Research Design:
Causal Inference from Randomized and Observational Data

SURV 722
2 credits/4 ECTS
Summer 2016
(July 19- September 12, 2016)

Instructor:
Frauke Kreuter, frauke.kreuter@uni-mannheim.de

Short Course Description:
Survey methodology research sets out to answer questions regarding the effects of particular design decisions: do self-administered modes increase the reports of socially undesirable behavior? Does the use of incentives increase response rates? Does dependent interviewing decrease seam-effects? Do the employment rate estimates change with adding additional response categories like “maternity leave”? This course teaches the fundamental concepts behind the estimation of causal effects, including potential obstacles to causal inference, faulty measurement, spuriousness, specification errors, and other problems that can lead to inappropriate causal inferences. We will discuss the benefits and the difficulties of randomization in survey research in the first half of the class. The focus of the second half is on the design of observational studies and inferences from prediction. Real-world examples will be discussed, with an emphasis on examples from survey methodology. Students will come away with an understanding of how to estimate causal effects in both randomized and observational settings, with a particular focus on careful design of both types of studies.

Course and Learning Objectives:
By the end of the course, students will be able to…

1. understand the fundamental concepts behind the estimation of causal effects;
2. understand and evaluate studies that produce point estimates and assert causality;
3. select an appropriate design to estimate causal effects;
4. design randomized experiments;
5. understand how to estimate causal effects in observational settings;
6. understand application of matching methods for causal inference.

Prerequisites
- Participation in the course Surv400 “Fundamentals of Survey and Data Science”
- Knowledge of basic statistics including regression analysis
- The students should be familiar with the statistical software R or STATA
**Class Structure and Course Concept**
This is an online self-paced course. It covers the same material and content as an on-site course but runs differently. Self-paced format of the course means that you can work with the course materials on your own time. Yet, you will have to complete the coursework (submit all the quizzes and assignments) and take the final exam by the end of the 8th week.

To support you in completing the course, we have set up some optional deadlines (they will be announced in the final version of the syllabus) for each of your assignments. The course schedule is designed given a commitment of about 12 hours a week. Although the suggested deadlines are optional and you can submit your homework at any time during the course, we highly recommend that you block out time for the course every week (ideally multiple times a week and not a single 12-hour learning session, which can be very exhausting). The date of the final exam is fixed and cannot be changed. The course requires you to successfully finish each module, before proceeding to the next.

**Course Components**
In this course, you will learn by:

- **Watching pre-recorded video lectures:**
  For more information, see “Class Schedule.”

- **Reading the required literature:**
  For more information, see “Class Schedule.”
  Although some readings will be summarized in the video lectures, you are obliged to read all of the required literature. The material covered in the required readings will be included in the course assignments.

- **Accomplishing five homework assignments:**
  You will work on five homework assignments.

- **Interacting with the instructor and your classmates:**
  Students are encouraged to post questions about the material covered in the videos and readings in the discussion forums. Chances are, someone else is wondering about the same thing you are, so don’t be shy using the forum. Please note that the instructor needs at least 24 hours to reply.

- **Connecting with your classmates (optional):**
  You will have an opportunity to participate in weekly online study groups. We will help you schedule them using BlueJeans.

**Grading**

*Grading Scheme:*
Grading will be based on the following elements.

<table>
<thead>
<tr>
<th>Element</th>
<th>Percent of Grade</th>
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<tbody>
<tr>
<td>Class participation</td>
<td>10%</td>
</tr>
<tr>
<td>Homework assignments (5)</td>
<td>60% (Assignment #5 will account for 20% of the total grade for assignments)</td>
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<td>-------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Final exam</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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**Online Class Participation:**
Class participation points are based on forum posts. There will be a unit-based forum in which you are required to post one question and one response to your classmate’s post about the weekly readings or lectures.

**Academic Conduct**
Clear definitions of the forms of academic misconduct, including cheating and plagiarism, as well as information about disciplinary sanctions for academic misconduct may be found at

http://www.graduate.umd.edu/policies/misconduct.html (University of Maryland) and https://www.uni-mannheim.de/1/english/research/Good Research Practice/141119- Satzung wiss FV Senat_en.pdf (University of Mannheim).

Knowledge of these rules is the responsibility of the student and ignorance of them does not excuse misconduct. The student is expected to be familiar with these guidelines before submitting any written work or taking any exams in this course. Lack of familiarity with these rules in no way constitutes an excuse for acts of misconduct. Charges of plagiarism and other forms of academic misconduct will be dealt with very seriously and may result in oral or written reprimands, a lower or failing grade on the assignment, a lower or failing grade for the course, suspension, and/or, in some cases, expulsion from the university.

**Accommodations for Students with Disabilities**
In order to receive services, students at the University of Maryland must contact the Disability Support Services (DSS) office to register in person for services. Please call the office to set up an appointment to register with a DSS counselor. Contact the DSS office at 301.314.7682; http://www.counseling.umd.edu/DSS/.

**Course Evaluation**
In an effort to improve the learning experience for students in our online courses, students will be invited to participate in an online course evaluation at the end of the course (in addition to the standard university evaluation survey). Participation is entirely voluntary and highly appreciated.
Class Schedule

Unit 1: Defining causal effects. Basic assumptions. Theories, models and paradigms. Formulating and testing hypotheses
(19/7/16 - 26/7/16)

How can we formulate valid arguments? How can/should we formulate testable hypotheses? How can we re-formulate questions or statements about the world into testable hypotheses? What translations are necessary to get from general theory to study design? Are the translations what we think they are? Why do we need hypothesis?

Required readings:


Recommended readings:


Assignment 1 (Suggested deadline: on Tuesday, 26. July 23:00 pm CET)

Unit 2: Randomized experiments.
(25/7/16 - 31/7/16)

Classical randomized experiments… What are potential outcomes? What is the stable unit treatment value assumption (SUTVA) and why do we need to make this assumption? What is the assignment mechanism?

Required readings:

Recommended readings:


Assignment 2 (Suggested deadline: on Monday, 1. August 23:00 pm CET)

Unit 3: Criteria to evaluate research designs
(1/8/16 - 8/8/16)

- Statistical Conclusion Validity (Statistical Power)
- Internal Validity
- Construct Validity
- External Validity

Required readings:


Assignment 3 (Suggested deadline: on Monday, 8. August 23:00 pm CET)

Unit 4: Practical Problems
(8/8/16 - 15/8/16)

- Practical problems
- Quasi-Experimental Designs

Required readings:


**Recommended readings:**


**Assignment 4 (Suggested deadline: on Monday, 15. August 23:00 pm CET)**

- **Unit 5+6+7: Propensity Scores, Matching, Regression Discontinuity Design**
  (15/8/16 - 5/9/16)

**Required readings:**


*Depending on your software of choice, read and work through one of the following 2:

1) For computing in R:

2) Stata:


- **Unit 8: Final Exam**
  (5/9/16 - 12/9/16)