social Influence

Fourth Due Date: Detailed Outline of Report

9. Week 9: Statistical Estimation of Networks, QAP & MRQAP
10. Week 10: Network Formation, ergm
11. Week 11: Longitudinal Network Data Analysis, rSIENA & xtergm
12. Week 12: Presentations 1
13. Week 13: Presentations 2

Fifth & Final Due Date: Final report

WEEK 2: Readings and Network Exercise

Required readings for the response memo

Intro to Networks & Network Theory

You can download the articles singly by clicking on the links, or (possibly) together as a single zip file using the "Tools" button on the top right of the page and selecting "Attachments."

- Borgatti, Stephen P. and Pacey C Foster. 2003. The Network Paradigm in Organizational Research: A Review of Typology. *Journal of Management*, 29:991-1013.
- Borgatti, Stephen P. and Daniel S. Halgin. 2011. On Network Theory. *Organization Science*, 22(5):1168--1181.
- Emirbayer, M. and Goodwin, J. 1994. Network Analysis Culture and the Problem or Agency. *American Journal of Sociology*, 99(6): 1-1454.
- Lazer, D., Pentland, A., Adamic, L., Aral, S., Barabási, A-L., Brewer, D., Christakis, N., Contractor, N., Fowler, J., Gutmann, M., Jebara, T., King, G., Macy, M., Roy, D. and Van Alstyne, M. 2009. Computational Social Science. *Science*, 323: 721-723.
- Kilduff, Martin and Daniel J. Brass. 2010. Organizational Social Network Research: Core Ideas and Key Debates. *Academy of Management Annals*, 4(1): 317--357.
- Wellman, Barry. 1988. Structural Analysis: From Method and Metaphor to Theory and Substance. Pp. 19-61 in *Social Structures: A Network Approach* edited by Barry Wellman and S. D. Berkowitz. New York: Cambridge University Press

Potential questions for your reaction memo:

Why is agency an important question for network research?

For what types of research questions is a network approach appropriate?

What is the relationship between the growing interest in computational social science and social network research?

Network Exercise Assignment

1. Install R.
2. Get it running.
3. Install the necessary packages (statnet, igraph, RSiena)
4. Select a network dataset (your own or an existing dataset, but NOT one included with the software).
5. Input the data into the software package.
6. Plot a network diagram of your data.

WEEK 3: Readings and Network Exercise

Required readings for the response memo

Contextual Readings – Nodes & Ties

- Butts, C. T. 2009. Revisiting the Foundations of Network Analysis. *Science*, 325(24 JULY 2009): 414-416.
- Granovetter, M. S. 1973. The Strength of Weak Ties. *American Journal of Sociology*, 78(6): 1360-1380.
- Marsden, P. V. 2005. Recent Developments in Network Measurement. Carrington, P. J., Scott, J., and Wasserman, S. Eds. *Models and methods in Social Network Analysis*. Cambridge, UK: Cambridge University Press. Pp. 8-30.
- Scott, J. 2011. Social network analysis: developments, advances, and prospects. *SOCNET*, 1:21-26.

Examples

- Bevelander, D., M.J. Page. 2011. Ms. Trust: Gender, Networks and Trust---Implications for Management and Education *Academy of Management Learning and Education*, 10(4): 623-642.
- Klein, K.J., B.C. Lim, J.L. Saltz, D.M. Mayer. 2004. How Do They Get There? An Examination of the Antecedents of Centrality in Team Networks. *Academy of Management Journal*, 47(6): 952--963.
- Yakubovich, V. 2005. Weak Ties, Information, and Influence: How Workers Find Jobs in a Local Russian Labor Market. *American Sociological Review*, 70: 408--421.

Potential questions for your reaction memo:

How do differences among network nodes affect network outcomes?

To what extent can the distinctiveness of nodes be set aside in network research?

How do differences in the nature of network ties affect network outcomes?

To what extent can the distinctiveness of ties be set aside in network research?

Critique the assumptions of dichotomizing ties into “strong” and “weak.”

Network Exercise Assignment

1. Read and do the first 4 sections (pages 1-7) of Goodreau et al.'s 2008 Statnet Tutorial.
2. Make directed (asymmetric) and undirected (symmetric) versions of your network.
3. Add at least two types of node characteristic information to the network.
4. Graph one version of the network (i.e., directed OR undirected) presenting at least two dimensions of node characteristics (e.g., via node size, shape, color, labeling, etc.)
5. For each version of your network (i.e., directed AND undirected), calculate:
 - a. The frequency of within-group ties for one of the node characteristic dimensions
 - b. The frequency of between-group ties for the same dimension
 - c. The expected frequencies of within-group and between-group ties if the network had the same number of edges, but the edges were randomly allocated.
6. Discuss whether the results from number 5 suggest that the node characteristic analyzed plays a role in network structure.

WEEK 4: Readings and Network Exercise - Network Structure

Required readings for the response memo

Contextual Readings

- Barabasi, Albert Laszlo and Reka Albert. Emergence of Scaling in Random Networks. 1999. *Science*, 286(15 October): 509-512.
- Borgatti, Stephen and Martin Everett. 1999. Models of core/periphery structures. *Social Networks*, 21: 375--395.
- Watts, Duncan and Steven Strogatz. 1998. Collective dynamics of 'small-world' networks. *Nature*, 393(4 June): 440-442.

Examples

- Cattani, Gino and Simone Ferriani. 2008. A Core/Periphery Perspective on Individual Creative Performance: Social Networks and Cinematic Achievements in the Hollywood Film Industry. *Organization Science*, 19(6): 824--844.
- Moody, James. 2004. The Structure of a Social Science Collaboration Network: Disciplinary Cohesion from 1963 to 1999. *American Sociological Review*, 69(2): 213-238.
- Newman, M.E.J. 2001. The structure of scientific collaboration networks. *PNAS*, 98(2): 404-409.

Network Exercise Assignment

NOTE: For this assignment, it will be helpful to read Sections 4.1-4.3 of chapter 4 in Knoke and Young (2008). (You can ignore the passage about "network range.")

1. Calculate the density of your network
2. Generate a random network with (approximately) the same density
3. Calculate and plot the degree distributions for both your network and your same-density random network.
4. Discuss whether your network exhibits small world, scale free, or core/periphery properties.
5. Explain any calculations you make to evaluate whether your network exhibits these properties.

WEEK 5: Readings and Network Exercise - Centrality & Social Capital

Required readings for the response memo

Contextual Readings

- Bonacich, Phillip and Paulette Lloyd. 2001. Eigenvector-like measures of centrality for asymmetric relations. *Social Networks*, 23: 191—201
- Bonacich, Phillip. 2007. Some unique properties of eigenvector centrality. *Social Networks*, 29: 555--564.
- Borgatti, Stephen P., Candace Jones, and Martin G. Everett. 1998. Network Measures of Social Capital. *Connections* 21(2):27-36.
- Borgatti, Stephen P. 2005. Centrality and network flow. *Social Networks*, 27: 55--71.
NOTE: Section 4.4. in the Knoke & Yang (2008) chapter provided last week provides additional descriptions (and formulas for calculating) of many of the centrality measures described in the readings.

Examples

- Brass, Daniel J. 1984. Being in the Right Place: A Structural Analysis of Individual Influence in an Organization. *Administrative Science Quarterly*, 29(4): 518-539.
- Burris, V. 2004. The academic caste system: Prestige hierarchies in PhD exchange networks. *American Sociological Review*, 69(2): 239-264.

Network Exercise Assignment

1. Based on your interests and the nature of your network data, choose 2 centrality measures in addition to degree centrality (if directed, use in-degree) to calculate for your observed and your equivalent random network.
2. Describe in words what you think high centrality indicates for each of the 3 measures.
3. Make a table of the mean, median, range, and label (i.e., vertex ID) for the maximally central node for the 3 centrality measures for the 2 networks.
4. Comment on whether (and if so, why) the different measures identify different most-central-nodes.
5. Calculate and show the correlation table for these 3 measures within each network.
6. What do the correlations mean for the differences among these 3 centrality measures?

WEEK 6: Readings and Network Exercise - Cognitive Social Structures & Structural Holes

Required readings for the response memo

Cognitive Social Structures

- Krackhardt, David. 1987. Cognitive Social Structures. *Social Networks*, 9:109-134.
- Krackhardt, David and Martin Kilduff. 2002. Structure, culture and Simmelian ties in entrepreneurial firms. *Social Networks*, 24(3): 279-290.
- Kilduff, Martin , Craig Crossland, Wenpin Tsai, and David Krackhardt. 2008. Organizational network perceptions versus reality: A small world after all? *Organizational Behavior and Human Decision Processes*, 107(1): 15--28.

Structural Holes

- Burt, Ronald S. 1992. Formalizing the Argument. Chapter 2 (pp. 50-81) in *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Burt, Ronald S. 2001. Structural Holes versus Network Closure as Social Capital. Chapter 2 (pp. 31-56) in *Social Capital: Theory and Research*. Nan Lin, Karen S. Cook, and Ronald S. Burt, editors.

Network Exercise Assignment

1. Based on your understanding of structural holes, which centrality measure from last week do you think should be most closely related with constraint? Justify your answer.
2. Use the "constraint" command in the "igraph" library to calculate constraint in your network.
3. Add constraint to the correlation table among the centrality measures based on your actual network, and comment on whether your results are expected or surprising.
4. Structural holes are commonly measured using ego-centric network data asking an individual for her/his alters and her/his perceptions of the presence or absence of ties among others. Fundamentally, ego-centric based constraint use cognitive social structures. Discuss the advantages and disadvantages of calculating constraint using this kind of ego-centric CSS data versus full network data.

WEEK 7: Readings and Network Exercise - Equivalence and Clustering

Required readings for the response memo

Equivalence & Clustering

- Newman, M. E. J. 2006. Modularity and community structure in networks. *PNAS*, 103(23): 8577-8582.
- Wasserman, Stanley and Katherine Faust. 1994. Chapter 9: Equivalence. Pp. 347-393 in: *Social Network Analysis: Methods and Applications*. Cambridge, UK: Cambridge University Press.
- White, Harrison C., Scott A. Boorman and Ronald L. Breiger. 1976. Social Structure from Multiple Networks. I. Blockmodels of Roles and Positions. *American Journal of Sociology*, 81(4):730-780.
- Winship, Christopher and Michael Mandel. 1983. Roles and Positions: A Critique and Extension of the Blockmodeling Approach. *Sociological Methodology*, 14:314-344.

Examples

- OPTIONAL:** Pollack, Craig Evan, Gary Weissman, Justin Bekelman, Kaijun Liao, and Katrina Armstrong. 2012. Physician Social Networks and Variation in Prostate Cancer Treatment in Three Cities. *Health Services Research*, 47(1pt2): 380--403.
- van Rossem, Ronan and Marjolijn M. Vermande. 2004. Classroom Roles and School Adjustment. *Social Psychology Quarterly*, 67(4): 396--411.
- Shwed, Uri and Peter S. Bearman. 2010. The Temporal Structure of Scientific Consensus Formation. *American Sociological Review*, 75(6):817-840.

Network Exercise Assignment

1. Plot a dendrogram (tree diagram illustrating the clustering of a network) for your network
2. Clustering differs based on the distance measure used. What kind of distance measure would make the most sense if you needed to cluster your network data?
3. If you had to choose a clustering cutoff "height" for your dendrogram #1, what would it be and why? How many clusters of more than 1 node would that cutoff yield? How many isolates?

NOTES:

For a worked out example of how to plot a dendrogram,
see:<http://igraph.sourceforge.net/screenshots2.html>

WEEK 8: Readings and Network Exercise - Social Influence and Contagion

Required readings for the response memo

Social Influence and Contagion

- Leenders, R. 2002. Modeling social influence through network autocorrelation: constructing the weight matrix. *Social Networks*, 24 (1):21-47.
- Marsden, Peter V., and Noah E. Friedkin. 1993. Network Studies of Social-Influence. *Sociological Methods & Research*, 22 (1):127-151.
- Mouw, Ted. 2006. Estimating the Causal Effect of Social Capital: A Review of Recent Research. *Annual Review of Sociology*, 32:79--102.
- Shalizi, Cosma Rohilla and Andrew C. Thomas. 2011. Homophily and Contagion Are Generically Confounded in Observational Social Network Studies. *Sociological Methods & Research*, 40(2): 211-239.

Examples

- Aral, Sinan, Lev Muchnik, and Arun Sundararajan. 2009. Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks. *PNAS*, 106(51):21544--21549.
- Lazer, David, Brian Rubineau, Nancy Katz, Carol Chetkovich and Michael Neblo. 2010. The Coevolution of Networks and Political Attitudes *Political Communication*, 27:248--274.

Network Exercise Assignment

1. Estimate the association between some node-attribute “exposure” variable and another node-attribute “outcome” variable as an estimation of social influence.
2. Given the structure of your data, would a significant measure of association suggest the presence of influence? Why or why not?
3. How would the data, analysis or both need to be restructured to allow an estimation of influence?

Week 7: Social Capital & Brokerage

Week 8: Contagion, Diffusion & Social Influence

Week 9: Statistical Estimation of Networks, QAP & MRQAP

Week 10: Network Formation, ergm

Week 11: Longitudinal Network Data Analysis, rSIENA & xtergm

WEEK 9: Readings and Network Exercise - Statistical Estimation of Social Networks

Required readings for the response memo

Statistical Estimation of Social Networks

- Anderson, C.J., S. Wasserman, B. Crouch. 1999. A p* primer: logit models for social networks. *Social Networks*, 21: 37--66.
- Krackhardt, D. 1987. QAP partialling as a test of spuriousness. *Social Networks*, 9: 171--186.
- _____. 1988. Predicting with networks---Nonparametric multiple-regression analysis of dyadic data. *Social Networks*, 10(4): 359--381.
- Lindgren, Karl-Oskar. 2010. Dyadic regression in the presence of heteroscedasticity---An assessment of alternative approaches. *Social Networks*, 32: 279--289.

Examples

- Bowler, Wm. Matthew and Daniel J. Brass. 2006. Relational Correlates of Interpersonal Citizenship Behavior: A Social Network Perspective. *Journal of Applied Psychology*, 91(1): 70 – 82.
- Schaefer, David R. 2012. Youth co-offending networks: An investigation of social and spatial effects. *Social Networks*, 34(1): 141--149.

Network Exercise Assignment

MRQAP

1. Using the qaptest method in statnet, test the significance of the correlation between two networks
2. Using the netlm method in statnet with the nullhyp="qapspp" option, use MRQAP to estimate associations between a network dependent variable and network-based independent variables

ERGM

1. Complete the statnet tutorial.
2. Estimate an ergm with your data
3. Check the goodness of fit statistics for your model. Comment on the goodness-of-fit - is it a reasonable model for your data?

SYNTHESIS

1. Is it possible to have individual-level IVs in an MRQAP model?
2. What are the main differences between estimating a network with MRQAP versus ergm?

WEEK 10: Readings and Network Exercise - Network Formation

Required readings for the response memo

Network Formation

- Nebus, James. 2006. Building Collegial Information Networks: A Theory Of Advice Network Generation. *Academy of Management Review*, 31(3): 615--637.
- Robins, Garry and Jennifer Boldero. 2003. Relational Discrepancy Theory: The Implications of Self-Discrepancy Theory for Dyadic Relationships and for the Emergence of Social Structure. *Personality and Social Psychology Review*, 7(1): 56-74.
- Wimmer, Andreas and Kevin Lewis. 2010. Beyond and Below Racial Homophily: ERG Models of a Friendship Network Documented on Facebook. *American Journal of Sociology*, 116(2): 583--642. (Theory portion)

Examples

- 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.
- Shipilov, Andrew V. , Tim J. Rowley and Barak S. Aharonson. 2006. When Do Networks Matter? A Study of Tie Formation and Decay. *Advances in Strategic Management*, 23: 481--519.
- Krackhardt, David and Mark S. Handcock. 2007. Heider vs Simmel: Emergent Features in Dynamic Structures. *International Conference on Machine Learning, 2006 Ws, Lecture Notes in Computer Science* 4503: 14-27.
- Wimmer, Andreas and Kevin Lewis. 2010. Beyond and Below Racial Homophily: ERG Models of a Friendship Network Documented on Facebook. *American Journal of Sociology*, 116(2): 583--642. (Empirical portion)

Network Exercise Assignment

Using a set of ergms to estimate your network:

1. For a node characteristic available in your data, estimate the association between homophily on that characteristic with your network. Control for ego effects for the node characteristic itself.
2. Add to your model one or more terms to control for closure/transitivity (and if your network is directed, reciprocity). Justify the terms you choose to represent closure/reciprocity.
3. Estimate your new model.
4. Did the inclusion of controls for closure/transitivity (and possibly reciprocity) attenuate the apparent homophily effect? Discuss.

WEEK 11: Readings and Network Exercise - Longitudinal Network Analysis

Required readings for the response memo

Longitudinal Network Analysis

- Leifeld, P., Cranmer, S. J., & Desmarais, B. A. 2014. Estimating Temporal Exponential Random Graph Models by Bootstrapped Pseudolikelihood.
- Snijders, T. A. B. 2005. Models for Longitudinal Network Data. Peter J. Carrington, John Scott, Stanley Wasserman, Eds. *Models and methods in social network analysis*. Pp. 215-247. Cambridge UK: Cambridge University Press.
- Snijders, T. A. B., G. G. van de Bunt, and C. Steglich. 2010. Introduction to Stochastic Actor-Based Models for Network Dynamics. *Social Networks*, 32: 44-60. (A pre-publication version)

Examples

- Steglich, C., T. A. B. Snijders, and M. Pearson. 2010. Dynamic Networks and Behavior: Separating Selection from Influence. *Sociological Methodology*, 40:329-393.
- van Duijn, M. A. J., E. P. H. Zeggelink, J. M. Huisman, F. N. Stokman, and F. W. Wasseur. 2003. Evolution of Sociology Freshmen into a Friendship Network. *Journal of Mathematical Sociology* 27:153-191.

Network Exercise Assignment

Look over section 2.3 of the RSiena manual (it's not really reading).
Using the scripts provided in section 2.4 of the manual, estimate an RSiena model using the example provided in the RSiena manual script. (The needed data files are attached to this page - they begin with "s50".)
The sample script working through an example of estimating an RSiena model is on pp. 15-34. Once you have the estimated model, you can stop. (There is a lot of extra information here too. Please skip the parts about: Arc List & Pajek (p. 19-20), and the bottom of p. 24 about bi-partite data.)

WEEK 12: Final Readings - Integrative and emerging work

Required readings for the response memo

Integrative and emerging work

- Burt, R. S. 2012. Network-related personality and the agency question: Multirole evidence from a virtual world1. *American Journal of Sociology*, 118(3), 543-591.
- Goldberg, Amir. 2011. Mapping Shared Understandings Using Relational Class Analysis: The Case of the Cultural Omnivore Reexamined. *American Journal of Sociology*, 116(5): 1397-1436.
- Papachristos, Andrew V. 2009. Murder by Structure: Dominance Relations and the Social Structure of Gang Homicide. *American Journal of Sociology*, 115(1): 74-128.
- Sasovova, Zuzana, Ajay Mehra, Stephen P. Borgatti, and Michaéla C. Schippers. 2010. Network Churn: The Effects of Self-Monitoring Personality on Brokerage Dynamics. *Administrative Science Quarterly*, 55(4): 639-670.