Proposal for Undergraduate Certificate in Social Science Analytics  
February 16, 2015  
To: Helena Dettmer, Associate Dean for Undergraduate Programs and Curriculum  
From: The Departments of Geography and Sustainability Sciences, Political Science, Sociology, and Statistics and Actuarial Sciences

Rationale

Students increasingly need training in data analysis in order to compete on the job market, but undergraduate offerings within our departments remain sparse. In fact, as one researcher put it, “Big data is having a transformative impact across virtually all academic disciplines—it is time for data science to be integrated into the foundational courses for all undergraduates.” Creating a certificate in social science data analysis will make students more competitive for jobs with political campaigns, consulting, policy analysis, public opinion firms, government agencies, and local communities. Recent hires and upcoming searches increasingly have the skills to contribute new, cutting-edge courses to that curriculum in such areas as social network analysis, new media, text analysis, spatial analysis, and visualizing social science data. Structuring students’ access to these skills via a certificate will provide appropriate technical training in combination with an understanding of the social processes and theories that highlight the substantive nuances and context of the data at hand.

At the same time the growth of “Big Data” and informatics calls for a new set of skills for social science undergraduates and an increased understanding of the logic of data collection and analysis. The payoff therefore increasingly comes from fusing techniques from other fields with social science research questions. It is therefore natural for Geographical and Sustainability Sciences and Statistics and Actuarial Science to partner with us on this certificate. They both offer rigorous training in collecting, managing, analyzing, and interpreting data as well as its implications for society. By bringing together these diverse skills we can offer our students a rigorous program of study that will allow participants to distinguish themselves for employers or help prepare them for further study.

Further, the certificate will benefit students in Geographical and Sustainability Sciences and Statistics and Actuarial Science by affording many opportunities to interact and collaborate with research-minded social science students. Such opportunities to work directly with peers from different, non-mathematical sciences disciplines represent an invaluable component of an undergraduate statistic student’s education. More than ever before, today’s statistics students are familiar with the names of several role models, like the statistician-political analyst, Nate Silver, the sabermetrician, Bill James, or the global data visualizer and TED talk celebrity, Hans Rosling. The SSDA certificate is designed to broaden backgrounds and give undergraduate statistics majors the additional skills necessary to become the next Silver, James, or Rosling.

Creating the certificate within this group of departments allows us to leverage distinct strengths and existing course offerings in each and open up this new area of study. Political Science currently offers one undergraduate data analysis course; the small size of Geographical and Sustainability Sciences makes it difficult for faculty to offer more in-depth courses in this area. This certificate program would
afford students in all departments access to a wider range of courses as well as the opportunity for students in Political Science, Sociology, and Geography to undertake more in-depth coursework in data collection, management, and analysis which in turn would make them more marketable to future employers.

Compared to the recently approved large data analysis (LDA) certificate, the proposed social science data analysis (SSDA) certificate focuses more on the application side of data analysis. The LDA certificate will be attractive to the mathematically-oriented student who wishes to learn more about the formal computational and analysis tools that are useful for collecting, managing, munging, and mining large data sets; it is designed for computer science, statistics, and mathematics undergraduate majors. As described above, the SSDA certificate clearly will be attractive to the quantitatively-oriented social science student, but it will also be attractive to the mathematically-oriented statistics student who wishes to learn more about the specific research methods and quantitative skills needed to contribute in an increasingly complicated social-political world.

In closing, the proposed certificate offers undergraduates an opportunity to receive interdisciplinary training on how data can be used to address important questions in the social sciences (e.g., How can we leverage google search data to predict how quickly a disease will spread? In our quest to understand socially influenced behavior, how can we scale-up from small, face-to-face laboratory-based experiments to online experiments with thousands of participants? What do the interpersonal network ties among legislators tell us about the success and failure of legislation?). Whereas the LDA certificate constitutes in-depth training related to the collection and analysis of complex data, the Social Science Analytics certificate is designed to teach students how to approach the social-political world using data-driven methods.

**Description of the Certificate**

The certificate would require 18 semester hours as described below. Students must complete requirements in each of four different components of the certificate, requiring 6 courses total. No more than 6 semester hours of course work towards a major may be counted towards the certificate.

Once the certificate gains enough enrollments we hope to create and implement a capstone course that everyone would take in order to integrate the materials and help students apply the knowledge learned. In the meantime, we will institute a faculty mentor system drawing from affiliated faculty who will meet regularly with students enrolled in the certificate (see resources section for more information).

Some of the courses have prerequisites within their home departments. For example, STAT:3200 requires STAT:2010 or STAT:2020; STAT:4520 requires (as one possibility) STAT:3120; STAT:6560 requires STAT:3101 (22S:131), and STAT:3200 (22S:152) or STAT:5200 (22S:164); STAT:6220 requires STAT:3200 and STAT:3210, or STAT:5200 and STAT:5201. GEOG:3540 and GEOG:4580 require GEOG:1050. CS:2420 requires CS:2110; CS:3980 requires CS:2110 or CS:2230 or CS:2820 or CS:3110. SLIS:6100 requires SLIS:5020. ECON:4800 Introduction to Econometrics requires STAT:3120.
I. Core Statistics Sequence (Choose two)
   1. STAT:3120 (22S:120) Probability and Statistics
   2. STAT:6513 (22S:148) Intermediate Statistical Methods
   3. STAT:3200 (22S:152) Applied Linear Regression

II. Social Science research design and data analysis (Choose one)
   1. POLI:3000 (030:100) Understanding Political Research
   2. SOC:2170 (034:011) Research Methods

III. Building Skills and Data Science (Choose two)
   1. POLI:3050 (030:122) Topics in Research Methods
   2. STAT:4520 (22S:138) Bayesian Statistics
   3. STAT:6510 (22S:162) Applied Generalized Regression
   4. STAT:6560 (22S:156:001) Applied Time Series Analysis
   5. CS:2210 (22C:019) Discrete Structures
   6. CS:2110 (22C:080) Programming for Informatics
   7. CS:2420 (22C:082) Human-Computer Interaction
   8. CS:3980 (22C:096) Topics in Computer Science I: Visual Analytics
   9. SOC:3880 (034:170) Social Networks
   10. ECON:4800 (06E:184) Introduction to Econometrics
   11. GEOG:1050 (044:005) Foundations of GIS
   12. GEOG:3540 (044:109) Introduction to Geographic Visualization
   13. GEOG:4580 (044:141) Introduction to Geographic Databases
   15. GEOG:4870 (044:188) Applied Geostatistics

IV. Applied Research Experience (Choose 1)
   1. STAT:6220 (22S:173) Statistical Consulting
   2. POLI:3001 (030:101) Hawkeye Poll
   3. POLI:4600 (030:185) Honors Research Project
   4. POLI:4702 (030:194) Senior Research Project/Paper
   5. POLI:3150 (030:119) Problems in American Politics: Legislative Policy Seminar
   6. GEOG:4030 (044:150) Senior Project Seminar

Advisory Board

The Advisory Board for the Certificate in Social Science Analytics will approve significant changes to the curriculum or to certificate’s policies and procedures, including appropriate exceptions to requirements.
The committee will advise on program operations, including the budget, expenditures, and co-curricular activities related to the certificate or related matters. The Board will be composed of a minimum of 5 members representing the interdisciplinary nature of the certificate program, with members representing at least 4 CLAS departments. The Board meets at least once each semester. The following individuals have agreed to serve on the Board at its inception.

1. Frederick J. Boehmke (Political Science), chair and coordinator
2. Juan Pablo Hourcade (Computer Science)
3. Joseph Lang (Statistics and Actuarial Sciences)
4. Freda Lynn (Sociology)
5. Mary Noonan (Sociology)
6. Rene Rocha (Political Science)
7. Heather Sander (Geographical and Sustainability Sciences)

Resources

All certificate coursework is drawn from existing courses that are offered at least every other year.

Advisors for the four departments involved will be able to work with undergraduate majors in their departments and we will disseminate information about the certificate to faculty advisors, the Academic Advising Center, and CLAS Advising to assist them. In addition, based on projected enrollment (see table below, line "Other"), these four advisors are willing to advise students coming from other departments who wish to enroll in the certificate. If the actual number of other students interested in the certificate greatly exceeds projected enrollment, then the Advisory Board will take on this particular advising task until a new plan is developed.

Until the creation of a capstone course, students will also have mentors from among the affiliated faculty appointed to them for regular meetings (at least once per semester) to help them through the certificate as best fits their interests and also to ensure that their studies have sufficient focus and they are able to synthesize the material from possibly many fields into a coherent understanding of social science analytics. When the capstone course is in place, the individual meetings will no longer be required. However, at least three faculty members from the steering committee will still be available per semester to provide advising help to students.

We also plan to host receptions (e.g., a lunch or an afternoon coffee meeting) for enrolled students in order to facilitate interaction and provide opportunities to meet other students enrolled in the certificate.

Starting Date and Five-year Enrollment Projection

We would like to start this certificate in fall 2015 if possible, but can delay as necessary for approval.

Our enrollment projections indicate the number of students participating in the certificate each year and are based on the number of majors in the departments of Political Science, Sociology, Geographical and Sustainability Sciences, and Statistics and Actuarial Science and assume that 7% of those in the first
two would take it and 3% in the other two. The B.S. in Political Science requires our course in research methods as well as courses in Mathematics or Statistics and about 10% of our majors choose this track over the B.A. We expect the certificate will draw significantly from those students but that it will also draw in students who do not take the B.S. track but are interested in data analysis.

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<th>Table 1. Projected Enrollments by Department and Year</th>
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<td>Geography and Sustainability Science</td>
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<td>Statistics and Actuarial Science</td>
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<td>Other Departments</td>
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**Outcome Assessment**

We will gather information through surveys of participants and discussion with instructors, advisors, and faculty mentors. We will look at course performance, pickup rate among the involved departments, effects on enrollments in relevant courses, graduation rates, and employment rates.

**Plan for Disseminating Information to the University Community**

We will email information to the Registrar, the Academic Advising Center, and CLAS advisors in the four affiliated departments. The DEOs from all four departments are among the faculty supporting the certificate.