Charles University
Faculty of Social Sciences
Department of Security Studies

Introduction to Computational Social Science (JPM 915)

Summer semester 2017/2018

4 ECTS

Wednesday Feb 28, 9:30 – 11:00 & 12:30 – 14:00, room J2063
Thursday Mar 1, 9:30 – 11:00 & 12:30 – 14:00, room J2063
Friday Mar 2, 9:30 – 11:30, room J2063

Lecturer

Dr. Karsten Donnay (karsten.donnay@uni-konstanz.de)

Office hours

upon request

Course requirements

The students' performance in the course will be assessed based on these criteria:

- Submission of Research Design (90 %)
- Attendance/Activity (10 %)

Research Design

As part of the course, students are required to develop the concept for a research design using computational social science methodologies applied to a substantial topic of their choice. Initial ideas have to be presented in the last session of the course and a full 5 to 10-page research design has to be submitted 2 weeks after the course.

Attendance/Activity

All students are required to participate in each session. One unexcused absence will be tolerated, more absences will be considered on an individual basis.

Evaluation

General Grade	Grade Specification	Percentage
A - excellent	Excellent upper (1)	100 – 96
	Excellent lower (2)	95 - 91
B – very good	Very good upper (1)	90 - 86
	Very good lower (2)	85 – 81
C - good	Good upper (1)	80 – 76
	Good lower (2)	75 – 71
D - satisfactory	Satisfactory upper (1)	70 – 66
	Satisfactory lower (2)	65 – 61
E - sufficient	Sufficient upper (1)	60 - 56
	Sufficient lower (2)	55 - 51
F - fail		50 - 0

Course rules

The *Code of Study and Examination of Charles University in Prague* provides the general framework of study rules at the university. According to art. 6, par. 17 of this Code, "a student may not take any examination in any subject entered in his study plan more than three times, i.e. he shall have the right to two resit dates; no extraordinary resit date shall be permitted. (…) If a student fails to appear for an examination on the date for which he has enrolled without duly excusing himself, he shall not be marked; the provision of neither this nor of the first sentence shall constitute the right to arrange for a special examination date."

Any written assignment composed by the student shall be an original piece. The practices of plagiarism, defined by the Dean's Provision no. 18/2015, are seen as "a major violation of the rules of academic ethics" and "will be penalized in accordance with Disciplinarian Regulations of the faculty."

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Course description

This course introduces students to the field of computational social science. It covers four core research areas in the field: automated data extraction, social complexity, computational simulations and social network analysis. Each topic is first briefly introduced conceptually and then relevant foundational and applied research papers are discussed. Selected readings accompany each section and additional recommended readings are provided that allow students to delve deeper into selected topics. Where possible, relevant data and applications are illustrated with practical hands-on examples. The objective of the course is to familiarize students with quantitative approaches at the intersection of social science research and computational methodologies while reflecting on their strengths and limitations. As part of the seminar, students develop the concept for a research design using computational social science methodologies. The course is a conceptual introduction, no specific technical skills are required.

Aims of the course

After completing the course, students shall

- have a good conceptual understanding of key computational methodologies that can aid the quantitative study of substantive questions in social science
- judge the strengths and limitations of these approaches in addressing specific research questions
- be able to develop, at a conceptual level, research designs that entail the use of these approaches

Structure of the course

Day 1

Session 1: Introduction to Computational Social Science (90 min)

The introductory lesson will give a brief overview of the course, the formalities and then provides an introduction to the field of Computational Social Science and the use of novel quantitative methods in the study of social phenomena.

Readings:

Lazer, David, Alex Pentland, Lada Adamic, Sinan Aral, Albert-László Barabasi, Devon Brewer, Nicholas Christakis, Noshir Contractor, James Fowler, Myron Gutmann, Gary King, Michael Macy, Deb Roy and Marshall Van Alstyne. (2009). Computational Social Science. *Science* 323: 721–723.

Giles, Jim. (2012). Computational Social Science: Making the Links. *Nature* 488: 448– 450.

Session 2: Automated Data Extraction & Social Media Data (90 min)

One of the key applications of computational methodologies pertains to the automated collection of (online) data. This session first reviews classical approaches to systematic collection of relevant data from news media articles and political texts and its processing. It then covers recent approaches using the vast volume of data on human interactions on social media platforms.

Readings:

Grimmer, Justin and Brandon M. Stewart. (2013). Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts. *Political Analysis* 21(3): 267– 297.

Earl, Jennifer, Andrew Martin, John D. McCarthy and Sarah A. Soule. (2004). The Use of Newspaper Data in the Study of Collective Action. *Annual Review of Sociology* 30(1): 65–80.

Golder, Scott A., and Michael W. Macy. (2011). Diurnal and Seasonal Mood Vary with Work, Sleep, and Daylength Across Diverse Cultures. *Science* 333: 1878–1881.

Ruths, Derek, and Jürgen Pfeffer. (2014). Social Media for Large Studies of Behavior. *Science* 192: 59–60.

Day 2

Session 3: Social Complexity and Agent-Based Simulations (90 min)

The study of social complexity lies at the very foundation of early quantitative approaches to social science research. This session, first reviews key concepts of complexity and complex systems. It then turns to a discussion of how agent-based models can be used to capture complex endogenous dynamics in such systems, including recent approaches that go beyond abstract conceptual models and seed, calibrate and validate their simulations with empirical data.

Readings:

Epstein, Joshua M. (1999). Agent-Based Computational Models and Generative Social Science. *Complexity* 4(5): 41–60.

Miller, John H. and Scott E. Page. (2004). The Standing Ovation Problem. *Complexity* 9(5): 8–16.

Schelling, Thomas C. (1971). Dynamic Models of Segregation. *Journal of Mathematical Sociology* 1: 143–186.

Bhavnani, Ravi, Karsten Donnay, Dan Miodownik, Maayan Mor, and Dirk Helbing. (2014). Group Segregation and Urban Violence. *American Journal of Political Science* 58(1): 226–245.

Session 4: Social Network Analysis (90 min)

The study of social networks has a long tradition in the social sciences. Through the advent of social media platforms, much larger and more comprehensive data on social networks ties have become available that have revolutionized the way in which social network analysis can aid in the study of relevant social phenomena. This session first reviews the historical development of the field and then discusses recent approaches and quantitative studies.

Readings:

Lazer, David. (2011). Networks in Political Science: Back to the Future. *PS: Political Science & Politics* 44(1): 61–68.

Conover, Michael D., Jacob Ratkiewicz, Matthew Francisco, Bruno Goncalves, Alessandro Flammini and Filippo Menczer. (2011). Political Polarization on Twitter. *Proceedings of the Fifth International AAAI Conference on Weblogs and Social Media*, p. 89–96.

Coppock, Alexander, Andrew Guess and John Ternovski. (2016). When Treatments are Tweets: A Network Mobilization Experiment over Twitter. *Political Behavior* 38(1): 105–128.

Bisbee, James and Jennifer M. Larson. (2017). Testing Social Science Network Theories with Online Network Data: An Evaluation of External Validity. *American Political Science Review* 111(3): 502–521.

Day 3

Session 5: Student Presentations (120 min)

In this session, students give short (5 min) presentations of an initial idea for a research design incorporating computational social science methodologies to address a substantial question of their choice. Each presentation will be followed by a short in-class discussion providing feedback and ideas.

Further Recommended Readings

Session 2:

Barberá, Pablo and Thomas Zeitzoff. (2017). The New Public Address System: Why Do World Leaders Adopt Social Media? *International Studies Quarterly* doi: 10.1093/isq/sqx047.

Brayne, Sarah. (2017). Big Data Surveillance: The Case of Policing. *American Sociological Review* 82(5): 977–1008.

Carlson, David and Jacob M. Montgomery. (2017). A Pairwise Comparison Framework for Fast, Flexible, and Reliable Human Coding of Political Texts. *American Political Science Review* 111(4): 835–843.

Chadefaux, Thomas. (2014). Early Warning Signals for War in the News. *Journal of Peace Research* 51(1): 5–18.

King, Gary, Jennifer Pan and Margaret E. Roberts. (2014). Reverse-Engineering Censorship in China: Randomized Experimentation and Participant Observation. *Science* 345: 1251722-1–1251722-10.

Spaiser, Viktoria, Thomas Chadefaux, Karsten Donnay, Fabian Russmann and Dirk Helbing. (2017). Communication Power Struggles on Social Media: A Case Study of the 2011–12 Russian Protests. *Journal of Information Technology & Politics* 14(2): 132–153.

Session 3:

Axtell, Robert L., Joshua M. Epstein, Jeffrey S. Dean, et al. (2002). Population Growth and Collapse in a Multiagent Model of the Kayenta Anasazi in Long House Valley. *Proceedings of the National Academy of Sciences* 99: 7275–7279.

Cederman, Lars-Erik. (2003). Modeling the Size of Wars: From Billiard Balls to Sandpiles. *American Journal of Political Science* 97(1): 135–150.

Helbing, Dirk. (2010). Pluralistic Modeling of Complex Systems. *Science and Culture* 76(9-10): 315–329.

Schich, Maximilian, Chaoming Song, Yong-Yeol Ahn, Alexander Mirsky, Mauro Martino, Albert-László Barabasi and Dirk Helbing. (2014). A Network Framework of Cultural History. *Science* 345: 558–562.

Weidmann, Nils and Idean Salehyan. (2013). Violence and Ethnic Segregation: A Computational Model Applied to Baghdad. *International Studies Quarterly* 57(1): 52–64.

Session 4:

Watts, Duncan J. (2004). The 'New' Science of Networks. *Annual Review of Sociology* 30(1): 243–270.

Robins, Garry, Jenny M. Lewis, and Peng Wang. (2012). Statistical Network Analysis for Analyzing Policy Networks. *Policy Studies Journal* 40 (3): 375–401.

Centola, Damon. (2010). The Spread of Behavior in an Online Social Network Experiment. *Science* 329: 1194–1197.

Christakis, Nicholas A. and James H. Fowler. (2007). The Spread of Obesity in a Large Social Network Over 32 Years. *New England Journal of Medicine* 357(4): 370–379.

Steinert-Threlkeld, Zachary C. (2017). Spontaneous Collective Action: Peripheral Mobilization During the Arab Spring. *American Political Science Review* 111(2): 379– 403.