LIS590NA: Network Analysis, Fall 2013

Time: Fridays 1:00-03:50pm
Location: 131 LISB
Instructor: Jana Diesner
               http://people.lis.illinois.edu/~jdiesner/
Contact: Email: jdiesner@illinois.edu,
               Phone: 412 519 7576,
               skype: janadiesner
Office Hours: LIS 229, TR 3-5pm
Course Units: 4 GR hours. Open to graduate students
               campus wide

© Randy Glasbergen
glasbergen.com

"If you didn't have Facebook when you were a kid, how did you know who your friends were?"

1. Short Description

Network Analysis has become a widely adopted approach for studying the interactions between agents, information and infrastructures. The strong demand for comprehensive expertise and skills in network analysis has been fueled by the widespread acknowledgement that everything is connected, the popularity of social networking services, and advances in computational solutions for collecting, visualizing and analyzing network data.

Realizing that networks are ubiquitous and impact society and ecosystems on many dimensions, people across domains and sectors have been using the networks perspective to address questions such as: How does information emerge, spread and vanish in society and online? What do the properties, functioning and dynamics of networks imply for constructing and managing teams and organizations, gaining access to information, resources and power, fostering innovation, and protecting critical infrastructures and individual reputation? Students in LIS590NA learn how to answer these questions.

This interdisciplinary course introduces students to fundamental theories, concepts, methods and applications of network analysis. We will focus on social, socio-technical and information networks. Students learn how to approach network analysis in an informed, systematic and analytically rigorous fashion. At the end of the course, students will be able to design, manage and execute network analysis projects for scholarly and commercial use, and to critically assess network studies.

2. Learning Objectives

Completing this course and its requirements should enable you to:
- Understand the fundamental concepts and theories about networks.
- Apply this knowledge to solve real-world, network-centric problems.
- Use advanced network analysis methods and tools to visualize and analyze networks. Interpret the results with respect to exploratory, quantitative and substantive questions.
- Design and execute a small-scale network analysis project in a systematic fashion.

3. Materials

Textbook (required):

- Stanley Wasserman, Katherine Faust (1994) Social Network Analysis: Methods and Applications. Cambridge University Press.
- David Easley and Jon Kleinberg (2010) Networks, Crowds, and Markets: Reasoning About a Highly Connected World. Cambridge University Press.
  URL: http://www.cs.cornell.edu/home/kleinber/networks-book/

Textbook (recommended):

- Derek Hansen, Ben Shneiderman, Marc A. Smith (2010) Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Morgan Kaufmann.

Other readings (required and optional) will be provided as needed.

Software: We will use several software products for data collection and analysis. These tools are free for use. We will provide training for these tools in class.

4. Prerequisites

This is an interdisciplinary graduate course for students campus wide. The course is designed to benefit from the participation of students from any department or program. There are no formal prerequisites. No specific numerical, technical or programming skills are required. Students are expected to be willing to hone their skills in computational thinking.

5. Course Requirements

1. **Attendance and Participation:** You are expected to attend and participate in all class sessions. You are invited to initiate or engage in discussions on Moodle (post them to the "Open discussion" section) and to post information on Moodle.
2. **Reading and Discussions:** Readings are posted on Moodle. You are expected to read the material for each session and be prepared to discuss it in class. This requirement is tested as part of participation, homework assignments, and the test.
3. **Homework:** There will be 5 problem sets. You are expected to complete them on your own.
4. **Test:** Open books and open notes test on everything covered up to this date.
5. **Project:** Every student will conduct a network analysis research project. The learning goal with this project is to put the knowledge gained in this class into action and to provide you with practical research experience in this domain. The instructor will provide you with guidance and advice throughout this process. The project can be self-defined – alternatively we have a selection of projects available.

6. Evaluation and grading policy

Deliverable	Grade
Attendance and participation	10%
Homework assignments	50%
Test	15%
Project	25%

7. Course policies and expectations

You can expect me to provide you with feedback on any deliverable, to answer your emails within 24 hours, and to point you to further learning resources if you are interested.

To submit a deliverable, email it to me, put it into my mailbox, or slip it under my door. Petition for late submissions need to occur at a minimum of three days prior to the due date. Lateness for turning in any item will reduce the grade by 33% for each 24 hour period late.

Plagiarism and cheating are not tolerated in this course. Plagiarism means using words, ideas, or arguments from other people or sources without citation. To prevent plagiarism, cite all sources consulted to any extent (including material from the internet). Four or more words used in sequence must be set off in quotation marks, with the source identified. Cheating means copying answers from other people or sources, or providing someone with such information.

You are expected to be familiar with and to follow the UIUC Student Code in all matters related to this course (http://admin.illinois.edu/policy/code/Full_Code_web2012.pdf). Specifically I call your attention to Part 4, "Academic Integrity" (http://admin.illinois.edu/policy/code/article1_part4_1-401.html) and to Section 1‑401 (b), which states: "Students have been given notice of this rule by virtue of its publication. Regardless of whether a student has actually read this rule, a student is charged with knowledge of it..."

8. Course Schedule

The most up to date syllabus and set of readings and deliverables is available on Moodle.

Session	Date	Theme	Concepts	Deliverables
1	08/30	Course overview Introduction to network analysis Network analysis process Data and Tools Network visualization	Graphs, matrices, nodes, edges, modality	
2	09/06	Basic network metrics	Connectivity, cohesion, power, prestige, centrality	
3	09/13	Lab: NodeXL Training		HW 1 out
4	09/20	Models of network evolution	Random graphs, power laws, small world network	

		Network Topologies Lab: Agent based modeling and simulation		
5	09/27	Network Topologies and Social Interaction Grouping	Clustering, community detection	HW 1 due, HW 2 out
6	10/04	Embedding, Closure	Strong and weak ties, bridging, homophily, social capital, structural holes	Project proposal due
7	10/11	Balance, Triads, Transitivity		HW 2 due, HW 3 out
7	10/18	Lab: NodeXL Training		
8	10/25	Roles and Positions	Equivalence, blockmodels	HW 3 due, HW 4 out
9	11/01	Diffusion	Spread of information, innovation, diseases and rumors, percolation	
10	11/08	Exponential Random Graph Models	ERGMs	HW 4 due, HW 5 out
11	11/15	Online social networks		Project update due
12	11/29	Thanksgiving break. Call it a break if you can.		
13	12/06	Review		HW5 due
14	12/13	Project presentation		Project report due

Details on project:

Teams: You are welcome to work in self-defined teams of two to three people. PhD students conducting a project related to their research can work on their own.

Process: You will be introduced to the network analysis process early in class. The deliverables for the project are aligned with the steps of this process.

Data: You can analyze existing network data, generate network data or use your network dataset. Collecting network data as part of this project might be very time consuming. Consult with the instructor if you have questions about this point.

Report: Write up your work and findings in the form of a research report. Your report should be between 8 and 20 pages (12 pt font, margin 1 inch on all sides, 1.5 line spacing). You will receive feedback on each deliverable. Structure your report as specified in the Appendix of this document.

Appendix

Report structure and evaluation

1. Title
2. Name(s) of author(s).
3. Abstract
   a. 250-350 words.
   b. Motivate and state your research question.
   c. Focus on what you have learned (key findings).
4. Introduction
   a. Why does your research question matter?
5. Background
   a. Discuss and synthesize prior work such that you identify a gap in prior research, a conflict between prior results or a lack of knowledge with respect to understanding networks. Start by drawing from the course readings and expand with additional readings.
6. Data
   a. Describe the dataset you use. This description should include:
      i. How the data was collected (by who, from whom, when, what methods).
      ii. Size.
      iii. Reliability.
      iv. Limitations.
7. Method
   a. How do you analyze the data (unit of analysis, network metrics, etc.).
8. Results
   a. Describe your findings. Add in figures, tables and visualizations as needed.
9. Conclusions
   a. Interpret your findings with respect to your research question.
   b. What new knowledge was gained from this study?
   c. How can your findings be expected to generalize?
   d. For whom might your findings be relevant, who can use the knowledge you have gained?
10. Limitations and Future Work
   a. State all limitations that apply to the data, methods and results.
   b. How could your work be extended and why would that be useful?
11. References

Schedule of project deliverables:

Date	Deliverable	What to write up/ prepare	Grading criteria
Oct 4	Project proposal: Oct 4 in class, Oct 11 in written form (10 pts)	1-2 pages: - Team (2.) - Project idea/ research question (4.) - Rough draft of background section (5.)	Content: - Synthesis of relevant background work (substantive question or quantitative problem) - Identify an interesting network-centric research question - Understand your dataset (how it was

		- Data section (6.)	collected, properties, limitations) Writing (same criteria apply to all writing deliverables for the report): - Clarity (flow, transitions, consistent use of terminology) - Coherence and logic
Nov 15	Project progress report (30 pts)	Additional 2-4 pages: - Update on previous sections if applicable and based on feedback - Methods section (7.), incl: - Data analysis: strategy and operationalization - Preliminary results (8.)	Content: - Demonstrate ability to select and apply a network analysis method (qualitative, quantitative, metrics, etc.) that is appropriate and feasible given the research question, dataset and scope of the project.
Dec 13	- 12/13: In-class project presentation (20 points)	- Presentation: poster or slides	In-class project presentation: - Every team member is able to present - Respond to questions from class and instructor
Dec 15	- 12/15: Final project report (40 points)	- Final report (1. – 11.)	Report: - Update on previous sections if applicable and based on feedback All sections completed (1.-11.)