

# Data Science for Smart Cities

T 2:00P-4:00P | Wurster 106

Units: 2

Instructor: *Marta C. González*

Design and operation of smart, efficient, and resilient cities nowadays require data science skills. This course provides an introduction to spatial analysis using data from transportation systems, power grids, and communication networks, putting into context their population access via census data. Methods include: network science, introduction to machine learning and complex systems thinking to study urban systems. Programming language is Python.

**Prerequisites:** An undergraduate-level understanding of statistics, and programming skills is assumed

## List of lectures

Lec 1: January 23 <sup>rd</sup>	Introduction to Network Science	
Lec 2: January 30 <sup>th</sup>	Network Metrics	
Lec 3: February 6 <sup>th</sup>	Network Models (SW and RG)	Assignment 1
Lec 4: February 13 <sup>th</sup>	Network Models (Barabasi Model)	Assignment 2
Lec 5: February 20 <sup>th</sup>	Clustering Census Data (cenpy + sandiego)	
Lec 6: February 27 <sup>th</sup>	Clustering Census Data (Georgia example)	Assignment 3_I
March 5 <sup>th</sup> :	No class	Assignment 3_II
Lec 7: March 12 <sup>th</sup>	Discussion of Research Ideas	
Lec 8: March 19 <sup>th</sup>	Centralities and Network Resilience	
March 26 <sup>th</sup>	Spring Recess	
Lec 9: April 2 <sup>nd</sup>	Clustering Networks (Community Detection ,Airports Paper, Guest Lecture )	
Lec 10: April 9 <sup>th</sup>	OSMNx (Google API)	Assignment 4
Lec 11: April 16 <sup>th</sup>	Weighted Networks + BART (GTFS)	
Lec 12: April 23 <sup>rd</sup>	Class Summary Tools of Spatial Analysis	Paper Draft
Final Presentations	Project Presentations (April 30 <sup>th</sup> , May 1 <sup>st</sup> and May 2 <sup>nd</sup> )	

## • Problem sets

	Covers	Assigned	Due
Assignment 1	L1-L2	01/30	02/08
Assignment 2	L3-L4	02/10	02/18
Assignment 3 part 1	L5-L6	02/20	02/28
Assignment 3 part 2	L5-L6	03/01	03/10
Assignment 4	L7-L10	03/12	04/02
Checkup (paper draft)	L1-L12	04/04	04/18
Final Project	L1-14		04/30, 05/01 and 05/02

## • Assignments

- 4 Homework assignments (problem sets)
- 1 Assignment for Project Plan (a Paper Draft)

- 1 Final project: Paper report and oral presentation
  - Unless stated otherwise, problem sets should be solved individually. Electronic versions must be uploaded to the bcourses site.
  - 20% for late assignments reduction for late assignments more than a 48 hours grace period
  - 15% for each problem set (4x15 =60%)
  - 10% Class Participation
  - 15% Project check-up (paper draft)
  - 10% Final project paper
  - 5% Project presentation
- Lectures: Tuesdays 2-4pm
  - Contact information:
    - Prof. Marta C. Gonzalez
    - Office hours: Tuesdays 4:00-5:30 PM @Room 406c; martag@berkeley.edu
    - Thursdays 9:00-10:00 by appointment via email (20 min slots)
    - Via ZOOM <https://berkeley.zoom.us/j/4124372482>

Refer to bourses for the most up-to-date information.

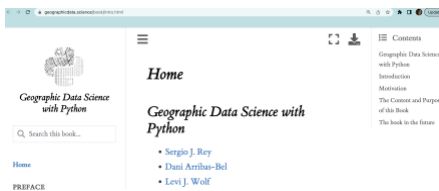
The piazza site is at: <https://piazza.com/berkeley/spring2023/ce88cp88>

### Textbook:

- 1) *FIRST COURSE IN NETWORK SCIENCE*, Author: MENCZER, ISBN: 9781108471138



- 2) Geographic Data Science with Python:



<https://geographicdata.science/book/intro.html> (Clustering & Regionalization)

### Desired Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions