Course Form for PKU Summer School International 2018

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Computational Social Science</th>
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<tbody>
<tr>
<td></td>
<td>计算社会科学</td>
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<tr>
<td>Teacher</td>
<td>Jonathan ZHU, Winson PENG</td>
</tr>
<tr>
<td>First day of classes</td>
<td>July 2, 2018</td>
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<tr>
<td>Last day of classes</td>
<td>July 12, 2018</td>
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<tr>
<td>Course Credit</td>
<td>2 credits</td>
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Course Description

Objective
The course aims to introduce computational social science (CSS) to students in various data science disciplines such as computer science, mathematics, statistics, electronic engineering, bio-/medical informatics, etc., who are interested in individual human behaviors and aggregate social processes. Assuming the enrolled students to have already known how to perform basic data analysis using a variety of algorithms or tools, the course focuses on the fundamental principles (e.g., what are good or bad practices) and the research design (e.g., how to plan rigorous studies to answer causal questions). Ample examples from the existing literature will be used to help illustrate the principles and apply the research design. At the end of the course, the students are expected to be able to do the following: (1) communicating and collaborating with social scientists using their vocabulary and reasoning logic; (2) planning and implementing rigorous computational studies on human behaviors or social processes; (3) evaluating the quality of other social science studies and suggesting feasible improvements.

Pre-requisites /Target audience
Pre-requisites: Basic knowledge of statistical analysis, text mining, machine learning
Target audience: Senior undergraduate students and graduate students in various disciplines of data science (computer science, mathematics, statistics, electronic engineering, bio-/medical informatics, etc.)

Proceeding of the Course
No

Assignments (essay or other forms)
Readings, In-class and online discussions, and take-home exercises

Evaluation Details
### Session 1: Introduction to CSS and Research Design

**Date:** 7/2/2018

**Description of the Session**

The basic features of computational social science (CSS, e.g., what it is, how it has come about and why, what it aims to do, and how it works), primary purpose of social science research (descriptive, explanatory, or predictive), and most common research designs in social research (within-subjects design and between-subjects design).

**Questions**

What is CSS? How is it related to and different from social sciences and data science and why? How to study social phenomena cross time, space, and population?

**Readings, Websites or Video Clips**

1. Babbie Ch1, Ch3-4
2. Salganik Ch1, Ch3
4. Campbell Video1 1.1-1.7; 4.1-4.7; 5.1-5.8; 6.1-6.8

**Assignments for this session (if any)**

Nil

### Session 2: Experiment in Social Research

**Date:** 7/3/2018

**Description of the Session**

Principles and procedure of social science experiment (i.e., comparison between subjects with and without exposure to stimulus) as the key solution to problems and challenges in causal reasoning.

**Questions**

Why is it difficult to determine causes of social processes and how to deal with the problems?
<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Description of the Session</th>
<th>Readings, Websites or Video Clips</th>
<th>Assignments for this session (if any)</th>
</tr>
</thead>
</table>
| 3       | 7/5/2018      | How to collect data on human behaviors through online and offline means; technical, operational, and quality challenges involved. | 1. Babbie Ch8  
2. Salganik Ch4  
3. Bond et al. (2012)  
4. King et al. (2017)  
5. Campbell Video1 7.1-7.8 | Exercise 1. Review and critique of the research design and the causal reasoning used in a set of published CSS studies |
| 4       | 7/6/2018      | Principles and methods of classic probability sampling; opportunities and challenges of applying probability sampling to online data. | 1. Babbie Ch9, Ch11  
2. Salganik Ch2, Ch5  
4. Campbell Video2 2.1-2.10 | Nil |
| 5       | 7/7/2018      | How to quantify human thoughts and behaviors from empirical data; how to link latent | 1. Babbie Ch7  
2. Zhu et al. (2011)  
3. Xu & Zhu (2016)  
4. Campbell Video2 3.1-3.9 | Nil |
### Session 6: Multivariate Analysis  
**Date:** 7/9/2018

#### Description of the Session
Principles, procedure, and exemplar applications of multivariate analysis (e.g., multiple regressions) to describe, explain, and predict causal processes with multiple causes.

#### Questions
How to control for confounding effects, identify inflated or suppressed effects, and mediated/moderated effects?

#### Readings, Websites or Video Clips
1. Babbie Ch14-16
2. To be added

#### Assignments for this session (if any)
Nil.

### Session 7: Multilevel and Temporal Analysis  
**Date:** 7/10/2018

#### Description of the Session
Multilevel analysis: principles, procedure, and exemplar applications of multilevel analysis (e.g., mixed effects model and network analysis) to identify socially structured effects on individuals and emergent effects from individuals on social structure. Temporal analysis: principles, procedure, and exemplar applications of temporal analysis (e.g., time series analysis, cohort analysis, survival analysis, sequence analysis) to model dynamic characteristics of individual human behaviors and aggregated social processes.

#### Questions
Multilevel analysis: How to quantify individual variability within global regularities? How to determine societal and collective effects on individuals? How to determine individual contributions to the society? Temporal analysis: How to separate and quantify different dynamic processes (e.g., auto-regression, periodicities, long-term trends, short-term shocks, individual habits, social constraints, etc.) underlying social data?

#### Readings, Websites or Video Clips
6. Xu et al. (2013)

【Assignments for this session (if any)】
Nil.

Session 8: Research Ethics and Student Presentation  Date: 7/11/2018

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)
Ethical concerns for traditional social science research; new challenges for computational social science; causes of and possible solutions to threats to privacy, confidentiality, security, copyrights, and other issues. Students present the results of assignment 3.

【Questions】
When does computational social science research become harmful to individuals and the society and how to mitigate the negative consequences?

【Readings, Websites or Video Clips】
1. Babbie Ch3
2. Salganik, Ch6-7
3. Campbell (2) Video 6.1-6.9

【Assignments for this session (if any)】
Exercise 3: Analysis and interpretation of online data with a complex structure (i.e., multivariate, multilevel, and time-stamped)

Sources of Textbooks, Videos, and Additional Readings

Textbooks/Videos:
- Campbell = Cameron Campbell: Social science approaches to the study of Chinese society, part 1 and part 2, Coursera.com

Additional Readings: