SYLLABUS

Instructors

- Professor: Gabor Simonovits (simonovitsg@ceu.edu)
- Section leader: Reka Branyiczki (Branyiczki_Reka@phd.ceu.edu)
- Teaching assistant: Ameni Mehrez (Mehrez_Ameni@phd.ceu.edu)

Class meetings, section, office hours & asking for help

- Lectures: Mon 15:30-17:10 + Tues 11:00-12:40 OR Mon 17:20-19:00 + Tues 13:30-15:10
- Section: Thursday
- Office hours: TBA

Given that both me and the TAs will commute between Vienna and Budapest during this academic year some or most of consultations will necessarily take place online. While this situation is bound to create some difficulties, I strongly suggest to each participants to ask for help in email and/or sign up for consultations via skype. We will do everything we can to compensate for this situation with allocating time to provide extra help to students.

Summary

Statistics is an integral part of a political scientist's training for several reasons. First, it provides a coherent intellectual perspective through which to interpret regularities occurring in politics as well as other domains of the world. Second, it allows its users to engage with information summarized in the language of numbers, whether it is scientific, journalistic or conversational. Third, it allows practitioners to produce new insights from data and convey it to different audiences.

This is an introductory class in quantitative methods with the goal of (1) rigorously explaining some of the core concepts in statistics (2) giving an overview of some basic tools that can be used to learn from data and (3) apply these baic tools using statistical software. At a minimum, by the end of the course students should feel comfortable to both make and critically engage with arguments involving statistics. Moreover, the course will provide the foundations (aka prerequisites) for more advanced classes offered in the Department and elsewhere.

Learning Outcomes

The goal of the course is to provide students with the most basic tools to understand quantitative reasoning and provide the foundations for more advanced courses in quantitative methods as well as to learn the basic of programming and the use of statistical software.

Evaluation

The class will be assessed through quizzes, assignments, and a final exam. Quizzes will are intended to make sure that participants continuously follow the covered material. They will be short tests conducted in the first 10 minutes of 3 class meetings (not announced). Assignments will require the application of the concepts covered in class to specific case studies, simple computations and data visualizations using R or the critical reading of scholarly articles. They will be weighed equally.

The final exam will consist of a paper-and-pencil component that tests the understanding of theoretical concepts and a component testing familiarity with statistical computing and the interpretation

of empirical results. For the latter part students will use statistical software and will be allowed to consult the internet.

Attendance (with timely arrival) is **REQUIRED** and two unexcused absences will lead to an automatic failure of the class. Complete academic honesty is expected of everyone. Failure to comply with this requirement will result in automatic failure in this course (and subsequently in the program) and additional disciplinary action on higher levels. All assignments are to be done individually. You can talk about how to do it, but none of the actual work can be done in a group. Any evidence to the contrary will be investigated.

Grading

Quizzes:	3 X 5=15%
Assignments:	3 X 15=45%
Final Exam:	40%

Math camp and exemption

During the pre-session and zero week, a general introduction and preparation for the class will be taught by the teaching assistants. All students participating in the class must take the **math test**, which will give the students a preliminary assessment of basic knowledge they should have for the class. The **math test** will cover topics presented during the preparatory sessions. The test will be corrected, but not graded, and it will not be part of the evaluation of the class itself, but it will serve as a guide to which preparatory sessions one should attended.

For those that have already mastered basic statistics and are thus convinced that this class will be superfluous for them, a chance will be given to take an **exemption test** that consist of a oral interview with the instructor as well as a programming/computing exercise using R. Upon successful completion of the exemption test, the student is exempted from taking the class.

Readings

There are three textbooks from which readings will be assigned (each will be made available online).

- **Imai, Kosuke. Quantitative social science: An introduction**: This is a new textbook that covers all the topics the course will discuss with a heavy focus on computation in R.
- **Philip H. Pollock. The Essentials of Political Analysis**: A textbook with more thorough explication of theory but no R.
- **Judea Pearl. The book of why**: A book with an extremely astute perspective on some of the topics

For each week a corresponding chapter of the Imai textbook will be assigned in some cases accompanied by chapters from the other books. I assign parts of multiple texts when the coverage of the Imai book is too thin. That being said, I encourage students to read about each topic using multiple sources – this definitely helps a deeper understanding.

I also strongly suggest that course participants spend some time to look up key concepts online. It might sound funny, but wikipedia is an extremely useful resource. Similarly, I strongly recommend students to actively look for practice questions online – though some will be provided. Finally, students should actively seek out online sources and possibly additional textbooks to familiarize themselves with statistical computing in R.

Schedule

Week 1: Introduction to statistics and programming

- Readings: Imai Ch1, Pearl, Ch1
- Topics and concepts: goals and types of quant methods
- Software skills: Objects and functions in R

Week 2: Measurement and description

- Readings: Imai Ch3, Pollock Ch2
- Topics and concepts: central tendency, variation and covariation
- Software skills: summarizing and visualizing variables and relationships

Week 3: Comparison and causality

- Readings: Imai Ch2, Pearl, Ch2
- Topics and concepts: counterfactuals, confounding, DAGs
- Software skills: comparison of variables across groups

Week 4: Modelling and prediction

- Readings: Imai Ch4, Pollock Ch 4-5
- Topics and concepts: modelling, parameters, fit
- Software skills: regression in R

Week 5: Probability

- Readings: Imai Ch6, Pollock Ch6
- Topics and concepts: probability, Bayes theorem, LLN, CLT
- Software skills: simulations in R

Week 6: Inference

- Readings: Imai Ch7, Pollock Ch7
- Topics and concepts: standard error, hypothesis testing, confidence intervals, p-values
- Software skills: statistical tests in R (t, χ^2), regression tables in R