CP 101 Introduction to Urban Data Analytics (4 credits)

Course Description
This course (1) provides a basic intro to census and economic data collection, processing, and analysis; (2) surveys mapping techniques in planning; (3) demonstrates the uses of real-time urban data and analytics; and (4) provides a socio-economic-political context for the smart cities movement, focusing on data ethics and governance.

Synopsis
CP 101 introduces students to the systematic analysis of urban data in its institutional context, with a special focus on the smart cities movement. Recognizing that defining this context relies on critical thinking with regard to economic, social, and environmental outcomes, this course explores what, precisely, stakeholders value in conceptualizing “smart” urbanity. Fundamentally we will place the smart cities construct at the intersection of data and governance. Accordingly, this course will give students a foundation in systematic approaches to collecting, analyzing, modeling, and interpreting quantitative data used to inform robust research, and, ultimately, urban planning practice and policymaking. Beyond instruction in urban data science and analytics, students will be introduced to theory and critical discourses on topics such as big data, open data and e-governance. Instructors will expect students to engage with technical and theoretical - with particular focus placed on ethical - considerations associated with these subjects in lecture and laboratory sections.

The course will be structured following 3 modules:

Module 1: Introduction to Data Science for Planners
During this module students will be introduced to the smart cities construct and associated topics, and will explore fundamental data applications in urban planning. They will be instructed on sourcing data, analyzing data via statistical testing, and presenting data through written reports and visualizations. In Module 1, students will gain skills in working with Census and economic data, statistical testing, and static data visualization. The deliverable for this module will be a descriptive profile of a Bay Area neighborhood.

Module 2: Mapping the City
In the course’s second module, students will learn different tools to make maps. We will gain an understanding of the basic elements of maps, how to map with online programs and geographic information systems software (ArcGIS), and how to construct story maps. Students will produce a story map as the product for this module.
Module 3: Big Data and Smart Cities
In the course’s final module, students will use knowledge acquired in earlier modules to explore urban data science in the context of smart cities. Classes will cover topics such as big data, open data, and smart cities, and civic hacking; and students will gain skills in real-time and crowd-sourced data collection and use, as well as in interactive data visualization. As the final project for the class, students will use novel sources of data to answer a research question of their choice.

Prerequisites
CP 101 is open to all upper-division urban studies majors and smart cities minors; others can enroll with the permission of the instructor. No prior statistics coursework is assumed. This class provides a foundation to pursue further undergraduate data science courses at UC-Berkeley. For Urban Studies CP 101 satisfies one of the four additional City Planning courses for Upper Division Urban Studies Core. For the City Planning minor, CP 101 satisfies one of the four additional City Planning courses for Upper Division courses under List 1. For SED, CP 101 can count as an Upper Division outside SED major for Fall 16 admits and later. Fall 15 and prior SED admits as well as Sustainable Design minor students can petition for it to fulfill a requirement.

Course Requirements
All computer assignments will involve the use of data and software available in or through the DCRP Computer Lab. Students are expected to know how to use the Windows operating system, as lab instruction will be given on computers running Windows. However, students may certainly use the Macintosh OS on personal computers. If you are unfamiliar with either Windows or DCRP’s lab, you are encouraged to take advantage of the CED’s library services (Environmental Design Library Website) or consult with course instructors during office hours.

Students will be expected to have a working knowledge of the Microsoft Office Suite - specifically Excel, PowerPoint, and Word - for this course. Students are welcome to explore the use of free, open software interfaces, such as the R language for statistical computing, the RStudio software package; and the QGIS project; however, please check with the graduate student instructor before using any alternative software. Labs will be offered to introduce students to Excel, American FactFinder & Social Explorer, ArcGIS, CartoDB, story-mapping software, and open data portals.

Grading & Assignments and Reading
Students will be expected to read a number of articles/chapters/etc. prior to lecture and lab sessions. For ten sessions, students are asked to submit responses online on the course bCourse site. Students will also be expected to attend and actively participate in class and lab. They will take a midterm exam and complete three group projects, as well as a final presentation. Grades will be assigned as follows:
Assignment 1 (Neighborhood Profile): 20%
Assignment 2 (Story Map): 15%
Assignment 3/Presentation: 20%
Midterm Exam: 35%
Reading Responses: 5%
Class Participation: 5%

**Reading Responses**
Students are expected to submit 10 short (200-250 word) responses to the readings online on the course bCourse site. Only the class sessions marked with a * are available for commentaries; these are the sessions with more theoretical or critical readings, rather than technical texts. The responses should not be simple summaries of the readings, but reactions to the concepts and analyses presented. Responses should be posted by midnight the day before class (e.g., February 1 for February 2 class).

**Assignments**
All assignments will be conducted by groups of two students (though students may petition the instructor to expand the group to three). In the first two assignments (Neighborhood Profile and Story Map), students will explore the phenomenon of neighborhood change through in-depth analysis of census and economic data, as well as story-mapping. The Neighborhood Profile will be a Word document of 8-10 pages, plus appendices. The Story Map will consist of an interactive online map, with 3-5 pages of explanatory text.

For the third assignment, students will explore a research question of their own choosing, using big data and/or open data portals, as well as visualization techniques learned in class. This deliverable should include both an online project and a narrative of 15-20 pages, including references. Students will submit a one-page description of their research question and approach in the beginning of April and work closely with the instructors to develop a methodological approach. The semester will culminate with short (12-15 minute) presentations of Assignment 3 (during lab sessions).

**Exam**
There will be a comprehensive midterm examination held after the second module to assess student learning of course topics. The exam will consist of two parts: an in-class quiz (definitions and short answers) based on the class readings and lectures, and an in-lab quiz on map-making, based on the lab exercises and assignments.

**Attendance and Class Participation**
Students are expected to attend every class lecture and lab section. If for some compelling reason a student must miss a lesson or lab, they should alert the instructor ahead of time and may be asked to provide documentation of excuse after the fact. In addition to attending, students are expected to actively contribute to class discussions and ask questions. Participation will be evaluated by instructors based on a combination of attendance, and observed engagement and participation.
Course Materials
CP 101 has three required books and one optional book, in addition to a course reader.

**Required**


**Optional**

We expect you to purchase the books at the student store, or via an online book seller. The reader will be available for purchase at Krishna Copy, 2595 Telegraph Avenue (at Parker).

Lecture slides and other course materials will be posted on the CP 101 bCourses site.

Office Hours
Prof. Karen Chapple (chapple@berkeley.edu): Wed 11 AM-1 PM, 312A Wurster
GSI Alex Garbier (garbier@berkeley.edu): TBD

Statement on Academic Integrity
Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course. You may use words or ideas written by other individuals in publications, websites, or other sources, but only with proper attribution. If you are not clear about the expectations for completing an assignment or taking an exam, be sure to ask a course instructor.

You should also keep in mind that as a member of the campus community you are expected to demonstrate integrity in all of your academic work and be evaluated on your own merits. The consequences of cheating and academic misconduct — including a formal discipline record and possible loss of future opportunities — are not worth the risks.

Statement on Accommodations for Students with Disabilities
If you have been issued a letter of accommodation from the Disabled Students Program (DSP), please see the course lead instructor as soon as possible to work out the necessary
arrangements. If you need an accommodation and have not yet seen a Disability Specialist at the DSP, please do so as soon as possible.

If you would need any assistance in the event of an emergency evacuation of the building, the DSP recommends that you make a plan for this in advance. (Contact the DSP access specialist at 643-6456.)

**Statement on Scheduling Conflicts**
Please notify course instructors by the second week of the term about any known or potential extracurricular conflicts (such as religious observances, graduate or medical school interviews, or team activities). We will try our best to help you with making accommodations, but cannot promise them in all cases.

**Course Schedule - Readings & Assignments**
The course schedule/readings are outlined below.

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**Module 1: Introduction to Data Science for Planners**

*Wednesday, January 18: Introduction to Smart Cities*

Townsend (2013) "Introduction" pg. 1-18 & Chapter 2, "Cybernetics Redux"; pg. 57-92


*Optional:*


Ratti and Clauden (2016) Part I, "The City of Tomorrow (and Today)"; pg. 3-39

*Lab 1 (optional): Introduction to Excel*

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*Monday, January 23: Data Fundamentals for Planners*

Townsend (2013) Chapter 3, "Cities of Tomorrow"; pg. 93-114


Wheelan (2013) Chapter 7, "The Importance of Data"

**Wednesday, January 25: Metadata: Understanding the US Census**


**Lab 2: Excel Basics - Formulas and Generating Charts**

**Monday, January 30: Using Census Data**

*Introduce Module 1 Assignment*


**Optional:**

**Wednesday, February 1: Intro to Statistics for the American Community Survey**

Wheelan (2013) Chapters 2 & 3, "Descriptive Statistics" and "Descriptive Deception"

**Lab 3: Accessing Census Data via American FactFinder**

**Monday, February 6: More on Statistics**


**Optional:**

Wheelan (2013) Chapters 9, 10, & 12; “Inference”, “Polling,” “Common Regression Mistakes”

**Wednesday, February 8: Introduction to Economic Data and the Longitudinal Household-Employment Data**


**Optional:**


**Lab 4: Accessing Census and Economic Data via Social Explorer**

**Monday, February 13: Static Data Visualization**


Optional:
Check out Piktochart for infographics, www.piktochart.com
And the whole Tufte book is great – especially check out Chapter 1, “Graphical Excellence.”

**Wednesday, February 15: Neighborhood Data and Indicators***


Urban Displacement Project, www.urbandisplacement.org [SKIM]

Optional:

Chapple & Zuk, “Forewarned: The Use of Neighborhood Warning Systems for Gentrification and Displacement,”
https://www.huduser.gov/portal/periodicals/cityscape/vol18num3/article5.html

**Lab 5: Accessing Local Employment-Household Dynamics Data** (note: no lab on Friday Feb 17).

**Monday, February 20: NO CLASS!!**

Assignment #1 due Wednesday February 22!!!
Module 2: Mapping the City

Wednesday, February 22: Spatial Data & GIS Fundamentals

Monmonier, Mark. 1996 Chapters 1, 2, 3, 4, and 10 How to Lie with Maps. University of Chicago Press.


Lab 6: CartoDB Part I

Monday, February 27: Volunteered Geographic Information (VGI) (guest speaker: Geoff Boeing)*


Optional:


Wednesday, March 1: Introduction to Story Mapping*
Introduce Module 2 Assignment


Optional, helpful for thinking about examples:
Some examples to review:

- Displacement in the Bay Area: [www.antievictionmappingproject.net](http://www.antievictionmappingproject.net) and [http://www.antievictionmap.com/#/narratives-of-displacement/](http://www.antievictionmap.com/#/narratives-of-displacement/)
- City of Words DC: [http://maps.google.com/gallery/details?id=zfi7hbGPycckg.ktCoxcliDDS0&hl=en](http://maps.google.com/gallery/details?id=zfi7hbGPycckg.ktCoxcliDDS0&hl=en)
- NY Map of Restrooms, [http://m3.mappler.net/nyrestroom/](http://m3.mappler.net/nyrestroom/)

You can find more examples at the Google My Maps Gallery: [http://maps.google.com/gallery?hl=en](http://maps.google.com/gallery?hl=en) and check out ESRI’s gallery for more ideas: [https://storymaps.arcgis.com/en/gallery/#s=0](https://storymaps.arcgis.com/en/gallery/#s=0)

Lab 7: CartoDB Part II (Note: no lab on March 3 due to CED Circus)

**Monday, March 6: Participatory Mapping** (guest speaker Erin McElroy, Anti-Eviction Mapping Project)*


Optional:


**Wednesday, March 8: Power, Place and Mapping**


Lab 8: Story Mapping with Social Explorer, StoryMapJS (https://storymap.knightlab.com/), and Google My Map

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**Module 3: Big Data and Smart Cities**

**Monday, March 13: Introduction to Big Data**


**Optional:**


**Wednesday, March 15: Big Data – and Ethics -- for Planners**


**Optional:**


Assignment #2 due Wednesday March 15!!!

Lab 9: Arc GIS


Wednesday, March 22: In-Class Midterm

Introduce Module 3 Assignment

Lab 10: In-Lab Midterm

Week of March 27-31: NO CLASS, SPRING BREAK!!

Monday, April 3: Introduction to Projections


Optional:


Plan Bay Area (2013), Chapter 2 “The Bay Area in 2040”
http://files.mtc.ca.gov/pdf/Plan_Bay_Area_FINAL/2-The_Bay_Area_In_2040.pdf
Wednesday, April 5: Interactive Visualizations
Proposal for Assignment 3 due


Explore additional interactive visualizations here:
http://polygraph.cool/history/
http://goodcitylife.org/chattymaps/index.html
http://hubcab.org/#13.00/40.7219/-73.9484
http://218consultants.com/interactive-suitability-map/ (Look at all 3 interactive maps)
https://ourworldindata.org/a-history-of-global-living-conditions-in-5-charts/
http://www.urban.org/features/ vision-equitable-dc
and of course, http://www.urbandisplacement.org!

Optional:

Lab 11: WebScraping 101 using Import.io

Monday, April 10: Open Data & Using Portals (guest speaker Steve Spiker, Urban Strategies Council)*

Townsend (2013) Chapter 4, “The Open-Source Metropolis”; pg. 115-141


Optional:

**Wednesday, April 12: Presenting Data**


Optional:

Additional presentation tips:
[http://gradschool.unc.edu/academics/resources/postertips.html](http://gradschool.unc.edu/academics/resources/postertips.html)
[https://policyviz.com/better-presentations/](https://policyviz.com/better-presentations/)

**Lab 12: Accessing and Using Open Data Portals and Big Data**

[http://datausa.io/](http://datausa.io/)
[https://data.sfgov.org/](https://data.sfgov.org/)
[http://www.vitalsigns.mtc.ca.gov/](http://www.vitalsigns.mtc.ca.gov/)
[https://nycopendata.socrata.com/](https://nycopendata.socrata.com/)
Monday, April 17: Defining Smart Cities in Theory and Practice*


Optional:

IBM Smart Cities website,

Wednesday, April 19: Smart Institutions & e-Governance *(guest speaker TBD)*

Townsend (2013) Chapter 7, “Reinventing City Hall”; pg. 194 - 225


Also look over: https://smartcitizen.me/

Lab 13: Presentations Week I

Monday, April 24: Civic Hacking and Equity* *(guest speaker TBD)*


Optional:


Wednesday, April 26: The Inclusive Smart City*


Lab 14: Presentations Week II

Assignment #3 due Friday May 5!!!