Political Networks

PLSC 508
Spring 2020
Time: Monday, 9:00am–12:00pm
Location: 160 Willard
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Office Hours: Tuesday, 3–4, Wednesday 2–3 & by appointment
Office Location: 231 Pond Lab

Course Overview: A network is a set of relationships among units. The study of networks in political science, the social sciences, and beyond has grown rapidly in recent years. This course is a comprehensive introduction to methods for analyzing network data. We will cover network data collection and management, the formulation and expression of network theory, network visualization and description; and methods for the statistical analysis of networks. The course will make extensive use of real-world applications and students will gain a thorough background in the use of network analytic software. Most of the applications discussed will be drawn from political science and sociology, but this course will be relevant to anyone interested in the study of network data.

Course Objectives: The broad objectives in this course are that students will develop:

1. Fluency in the language of networks analysis; an in-depth understanding of the concepts that have proven most useful in the study of networks.
2. Awareness regarding how theory and hypotheses for networks are structured.
3. Command of network analysis software.
4. Understanding of how to explore and describe network data.
5. The ability to statistically model network data and formally test hypotheses about networks.
6. Practical experience in conducting research with network data.

Books: Students are not required to purchase any books for this course. However, all three of the following books make excellent references for network analysts.

1. Newman (2010)
2. Wasserman and Faust (1997)
3. Lusher, Koskinen and Robins (2012)

Prerequisites: This course will be accessible to students without prior training in quantitative research methods. However, students with background in basic descriptive and inferential statistics will likely get more out of the course than those who need to fill in the gaps along the way. Understanding of descriptive statistics, hypothesis testing, regression analysis, and some experience with a scripting-based statistical software will accelerate comprehension of the material.

Computing: All computing will be conducted in the `R` statistical software. We will use add-on packages, mostly from the `statnet` suite - `http://csde.washington.edu/statnet/`. It is strongly advised that students download `R` onto a laptop and bring the laptop to class every week. The course will include an introduction to `R` for those unfamiliar with the software and we will regularly walk through applications during class.

Problem Sets: There will be at least one problem set covering each of the top-level topics listed in the course schedule. Problem sets are worth 40% of the final grade.

Methods Tutorial: Each student will be responsible for presenting a detailed tutorial of one of the methods covered in the class. Worth 20% of grade.

Application Review: Each student will be responsible for writing a review of, and leading discussion for, one of the application papers. Worth 10% of grade.

Replication and Extension: Students are required to complete an original research paper. The paper should include the replication of results from at least one published study. The research paper and presentation is worth 30% of the final grade.

Grading Scale.

Grade	Lower	Upper
A	93	101
A-	90	93
B+	88	90
B	82	88
B-	80	82
C+	78	80
C	72	78
C-	70	72
D+	68	70
D	62	68
D-	60	62
F	0	60

Course Schedule: The schedule below gives the required reading. The readings listed for a particular day should be read before class time that day. The full citations for the readings can be found below in the references section.

1. **Section One:** Introduction to network data, network analysis and `R`

   1/13: Introduction to Network terminology and Network Data
   - Wasserman and Faust (1997) Chs. 1 – 2
   - Applications
     * Ward, Stovel and Sacks (2011)
     * Patty and Penn (2017)

   1/27: Making and Visualizing Networks with `R`
   - Complete this tutorial – `http://www.cyclismo.org/tutorial/R/input.html`
   - Butts (2008)
   - Fruchterman and Reingold (1991)
   - Applications
     * Wilson, Davis and Murdie (2016)
     * Montoya (2008)

2. **Section Two:** Measures of network structure

   2/3: Centrality

- Borgatti and Everett (2006)
- Applications
  - Gray and Potter (2012)
  - Ingold and Varone (2011)

2/10: Reciprocity

- Garlaschelli and Loffredo (2004)
- Applications
  - Christopoulos and Quaglia (2009)

2/17: Popularity

- Barabási and Albert (1999)
- Applications
  - McNutt (2006)
  - Carpenter (2007)

2/24: Transitivity

- Holland and Leinhardt (1971)
- Applications
  - Tam Cho and Fowler (2010)
  - Beyers and Braun (2014)

3/2: Assortative Mixing

- Newman (2003)
- Applications
  - Barberá (2015)
  - Settle and Carlson (2019)

3. **Section Three:** Statistical Inference with Networks

3/23: Quadratic Assignment Procedure

- Dekker, Krackhardt and Snijders (2007)
- Applications
  - Adam, Antl-Wittenberg, Eugster, Leidecker-Sandmann, Maier and Schmidt (2017)
  - Grossmann and Dominguez (2009)

3/30: Latent Space Modeling
- Krivitsky and Handcock (2008)
- Minhas, Hoff and Ward (2019)
- Applications
  * Dorff, Gallop and Minhas (0)
  * Almquist and Bagozzi (2016)

4/06: ERGM Introduction
- Wasserman and Pattison (1996)
- Applications
  * Bratton and Rouse (2011)
  * Duque (2018)

4/13: ERGM Specification
- Hunter and Handcock (2012)
- Applications
  * Song (2014)
  * Box-Steffensmeier and Christenson (2014)

4. **Section Four:** Causality and Networks

4/20 (climate crossover): Confounding of Selection and Influence
- Shalizi and Thomas (2011)
- Leenders (2002)
- Applications
  * Paterson, Hoffmann, Betsill and Bernstein (2014)
  * Kammerer and Namhata (2018)

4/27: Causal inference with interference
- Bowers, Fredrickson and Panagopoulos (2013)
- Applications
  * Phadke and Desmarais (2019)

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In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines (http://equity.psu.edu/sdr/guidelines). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

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Counseling and Psychological Services at University Park (CAPS)
(http://studentaffairs.psu.edu/counseling/): 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses
(http://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/)

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400 Crisis Text Line (24 hours/7

days/week): Text LIONS to 741741

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References

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