IPS 205: Introductory Statistics for Policy
Autumn 2015
Monday, Wednesday, 1:30-3:20pm, Econ 139; section Friday, 10:30-11:20am, 320-106

Instructor: Nicholas Sher, Political Science Department
Office: Margaret Jacks 431
Contact: nsher@stanford.edu (primary), 610-675-5250 (for emergencies)
Office Hours: Monday 3:30-5:00 or by appointment

Teaching Assistant:
Radhika Kapoor
Office hours: TBA
Office: TBA
Contact: radhikak@stanford.edu

IPS 205 provides an introduction to probability and statistical inference for decision making and data interpretation in policy contexts. The course is divided into three subject areas: fundamentals of mathematical probability, fundamentals of data science, and fundamentals of statistical inference. Our task is to begin developing skills for the systematic analysis of policy, as well provide the prerequisites for IPS 206.

Evaluation
The course assessment will be based on five problem sets (25%), a in-class mid-term (25%), and a cumulative take-home final exam (50%).

Problem Sets During the quarter, students will be asked to complete five homework assignments. You are encouraged to work in groups to complete the assignments, though each student must write their own code and write up the assignment themselves.

As detailed in the computing section below, all coding assignments are to be completed in the R programming language and I strongly recommend writing up all assignments in \LaTeX. Later homeworks may make this recommendation a requirement.

Midterm There will be a midterm exam to assess students’ understanding of probability theory. This will be closed book and taken during regular class time. Practice exams will be made available on Coursework.

Final Exam There will be a cumulative take-home, open-book and open-notes final exam, with an emphasis on applying theory to practical policy problems. No group work will be allowed on this exam. It will be due Thursday, December 10th.

Computing
This course will utilize R, a powerful and increasingly popular platform for data science. R is becoming a default language for data science work in industry, policy, and methodologically sophisticated academic analysis. See https://www.datacamp.com/ or the “R Cookbook” for extra resources.
Section
Section will provide another forum for discussing questions, presenting examples, and delivering course content. Sections will include applications of course material in R, and students are therefore encouraged to bring their laptops to section.

Readings
The following books are available for purchase or rent in the campus bookstore, though it may be more cost-effective to find them through an online retailer like Amazon.

- Teetor, Paul. R Cookbook. (optional, but highly recommended)

Students with documented disabilities Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Student Disability Resource Center (SDRC) located within the Office of Accessible Education (OAE). SDRC staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the SDRC as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, 723-1067 TTY).

Class Schedule

Probability Theory

September 21: Introduction to Probability
- DS 1.1-1.8, 1.10

September 23: Conditional Probability
- DS 2.1-2.3

September 28: Random Variables: Discrete
- DS 3.1, 3.3

September 30: Random Variables: Continuous
- DS 3.2, 3.3

October 5: Expectation and Variance
- DS 4.1-4.5

October 7: Multivariate Distributions, Correlation, and Covariance
- DS: 4.6-4.9, 3.6-3.9

October 12: Sampling and Limit Theorems
- DS: 6.1-6.3
October 14: Effective Graphics and Data Visualization
  - Selections to be uploaded to Coursework

Statistical Inference
October 19: The Midterm Exam
October 21: Intro to Statistical Inference
  - DS: 7.1-7.5

October 26: Point Estimation (Sampling Distributions) Part 1
  - DS: 8.1-8.3

October 28: Point Estimation (Sampling Distributions) Part 2
  - DS: 8.1-8.5

November 2: Hypothesis Testing Part 1
  - DS: 9.1-9.5

November 4: Hypothesis Testing Part 2
  - DS: 9.3-9.8

November 9: Model fit
  - DS: 10.1-10.5

November 11: Nonparametric Models
  - DS: 10.6-10.8

November 16: Introduction to Regression
  - DS: Chapter 11

November 18: Introduction to Regression, ctd
  - DS: Chapter 11

November 30: TBD
December 2: Review