

# Network Analysis: A First Course

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## Course Description

Social network analysis focuses on relationships between social entities. It is used widely in the social and behavioral sciences, as well as in political science, economics, organizational science, and industrial engineering. The social network perspective, which will be taught in this workshop, has been developed over the last sixty years by researchers in psychology, sociology, and anthropology. The social network paradigm is gaining recognition and standing in the general social and behavioral science communities as the theoretical basis for examining social structures. This basis has been clearly defined by many theorists, and the paradigm convincingly applied to important substantive problems. However, the paradigm requires a new and different set of concepts and analytic tools, beyond those provided by standard quantitative (particularly, statistical) methods.

This workshop, which has been taught in this format since the mid-1980's, focuses on precisely those concepts and tools. This five day workshop will present an introduction to various concepts, methods, and applications of social network analysis drawn from the social, and behavioral sciences. The primary focus of these methods is the analysis of relational data measured on groups of social actors. Topics to be discussed include an introduction to graph theory and the use of directed graphs to study structural theories of actor interrelations; structural and locational properties of actors, such as centrality, prestige, and prominence; subgroups and cliques; equivalence of actors, including structural equivalence, blockmodels, and an introduction to role algebras; an introduction to local analyses, including dyadic and triad analysis; and a brief introduction statistical global analyses, using models such as  $p_1$ ,  $p^*$ , and their relatives. Brief introductions will be given to common networks software packages: *UCInet*, *Pajek*, *relevant R libraries*, and *pnet* (if time permits). This is a workshop designed for people more interested in learning methodology than theory (we assume that you have a basic knowledge of network theory). It assumes a familiarity with matrix algebra and statistics. Because this workshop is the first of a two-workshop package, we intend to extend the topics covered in the first workshop during the second workshop.

## Schedule

The workshop will meet for about eight hours each day with a 75 minute break for lunch, according to the following schedule (times are approximate and may change a little)

Time	Activity
8:30-Noon	Lecture (Green, Wasserman)
Noon-1:15	Lunch
1:15-5:00	Lecture and Lab (Horta, Green)
5:00-6:00	Discussion (Green, Wasserman, Horta)

Normally, ICPSR holds a reception for us on the first afternoon after class. On Thursday evening we will organize an outing to a local pub for socializing.

**If you would like to schedule time to talk to the instructors about your own data or projects, please talk to us early in the week.**

### **Course texts**

There are two particularly helpful texts for this class. The Wasserman & Faust text will be primary.

Wasserman, S., and Faust, K. (1994). *Social Network Analysis: Methods and Applications*. Cambridge, ENG and New York: Cambridge University Press.

Carrington, P., Scott, J, and Wasserman, S. (2004). *Models and Methods for Social Network Analysis*. New York: Cambridge University Press.

Additionally, you may find the following texts helpful:

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

Knoke, D., and Yang, S. (2007). *Social Network Analysis*, Second Edition. Newbury Park, CA

Monge, P., and Contractor, N. (2003). *Theories of Communication Networks*. New York: Oxford University Press.

Newman, M.D. (2010). *Networks*. New York: Oxford University Press.

Prell, C. (2012). *Social Network Analysis: History, Theory, and Methodology*. Newbury Park, CA: Sage.

Wasserman, S., and Galaskiewicz, J. (1994). *Advances in Social Network Analysis: Research from the Social and Behavioral Sciences*. Newbury Park, CA: Sage.

There are some other, newer books on networks, that we will talk about during the week (but which your instructors are not quite familiar with yet).

**Topics to be taught** from Wasserman and Faust include:

Chapter 1: Introduction

Chapter 2: Social Network Data: Collection and Applications

Chapter 3: Notation for Social Network Data

Chapter 4: Graphs and Matrices

Chapter 5: Centrality, Prestige, Prominence, and Related Concepts

Chapter 7: Cohesive Subgroups

Chapter 9: Structural Equivalence

Chapter 10: Blockmodels

Chapter 13: Dyads

Chapter 15: Statistical Analysis of Single Relational Networks

These chapters will be augmented with readings from Carrington, Scott, and Wasserman, especially Chapters 8-10.

**Please review chapters 1-4 of Wasserman and Faust before you arrive in Ann Arbor. We will zip through this intro/beginning material, and it would be good if you had a head start.**

### **Computer Programs**

We will introduce a number of different social network analysis computer programs. All of these are available in the computer labs. All but UCINET are freely available on the web. However, we will focus primarily on analysis of data in R with relevant R libraries.

- UCINET, available in computer labs and for purchase from Analytic Technologies: <http://www.analytictech.com>
- Pajek: <http://pajek.imfm.si/doku.php?id=download>
- Netdraw, comes with the UCINET package or individually at: <http://www.analytictech.com>
- STOCNET: <http://stat.gamma.rug.nl/stocnet/> (see also <http://stat.gamma.rug.nl/snijders/siena.html>)
- pnet: <http://www.sna.unimelb.edu.au/pnet/pnet.html>
- Network Workbench: <http://nwb.slis.indiana.edu/download.html>

### **Other Resources**

These are some particularly useful resources on social networks available online.

The International Network for Social Network Analysis (INSNA) is the international and interdisciplinary professional association for people interested in social network research. Its website (<http://insna.org>) is a wonderful source of information and resources on social networks, including links to many informative sites and to social network computer programs and data.

The listserv, SOCNET, is the main on-line forum for discussion of current topics on social networks. Information on how to join is available through the INSNA site (see above) or at: <http://www.insna.org/pubs/socnet.html>

*Connections* is INSNA's newsletter/ informal journal. It is available through the INSNA website or directly at: <http://www.insna.org/pubs/connections/index.html>

*Journal of Social Structure* is a peer-reviewed online journal with many articles of interest to social network researchers. <http://www.cmu.edu/joss/>

Complexity and Social Networks Blog (<http://www.iq.harvard.edu/blog/netgov/>) is a new "on-line journal" devoted to network analysis.

Steve Borgatti's web page is a nice source of introductory material and handouts on various topics on social networks. <http://www.analytictech.com/networks/>

Data examples from Wasserman and Faust are available at the INSNA website.