Program for Quantitative and Analytical Political Science at Princeton

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Internet and computing revolution over the last two decades
Transformed social science research and education
Data, Data, and Data!
Past: government data, national survey data

Today: more of old types of data and lots of new data
  - Randomized experiments and surveys conducted by researchers
  - Administration records: voter files, contributions, lobbying, ...
  - Economic data: trade, company information, finance, ...
  - Military data: casualty, insurgent attacks, ...
  - Social media data: websites, blogs, tweets, cell phones, ...
  - GIS data: satellite, climate, natural resource discoveries, ...
  - Text, images, sounds: news, speeches, bills, commercials, ...
Examples of Recent Dissertation Research

1. Number and size of European states and their evolution over time
   - Traditional way: rich historical analysis of a few important cases
   - New way: Geocode state boundaries every 10 years over 400 years

2. Lobbying and trade policies
   - Traditional: hire research assistants hand-code lobbying reports
   - New: write a computer code to scrape and analyze 800,000 reports

3. Impact of supreme court opinion on lower courts’ decisions
   - Traditional: read lots of opinions!
   - New: use plagiarism detection software to compare 700,000 opinions
Examples of Recent Faculty Research

1. Analysis of 160 million geocoded US voters from L2 to study neighborhood effects on turnout

2. Analysis of 20 million roll calls in the state legislature to study polarization

3. Analysis of the careers of all federal employees to understand bureaucratic policy making and personnel politics
Analysis of geocoded insurgent attacks and US airstrikes in Afghanistan and Iraq to study civil war dynamics.

Analysis of 3 trillion product level imports and exports between 150 countries over 25 years.
Challenges

1. Data availability is NOT the problem
   - Need for new algorithms, models, and methods
   - Need for new computing technologies
     - parallel computing
     - database management and visualization
     - natural language, image, and video processing

2. Everyone, not just statisticians and methodologists, are analyzing data
   - Need for methodological training at all levels
   - Undergraduates, not just graduate students
     - Curriculum development
     - Independent research
     - Job market in virtually all areas

3. Importance of ideas and theory
   - Big data \(\mapsto\) what and where to look?
   - Game theory
   - How to connect theory to data
Overview of Quantitative Social Science at Princeton

- Courses
  - Certificate programs

- High performance computing center

- Teaching

- Infrastructure

- Training

- Consulting

- Fellowships
  - Workshops

- Project assistance

Kosuke Imai (Princeton)
1 Undergraduate teaching
   - 8 years ago ⇔ No politics undergraduate course in statistics
   - Now, we offer 3 courses
     - POL245 Visualizing Data (Freshman Scholars Institute): 30 students
     - POL345 Quantitative Analysis and Politics: 30 ⇔ 100 students
     - POL346 Applied Quantitative Analysis: 3 ⇔ 35 students
   - Courses in game theory and political economy
   - Certificate program: Statistics & machine learning, Political economy

2 Graduate teaching
   - 12 years ago ⇔ No sequence
   - Creation of sequences in statistics and game theory
   - Improved placements: Caltech, Chicago, Harvard, MIT, Yale, etc.
   - Options outside of academia: Facebook, political consulting, etc.
Introductory statistics courses are unpopular

- Non-politics introductory statistics courses in social sciences
- 5 year average: 2008/09–2013/14
- Courses in ECO, PSY, SOC, and WWS

<table>
<thead>
<tr>
<th></th>
<th>Lectures</th>
<th>Assignments</th>
<th>Readings</th>
<th>Precepts</th>
<th>Overall</th>
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<td>3.3</td>
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Politics introductory statistics courses:

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<td>4.2</td>
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What’s the secret of success?

Kosuke Imai (Princeton)  Q-APS: Quantitative Social Science  February 26, 2016
Why Teaching Introductory Statistics Courses is Hard

1. Students are not interested in statistics:

<table>
<thead>
<tr>
<th></th>
<th>Professor</th>
<th>Distribution Requirement</th>
<th>Departmental</th>
<th>Certificate Program</th>
<th>General Interest</th>
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<td>20%</td>
<td>71%</td>
<td>3%</td>
<td>6%</td>
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<tr>
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<td>6%</td>
<td>12%</td>
<td>32%</td>
<td>7%</td>
<td>42%</td>
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</tbody>
</table>

“Professor Imai tried hard to make statistics interesting. But, statistics is boring.”

2. Students have weak mathematical and programming background

“as a person not naturally inclined towards statistics and probability, I don’t feel at all qualified to pass judgement on how the course might have been improved.”
The Problem for social science students: **Boring!!**
- only teaches statistical concepts but not actual data analysis
- often does not teach basic statistical programming

How can we make these materials more fun and relevant?

- Emphasize **applications** rather than methods themselves
  - forecasting election outcomes
  - gender and racial discrimination in labor market
  - disputed authorship of the Federalist Papers
- Use of statistics in junior papers and senior thesis
- Statistics as a useful skill for post-graduate career
- Guest speakers from industry
• **Senior thesis research:**
  “I took your POL 345 course last semester, and I think I’m going to need to use statistical analysis skills in my research this semester. I’m currently studying abroad in Beijing, and working on a research project to assess which methods can best improve the quality of education and access to education for migrant children in Beijing…”

• **Graduate school:**
  “When I first decided to take Professor Imai’s statistics course as a senior majoring in Politics at Princeton, I was excited at the idea of gaining new skill sets but wasn’t entirely sure why statistics and learning R would be useful for me. In retrospect, I am very grateful for having taken the course, which helped me become fully ready for my present graduate studies in political science…”
Finance:
“It was a pleasure, and quite a coincidence, running into you on Wall St. the other week. I have actually been meaning to send you an e-mail to thank you for what Pol 345 has done for me. I recently returned from London for two months of training with DB, and spent a large majority of the time discussing options pricing models, which is highly contingent on statistical assumptions…”

Small-town newspaper:
“I graduated from Princeton last June, and took POL 345 a year ago. I was a history major, and my job now has little to do with statistics – I’m a sports reporter for a small-town newspaper. But I did find a way to employ R quite usefully…”
High performance computing center at Princeton
- Collaboration across different departments
- Originally built for natural science departments
- Social sciences and humanities are now utilizing too
- Growing demands for computational resources

Need training to use these and other resources
- Computing workshops
- Consulting services
  - 700 hours
  - 100 unique clients from 9 departments
- led by research specialists and postdocs
Concluding Remarks

- Everyone – undergrads, grad students, faculty – analyzes data
- Need for better curriculum and infrastructure at all levels
- Importance of human resources: teaching, training, consulting
  - methodologist faculty
  - research specialists
  - postdocs, graduate and undergraduate fellows
- Coordination with other departments at Princeton: Center for Statistics and Machine Learning
- Collaboration with private sectors, non-profits, and government agencies: data collection/sharing, joint projects, job placements
- Internationalization:
  - Political Economy conferences in Venice
  - Political Methodology conferences in Asia