Network Analysis I: Introduction*
1-3pm, June 20 – July 15, 2016

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Course Description & Aims

"[A]s usually practiced, using random sampling of individuals, the survey is a sociological meatgrinder, tearing the individual from his social context and guaranteeing that nobody in the study interacts with anyone else in it…If our aim is to understand people's behavior rather than simply to record it, we want to know about primary groups, neighborhoods, organizations, social circles, and communities; about interaction, communication, role expectations and social control." (Allen Barton 1968)

This course lays the groundwork of social network analysis (SNA) from a conceptual, mathematical and computational perspective. SNA differs from other analytic perspectives in requirements for data collection, storage, and descriptive/statistical analyses. The course will address these by sampling from the most commonly used classes of analytic concepts, demonstrating for each their implementation in primary data collection efforts, empirical basis and computational implementation (in R).

We will address these concepts around two organizing principles: (1) the two primary theoretical frameworks capturing reasons networks “matter”; and (2) how each class of measures can be applied across different units of analysis: individuals, groups and “whole” networks. While by no means exhaustive, this course will develop students’ beginning toolkit for SNA. SNA is a rapidly advancing field, and these tools are intended to provide the orienting frameworks that can guide further study of SNA on your own.

Objectives

By the end of the course, participants will be able to:
- **Understand** the primary theoretical & analytic frameworks that underpin SNA;
- **Transform** between the primary strategies for gathering & storing social network data;
- **Compute & interpret** several primary classes of measures, for varying analytic levels;
- **Describe & visualize** some of the most common patterns in empirical networks;
- **Run** descriptive & statistical analyses (in R) to identify these patterns in real data.

* This course benefited from syllabi/materials for similar courses taught by Jim Moody (Duke), Ryan Light (Oregon), David Schaefer (Arizona State), Omar Lizardo (Notre Dame), Ann Mcranie and Bernice Pescosolido (Indiana), and from students who participated in previous iterations at Arizona State, American University, Columbia’s EPIC program, and the University of Texas Health Sciences Center. I gratefully acknowledge their influence in developing the course.
Readings
There is no assigned textbook for this class. The recommended readings will all be provided in the course Dropbox (http://bit.ly/ICPSR_SNA). If you’d like a more in-depth treatment, there are numerous "overview" books available from a variety of perspectives on SNA. Several I recommend, in approximately descending order of their fit for purposes of our course:

- Borgatti SP, Everett MG, Johnson JC. 2013. *Analyzing Social Networks*. SAGE.
- Valente, TW. 2010. *Social Networks and Health: Models, Methods and Applications*. Oxford University Press.

Software, Prerequisites & Tutorials
All computational aspects of this course will be conducted in R. No formal statistical training or prior experience with R is assumed. However, students' prior familiarity with statistical and computing principles will enhance the course experience, easing the extension of coursework to your own research. Each course module's presentation will conceptually build only from prior material covered in this course. Code templates will be provided for the measurement and computation of each of the introduced concepts. All slides, scripts and data will be posted to dropbox (http://bit.ly/ICPSR_SNA). Participants should bring a computer for personal use (Windows, Mac or Linux), with R previously installed. We will use a number of R packages, which will require that you have privileges on your machine that allow you to install programs/applications. If this is not possible, please contact me in advance for a complete list of the packages you should be sure to have pre-installed.

Assignments & Grading
There are four short assignments involved in this course. Each assignment will count 25% of your final grade. Your assignments should be submitted by midnight on the days listed below. If you are not taking the course for credit, you can choose to submit some, all, or none of the assignments. You will be provided an answer key for each assignment when they are returned. I encourage you to work with each other to complete your lab work, but any assignments you submit for grading should be your own.
Tentative Course Schedule

Please note that this is subject to change; any changes will be announced in class AND posted to Dropbox. There is no class meeting on the first day of the session (June 20) or July 4th. For many days’ topics I have provided 2 readings for you to choose from – one more conceptually focused (if you prefer the mathematical and theoretical derivations of ideas), one more empirically oriented (for those of you who prefer to see ideas “in action” to make sense of them). ONE of these readings should be SKIMMED before the corresponding class. I will provide a separate list of additional recommended readings for further details about each idea presented.

**WEEK 1**

**21 June – 1. Introduction, Terminology & Matrices**

**Reading**

**22 June – 2. Theoretical Frameworks**

**Reading**

**23 June – 3. Network Visualization**

**Readings**

**Tutorial**
- Graph Visualization

**Homework**
- Graph Visualization – DUE 28 June

**24 June – 4. Ego Network Composition**

**Readings**

**Tutorial**
- Graph Visualization

**WEEK 2**

**27 June – 5. Small Worlds**

**Readings**

**Tutorial**
- Distance
28 June – 6. Social Balance

Readings

Tutorial
- Social Balance

Homework
- Dyad & Triad Census – DUE 1 July

29 June – 7. Collecting Network Data

Readings

30 June – 8. Centralities

Readings

Tutorial
- Centralities

1 July – 0. Catchup & Misc. Topics

Readings
- NONE

Tutorial
- Continuation as needed

Homework
- Centralities – DUE 8 July

WEEK 3

5 July – 9. Equivalence

Readings

Tutorial
- Blockmodeling
6 July – 10. Cohesion & Communities/Clustering

Readings

Tutorial
- Subgraph Cohesion

7 June – 0. Devoted Tutorial Time

Readings
- NONE

Tutorial
- Community Detection

Homework
- Communities – DUE 12 July

8 July – 11. Network Dynamics

Readings

Tutorial
- TBD

WEEK 4

11 July – 12. Diffusion & Influence

Readings

Tutorial
- Stochastic & Threshold Diffusion

12 July – 13. Permutation Tests

Readings

Tutorial
- TBD
13 July – 13. Exponential Random Graph Models

Readings


Tutorial

- ERGMs (as time permits)

14 July – 0. Devoted Tutorial Time

Readings

- NONE

Tutorial

- ERGMs cont’d

15 July – 14. Stochastic Actor Based Models

Readings