Sociology 323: Social networks

Matthew Salganik
145 Wallace Hall
mjs3@princeton.edu
Office Hours: Tuesday 2-4

Princeton University, Fall 2007

Introduction

This course provides an introduction to social networks. Topics include the small-world puzzle (six degrees of separation), the strength of weak ties, centrality, data collection, and the spread of diseases and fads. These concepts and others will then be used to understand empirical research on phenomena including the spread of HIV/AIDS, finding a job, collusion in industry, cooperative relationships between firms in the Garment District in New York, and the struggle for power among elite families in 15th-century Florence.

Structure of the course

During the first part of the course I will lecture on many of the main concepts and techniques of social network analysis. Then we will have an in-class exam. Following the exam, students will take turns presenting empirical research articles that use the ideas developed in the first part of the course in order to understand a range of topics. Many of the readings will be drawn from journals, but there will be one required text for this class:

- Watts, D. J. (2003). *Six Degrees: The Science of a Connected Age*. W.W. Norton, New York

Your grade will be based on the following:

In-class exam	30%
Final paper	30%
Homework/Quizzes	10%
Presentation	20%
Class participation	10%

Lecture schedule

1 Course introduction

2 The connected age and the small world problem

- Watts (Introduction and Chapter 1)
- Travers, J. and Milgram, S. (1969). An experimental study of the small world problem. *Sociemetry*, 32(4):425–443

- Kleinfeld, J. S. (2002). The small-world problem. *Society*, 39(2):61–66
- Granovetter, M. (2003). Ignorance, knowledge, and outcomes in a small world. *Science*, 301:773–774
- Dodds, P. S., Muhamad, R., and Watts, D. J. (2003a). An experimental study of search in global social networks. *Science*, 301:827–829

Further reading:
Milgram, S. (1967). The small world problem. *Psychology Today*, 1:62–67
Korte, C. and Milgram, S. (1970). Acquaintance networks between racial groups. *Journal of Personality and Social Psychology*, 15:101–108

3 Historical background

- Watts (Chapter 2)
- Chapters 1 and 3: Freeman, L. C. (2004). *The Development of Social Network Analysis*. Empirical Press, Vancouver

Further reading:
Freeman, L. C. (2004). *The Development of Social Network Analysis*. Empirical Press, Vancouver

4 Understanding the small world phenomenon

- Watts (Chapter 3)
- Watts, D. J. (1999a). Networks, dynamics, and the small world phenomenon. *American Journal of Sociology*, 105(2):493–527

Further reading:
de Sola Pool, I. and Kochen, M. (1978). Contacts and influence. *Social Networks*, 1(1):5–51
Kochen, M., editor (1989). *The Small World*. Ablex, Norwood, NJ
Watts, D. J. and Strogatz, S. H. (1998). Collective dynamics of 'small-world' networks. *Nature*, 393:440–442
Watts, D. J. (1999b). *Small Worlds: The Dynamics of Networks Between Order and Randomness*. Princeton University Press, Princeton, NJ

5 Degree distribution and power-laws

- Watts (Chapter 4 (p. 101-114))
- Barabási, A. L. and Bonabeau, E. (2003). Scale-free networks. *Scientific American*, pages 50–59
- Barabási, A. L. and Albert, R. (1999). The emergence of scaling in random networks. *Science*, 286:509–512

Further reading:
Amaral, L. A. N., Scala, A., Barthelemy, M., and Stanley, H. E. (2000). Classes of small-world networks. *Proceedings of the National Academy of Sciences USA*, 97(21):11149–11152
Albert, R., Jeong, H., and Barabási, A. L. (2000). Error and attack tolerance of complex networks. *Nature*, 406:378–381

6 Affiliation networks (2-mode data)

- Watts (Chapter 4 (p. 118-129)
- Breiger, R. L. (1974). The duality of person and groups. *Social Forces*, 53(2):181–190
- Feld, S. L. (1981). The focused organization of social ties. *American Journal of Sociology*, 86(5):1015–1035

Further reading:
McPherson, J. M. (1982). Hypernetwork sampling: Duality and differentiation among voluntary organizations. *Social Networks*, 3:225–249
Newman, M. E. J., Strogatz, S. H., and Watts, D. J. (2002). Random graph models of social networks. *Proceedings of the National Academy of Sciences USA*, 99:2566–2572

7 Search and the small world problem

- Watts (Chapter 5)
- Kleinberg, J. (2000). Navigation in a small world. *Nature*, 406:845
- Watts, D. J., Dodds, P. S., and Newman, M. E. J. (2002). Identity and search in social networks. *Science*, 296:1302–1305
- Killworth, P. D., McCarty, C., Bernard, H. R., and House, M. (2006). The accuracy of small world chains in social networks. *Social Networks*, 28(1):85–96

8 Spread of disease

- Watts (Chapter 6)
- Klovdahl, A. S. (1985). Social networks and the spread of infectious diseases: The AIDS example. *Social Science and Medicine*, 21(11):1203–1216
- Potterat, J. J., Woodhouse, D. E., Muth, S. Q., Rothenberg, R. B., Darrow, W. W., Klovdahl, A. S., and Muth, J. B. (2004). Network dynamism: History and lessons of the Colorado Springs study. In Morris, M., editor, *Network Epidemiology*, chapter 4, pages 87–114. Oxford University Press
- Des Jarlais, D. C. (2000). Structural interventions to reduce HIV transmission among injecting drug users. *AIDS*, 14(supp 1):S41–S46

9 The "madness" of crowds

- Watts (Chapter 7)
- Hedstrom, P. (2006). Experimental macro sociology: Predicting the next best seller. *Science*, 311:786–787
- 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
- Salganik, M. J. and Watts, D. J. (2007). Social influence, manipulation, and self-fulfilling prophecies in cultural markets. *Working paper*

10 Thresholds and cascades

- Gladwell, M. (1996). The tipping point. *The New Yorker*
- Watts (Chapter 8)
- Granovetter, M. (1978). Threshold models of collective behavior. *American Journal of Sociology*, 83(6):1420–1443
- Watts, D. J. (2002). A simple model of global cascades on random networks. *Proceedings of the National Academy of Sciences USA*, 99:5766–5771

11 Organizations

- Watts (Chapter 9)
- Dodds, P. S., Watts, D. J., and Sabel, C. F. (2003b). Information exchange and the robustness of organizational networks. *Proceedings of the National Academy of Sciences USA*, 100(21):12516–12521
- Cross, R., Liedtka, J., and Weiss, L. (2005). A practical guide to social networks. *Harvard Business Review*, pages 124–132
- Watts (Chapter 10 and 11)

12 Data collection

- Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology*, 16:435–463
- Bernard, H. R., Killworth, P. D., and Sailer, L. (1982). Informant accuracy in social-network data V. An experimental attempt to predict actual communication from recall data. *Social Science Research*, 11:30–66
- McCarty, C., Killworth, P. D., Bernard, H. R., Johnsen, E. C., and Shelley, G. A. (2001). Comparing two methods for estimating network size. *Human Organization*, 60(1):28–39

13 Friends of friends

- Feld, S. (1991). Why your friends have more friends than you do. *American Journal of Sociology*, 96(6):1464–1477
- Ball, P. (2003). Hub caps could cut vaccine costs. *Nature*, pages doi:10.1038/news031215–3
- Cohen, R., Havlin, S., and ben Avraham, D. (2003). Efficent immunization strategies for computer networks and populations. *Physical Review Letters*, 91(24):247901
- Newman, M. E. J. (2003). Ego-centered networks and the ripple effect. *Social Networks*, 25:83–95

14 Centrality and structural holes

- Freeman, L. C. (1978). Centrality in social networks: Conceptual clarification. *Social Networks*, 1:215–239
- Borgatti, S. P. (2005). Centrality and network flow. *Social Networks*, 27:55–71
- Chapters 1 and 2: Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition.* Havard University Press, Cambridge, MA
- Burt, R. S. (2004). Structural holes and good ideas. *American Journal of Sociology*, 110(2):349–399

15 Homophily

- 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
- Feld, S. L. (1982). Social structural determinants of similarity among associates. *American Sociological Review*, 47:797–801
- Segal, M. W. (1974). Alphabet and attraction: An unobtrusive measure of the effect of propinquity in a field setting. *Journal of Personality and Social Psychology*, 30(5):654–657

16 Strength of weak ties

- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6):1360–1380
- Yakubovich, V. (2005). Weak ties, information, and influence: How workers find jobs in a local Russian labor market. *American Sociological Review*, 70:408–421
- Bian, Y. (1997). Bringing strong ties back in: Indirect ties, network bridges, and job searches in China. *American Sociological Review*, 62(3):366–385

Further reading:
Granovetter, M. (1983). The strength of weak ties: A network theory revisited. *Sociological Theory*, 1:210–233
Granovetter, M. (1995). *Getting a Job: A Study of Contacts and Careers.* University of Chicago

Press, Chicago, 2nd edition

17 Visualizing network data

- Freeman, L. C. (2000). Visualizing social networks. *Journal of Social Structure*, 1(1)
- McGrath, C., Blythe, J., and Karckhardt, D. (1997). The effect of spatial arrangement on judgements and errors in interpreting graphs. *Social Networks*, 19:223–242

18 Sampling

- Granovetter, M. (1976). Network sampling: Some first steps. *American Journal of Sociology*, 81(6):1287–1303
- Salganik, M. J. and Heckathorn, D. D. (2004). Sampling and estimation in hidden populations using respondent-driven sampling. *Sociological Methodology*, 34:193–239

19 In-class exam

20-24 Putting it all together: Empirical applications

Now we have all the theoretical and technical tools we need to begin to use social network thinking to understand the world. In the remaining classes, students will take turns presenting research articles. The presentations should describe:

1. the question or problem that the article addresses
2. the data that the authors use and how it was collected
3. the way that the authors use the data to address the question of interest
4. the conclusions of the paper
5. limitations or weaknesses of the paper

Here are some suggested articles for presentation. If you would prefer to present another article, please see the instructor for permission.

- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Adminstrative Science Quarterly*, 42(1):35–67
- DiMaggio, P. and Louch, H. (1998). Socially embedded consumer transactions: For what kind of purchases do people most often use networks? *American Sociological Review*, 63(5):619–637
- Baker, W. E. and Faulkner, R. R. (1993). The social organization of conspiracy: Illegal networks in the heavy electrical equipment industry. *American Sociological Review*, 58(6):837–860
- Uzzi, B. and Spiro, J. (2005). Collaboration and creativity: The small world problem. *American Journal of Sociology*, 111(2):447–504

- Pedgett, J. F. and Ansell, C. K. (1993). Robust action and the rise of the Medici, 1400-1434. *American Journal of Sociology*, 98(6):1259–1319
- Bearman, P. S., Moody, J., and Stovel, K. (2004). Chains of affection: The structure of adolescent romantic and sexual networks. *American Journal of Sociology*, 110(1):44–91
- Klovdahl, A. S., Potterat, J. J., Woodhouse, D. E., Muth, J. B., Muth, S. Q., and Darrow, W. W. (1994). Social networks and infectious disease: The Colorado Springs study. *Social Science and Medicine*, 38(1):79–88
- Coleman, J., Katz, E., and Menzel, H. (1957). The diffusion of an innovation among physicians. *Sociometry*, 20(4):253–270
- Holme, P., Edling, C. R., and Liljeros, F. (2004). Structure and time evolution of an Internet dating community. *Social Networks*, 26:155–174
- Gould, R. V. (1991). Multiple networks and mobilization in the Paris Commune, 1871. *American Journal of Sociology*, 56(6):716–729
- Gould, R. V. (1989). Power and social structure in community elites. *Social Forces*, 68(2):531–552
- Brown, J. J. and Reingen, P. H. (1987). Social ties and word-of-mouth referral behavior. *Journal of Consumer Research*, 14(3):350–362
- . . . and your suggestions.