PLUS 668: Big Data for Planning and Development

Spring 2021 Syllabus

Instructor: Dr. Kevin Kane

Course Overview

This course provides an introduction to the role of data and analytics in planning and development processes with a particular focus on emerging sources and applications of so-called "Big Data."

Students will engage with conceptual material through readings, discussion, lectures, and guest interviews, learning about examples of big data analysis in business, planning, and transportation from leaders in the field. Readings will cover the ontology of "Big Data," its applications in urban social science, and critical discussions about the efficacy and equity surrounding big data, machine learning, and related topics in society.

Students will engage with technical material through labs using the R Statistical Programming Language and GeoDa spatial analysis software and will develop mastery of accessing, processing, and visualizing Census and American Community Survey data. While advanced programming and Geographic Information Systems (GIS) skills are beyond the scope of this course, students will gain a basic understanding of command line-based data analysis and spatial data handling.

Intended Learning Outcomes

- Develop an appreciation for what makes "Big Data" distinctive from conventional data sources.
- Understand how Big Data analysis can and cannot impact analytical research results, planning outcomes, and the development process.
- Understand what is meant by data flows, data openness, and data engagement in both conceptual and technical contexts.
- Understand the fundamentals of what is needed to conduct Big Data analysis by using a statistical programming language with a command-line interface.
- Understand the fundamentals of spatial data handling and visualization using open-source spatial analysis software.
- Develop an appreciation of the skill sets, workflows, and information required to conduct data analysis and big data analysis for planning and development applications.
- Become a critical consumer, user, and contributor to big data, machine learning, and related concepts in the urban realm by understanding not only the promise of big data but also its pitfalls and potential for reinforcing inequities.

Additional Course Requirements

This course requires students to have a computer which is capable of running the R statistical programming software (in addition to its companion interface, RStudio), as well as the GeoDa spatial analysis software. These programs are open source and free of charge and can be run on standard Window, Macintosh, or Linux systems.

R: www.r-project.org

Rstudio: www.rstudio.com

GeoDa: https://spatial.uchicago.edu/software

Assessments and Grading

Assignments are due at the beginning of the sync session corresponding to the course schedule below, unless otherwise noted by the instructor. Late assignments will be graded down substantially, up to 10% for 24 hours late or up to 30% for one week late, at the discretion of the instructor. A passing grade will not be assigned until all assignments have been completed.

Attendance and active engagement in course materials and during the sync sessions is expected and mandatory. Since a large portion of out-of-class time will be dedicated to technical material, the effective use of in-class time to engage with conceptual material is of high importance. Participation grades will be marked down for unexcused absences or non-completion of async material. The out-of-class time commitment required for learning technical material and completing labs will be significant and will vary based on the student's prior experience with data analysis and computer programming. Students are encouraged to work together to solve technical and programming challenges; however, labs are to reflect individual final work and any evidence of plagiarism or copying submitted material will not be tolerated.

In order to facilitate optimal use of class time for learning conceptual material, each student will be assigned to one of the course's nine conceptual weeks in order to lead a discussion of the assigned readings and, secondarily, async material. Discussion leads are expected to conduct an especially thorough reading of course material for their week and will provide an outline of the material's key points and several discussion questions to the instructor in advance of the sync session. Since the length and complexity of the assigned readings varies, students should be prepared, if needed, to include additional outside resources and materials to facilitate further understanding of the topic.

- (7.5%) What is Big Data to you? Written assignment at beginning of course
- (7.5%) What is Big Data to you? Written assignment at end of course
- (15%) Discussion lead
- (15%) Personal Big Data resources list. Written assignment at end of course
- (30%) Labs 1-3
- (20%) Lab 4
- (5%) Participation

Course Schedule

Week	Orientation	Readings*	Assignments
1: Course Introduction			
2: What Is Big Data?	Conceptual	Arribas-Bel, D. 2014. Accidental, open and everywhere: Emerging data sources for the understanding of cities. *Applied Geography*, 49, 45-53. doi: 10.1016/j.apgeog.2013.09.012	**What is Big Data to you I due.**

		Kitchin, R., & McArdle, G. 2016. What makes Big Data, Big Data? Exploring the ontological characteristics of 26 datasets. *Big Data & Society*. 3(1). doi: 10.1177/2053951716631130	
3: Big Data and transportation planning	Conceptual	Batty, M. (2013). Big data, smart cities and city planning. *Dialogues in Human Geography*, 3(3), 274-279. doi: 10.1177/2043820613513390 Grantz, K.H., Meredith, H.R., Cummings, D.A.T. *et al.* The use of mobile phone data to inform analysis of COVID-19 pandemic epidemiology. *Nat Commun* **11,** 4961 (2020). https://doi.org/10.1038/s41467-020-18190-5 OPTIONAL: Glaeser, E., Kominers, S., Luca, M., & Naik, N. (2018). BIG DATA AND BIG CITIES: THE PROMISES AND LIMITATIONS OF IMPROVED MEASURES OF URBAN LIFE: BIG DATA AND BIG CITIES. *Economic Inquiry*, *56*(1), 114–137. https://doi.org/10.1111/ecin.12364	
4: Data analysis in R (1 of 2)	Technical	For reference only: Machlis, S. and Ambrosio, J. 2013. Learn to use R: Your hands-on guide. *Computer World*. https://www.computerworld.com/article/2497143/	Begin Lab 1.
5: Data analysis in R (2 of 2)	Technical		
6: Spatial analysis in GeoDa	Technical	For reference only: GeoDa documentation (http://geodacenter.github.io/documentation.html)	Begin Lab 2. **Lab 1 due.**
7: Open GIS and Web GIS	Conceptual	Kamel Boulos, M.N., Geraghty, E.M. Geographical tracking and mapping of coronavirus disease COVID-19/severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic and associated events around the world: how 21st century GIS technologies are supporting the global fight against outbreaks and epidemics. *Int J Health Geogr* **19,** 8 (2020). https://doi.org/10.1186/s12942-020-00202-8 Dragicevic, S. 2004. The potential of web-based GIS. *Journal of Geographical Systems* 6: 79-81. doi: 10.1007/s10109-004-0133-4. Anselin, L., Sridharan, S., & Gholston, S. 2006. Using Exploratory Spatial Data Analysis to Leverage Social Indicator Databases: The Discovery of Interesting Patterns.	

		Social Indicators Research 82(2), 287-309. doi: 10.1007/s11205-006-9034-x	
8: Business applications of big data	Conceptual	Shelton, T., Poorthuis, A., & Zook, M. 2015. Social media and the city: Rethinking urban socio-spatial inequality using user-generated geographic information. *Landscape and Urban Planning* 142: 198-211. doi: 10.1016/j.landurbplan.2015.02.020 Alder, L. 2015. The Urban Internet of Things: Surveying Innovations Across City Systems. 31 August. https://datasmart.ash.harvard.edu/news/article/the-urban-internet-of-things-727	**Lab 2 due.**
9: Citizen sensors and citizen science	Conceptual	Goodchild, M. 2007. Citizens as sensors: The world of volunteered geography. *GeoJournal* 69: 211-221. doi: 10.1007/s10708-007-9111-y Optional/for reference only: Gebru, T., Krause, J., et al. 2017. Using deep learning and Google Street View to estimate the demographic makeup of neighborhoods across the United States. *Proc Natl Acad Sci U S A* 114(50), 13108-13113. doi: 10.1073/pnas.1700035114 Optional/for reference only: See, L., Mooney, P., et al. 2016. Crowdsourcing, Citizen Science or Volunteered Geographic Information? The Current State of Crowdsourced Geographic Information. *ISPRS International Journal of Geo-Information* 5(5), 55. doi: 10.3390/ijgi5050055	
10: Data flows	Technical		Begin Lab 3.
11: Student data analysis	Technical		Begin Lab 4.
12: Big Data and land use	Conceptual	Estiri, H., & Afzalan, N. 2017. Towards data-driven cities: Incorporating big data into urban management. In L. A. Schintler & Z. Chen (Eds.), *Big Data for Regional Science*. London: Routledge. Kane, K. and Clark, W.A.V. Mapping the landscape of urban work: Home-based businesses and the built environment. *Environment and Planning A* 51:2. doi: 10.1177/0308518X18762131	**Lab 3 due.**
13: Being a critical consumer, user, & contributor	Conceptual	O'Neil, C. (2016). Weapons of Math Destruction. New York: Broadway Books. Introduction, Chapters 1-2. Optional for sync discussion: O'Neil chapters 3-4.	
14: Weapons of	Conceptual	O'Neil chapters 5, 8, 9	**Lab 4 due.**

math destruction		Optional for sync discussion: O'Neil chapters 6, 7, 10	
15: Is what happens any different?	Conceptual	O'Neil conclusion chapter Shearmur, R. 2015. Dazzled by data: Big Data, the census and urban geography. Urban Geography, 36(7), 965-968. doi: 10.1080/02723638.2015.1050922	**Big data resource list due. What is Big Data to you II due.****

** Readings which are part of sync discussion are numbered and are detailed below. Additional resources NOT for discussion during sync are listed here*

***Assignment will not be due at the beginning of lecture. Due date will be announced and will correspond with the university semester schedule for course completion*.

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct. See http://policy.usc.edu/scientific-misconduct.

Support Systems

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call – provides free ree and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. See https://engemannshc.usc.edu/counseling/.

The National Suicide Prevention Lifeline – 1-800-273-8255 – provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. See http://www.suicidepreventionlifeline.org

Relationship & Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call – provides free and confidential therapy services, workshops, and training for situations related to gender-based harm. See https://engemannshc.usc.edu/rsvp/

The S*exual Assault Resource Center* provides information about how to get help or help a survivor, rights, reporting options, and additional resources. See http://sarc.usc.edu

The Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086 – works with faculty, staff, visitors, applicants, and students around issues of protected class. See https://equity.usc.edu

Bias Assessment Response and Support. Incidents of bias, hate crimes, and microaggressions need to be reported allowing for appropriate investigation and response. See https://studentaffairs.usc.edu/bias-assessment-response-support/

Student Support & Advocacy – (213) 821-4710 – assists students and families in resolving complex issues adversely affecting their success as a student, i.e., personal, financial, and academic. See https://studentaffairs.usc.edu/ssa/

Diversity at USC – https://diversity.usc.edu/ - provides information on events, programs, and training, the Provost's Diversity and Inclusion Council, Diversity Liasons for each academic school, chronology, participation, and various resources for students.

Academic Accommodations

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor (or to a TA) as early in the semester as possible. DSP is located in STU 301 and is open 8.30 a.m. to 5.00 p.m. Monday through Friday. See http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (phone), (213) 740-6948 (TDD only), (213) 740-8216 (fax), or ability@usc.edu