Term Information

Effective Term	Spring 2019

General Information

Course Bulletin Listing/Subject Area	Political Science
Fiscal Unit/Academic Org	Political Science - D0755
College/Academic Group	Arts and Sciences
Level/Career	Graduate
Course Number/Catalog	7560
Course Title	Inferential Network Analysis
Transcript Abbreviation	Inferentl Netwrk
Course Description	This course presents inferential statistical models for network data in detail. The course will integrate theoretical discussions with practical examples and software code to perform analyses.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	
Electronically Enforced	Yes

Cross-Listings

Cross-Listings	

Subject/CIP Code

Subject/CIP Code	45.1001
Subsidy Level	Doctoral Course
Intended Rank	Masters, Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students will learn models for statistical inference with networks based on the exponential random graph model and those based on the latent space network model,
- Students will learn models for statistical inference with networks based on the latent space network model.

Content Topic List

- Descriptives and partitioning
- Visualization
- Dependence and indepedence
- Exceptional random graph models
- Latent space model

Sought Concurrence

No

Attachments

- syllabus POLITSC 7560.pdf: POLITSC 7560 Syllabus

  (Syllabus. Owner: Smith,Charles William)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Smith,Charles William	06/20/2018 08:40 AM	Submitted for Approval
Approved	Herrmann,Richard Karl	06/20/2018 09:21 AM	Unit Approval
Approved	Haddad,Deborah Moore	06/20/2018 09:50 AM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	06/20/2018 09:50 AM	ASCCAO Approval

Syllabus
POLTISC 7560 Inferential Network Analysis
Spring (2019)

Professor: Skyler Cranmer
Office: 2032 Derby Hall
Email: cranmer.12@osu.edu
Office Hours: Wednesdays 0900-1100
Meeting Place & Time: Room: Derby 2075. Thu: 1400-1645
Course Web Site: Carmen

Rationale and Scope

This course aims to present inferential statistical models for network data in detail. The course will integrate theoretical discussions with practical examples and software code to perform analyses.

Just like any other area of statistics, network analytic procedures can be divided into two categories – descriptive and inferential. This course assumes you are familiar with the basics of network analysis (e.g. measures of centrality, methods of visualization, community detection, etc....) and begins where an intro course (e.g. Prof. Bond's) ends. Methods of descriptive network analysis, like you learned in your first course, are suitable for many worthwhile research pursuits, but are inadequate for research problems that demand precise hypothesis testing with network data, or stochastic simulation of network processes. Within the last 20 years, methodological research on inferential network analysis has seen several groundbreaking innovations in model formulation/specification and computation. We will cover the most important of these innovations theoretically, and then get practical experience working with their implementations in open source software. We will cover two general classes of models for statistical inference with networks, those based on the the exponential random graph model and those based on the latent space network model, where, for each, we will cover several useful extensions (e.g. to longitudinally observed networks, valued-edged networks, etc...).

Lastly, this course will be (largely) in a flipped format, where you receive lectures online at home and come to class or a seminar discussion. The seminar time will be largely dedicated to helping you with your problem sets and preparation for the paper. Expect to update the class several times during the semester regarding your paper progress.

Prerequisites

The course also assumes a working knowledge of non-network based statistics as well as concepts required for that (e.g. calculus and linear algebra).

Evaluation

Your final grade will be based on several problem sets (40%) throughout the semester (many of which will be designed to help you along with your final paper), a final paper in which you produce a high quality manuscript (e.g. one that could eventually be published) using the techniques we cover (40%), and the presentation of this paper to the class and a general audience (20%). You should complete the scheduled reading *before the class listed!*

Course Norms

- Speak up when you have a question.
- Teamwork and collaboration is *highly encouraged* on every aspect of the course. However, everyone must write out their own homework (no group submissions or just changing the name) and list who they worked with, and you are not allowed to divvy up the problems such that one person does one problem an another the next. You are even allowed to collaborate on the final paper if you like (max 2 authors and both get the same grade regardless of real or perceived contributions).
- *All* homework assignments must be written in LaTeX. Assignments not written in LaTeX (or `sweave` if you want to be really fancy) will be returned without a grade.

Texts

There is no good text for this course, which is why my collaborators and I are writing one. I will distribute detailed lecture notes / chapter drafts via Carmen and these notes will, eventually, be transformed into a proper book on the subject.

Tentative Schedule

Part 1. Basics of Networks
Some tweaking of this is basically inevitable. This is a rough guide, not a strict schedule.

Week 1 (January 12) **Introduction and the Basics of Networks**

Week 2 (January 19) **Descriptives and Partitioning**

Week 3 (January 26) **Visualization**

Part 1. Dependence and Interdependence

Week 4 (February 2) **The problem of inference with network data** *This lecture focuses specifically on why network data require tools outside of traditional regression analysis in order to conduct statistical inference. Specifically: the problem of dependence and interdependence of observations.*

Week 5 (February 9) **Detecting and Diagnosing Network Dependencies** *This lecture focuses on showing the reader how to detect the presence of complex dependencies (e.g. violations of independence assumptions).*

Part 2. The Family of Exponential Random Graph Models (ERGMs)

Week 6 (February 16) **The basic ERGM** *This section lays the theoretical groundwork for the introduction of the ERGM. Local emergence, self-organization, and the role of network topology.*

Week 7 (February 23) **Endogenous Dependencies** *This lecture focuses on the exposition of the (very) many endogenous dependence structures that may be included in an ERGM. All discussions will proceed theoretically, mathematically, and present simulation studies of the behavior of each of these statistics.*

Week 8 (March 2) **Estimation and Degeneracy** *This lecture examines the estimation of ERG models in detail. This is more important in the context of ERGMs than for, say, regression analysis because many of the challenges with ERG modeling stem from difficulties in estimation.*

Week 9 (March 9) **Prof. Giving workshop. No class.**

Week 10 (March 16) **Spring break, no class.**

Week 11 (March 23) **ERG Type Models for Longitudinally Observed Networks** *Many substantively interesting network are not observed only once, but recur and are observed longitudinally. This lecture focuses on explicating extensions to the ERGM that allows the researcher to model longitudinally observed networks.*

Week 12 (March 30) **Modeling Vertex Attributes/Behavior with ERG-Class Models** *This lecture is dedicated to a careful discussion and exposition of how to model vertex attributes concurrently with network relations.*

Week 13 (April 6) **Valued-Edge ERGMs: the generalized ERGM (GERGM)** *A general model for the ERGM-like analysis of networks with valued ties.*

Part 3. Latent Space Network Models

Week 14 (April 13) **The Basic Latent Space Model**

Week 15 (April 20) **Presentation of research papers**