CRD 230 – Spatial Methods in Community Research (Winter 2023)
Department of Human Ecology - University of California, Davis
Lecture: Monday, 10:00-11:50 am, 166 Hunt
Lab: Wednesday, 10:00-11:50 am, 1137 PES

Instructor: Dr. Noli Brazil
Office: 2325 Hart Hall
Email: nbrazil@ucdavis.edu
Office Hours: Monday & Wednesday: 4:30-5:30 or by appointment.
Zoom or in-person. Check Canvas for Zoom link.

Sign up here: https://www.wejoinin.com/sheets/vwzry. Out of courtesy to other students, please do not sign up for more than two 10-minute blocks. If you do, I will keep only the first two blocks. The last 20 minutes are open drop in.

Lab Website: https://crd230.github.io/index.html

Class Overview

Many community socioeconomic and demographic processes such as poverty, crime, healthy food access, school quality, migration, and segregation have important spatial components. Spatial data are becoming more ubiquitous and the tools for managing, processing, examining, and modelling these data are becoming more accessible. This course introduces students to the important theoretical roles that space and place have in community research. Here, the community is broadly defined as a geographic unit with recognizable boundaries that possesses a resident sense of place. The course will also have a large analytical component, exposing students to the acquisition, management, examination, and modelling of spatial data for understanding communities. The course will focus on applications in the social sciences and public health, including demography, epidemiology, sociology, criminology, human geography, public policy, education, and others. This course is “applied” in the sense that we focus on the application of these techniques more than on the derivation of equations. The course assumes you have taken an introductory class in statistics and have familiarity with multivariate statistics such as linear regression. Experience with a statistical package (e.g. Stata, SAS or R) is useful but not required.

Course Objectives

In this course, students will gain:

- A theoretical understanding of the role of space and place in community-level phenomenon
- An understanding of what kinds of spatial data are available and where to find them
- Proficiency in spatial analytic tools (R, ArcGIS) to
  o Manage and process spatial data
  o Descriptively examine spatial data
  o Run spatial models for statistical inference
- An understanding of how these methods are employed in community research
Course Format

All lectures and labs will be in person and not recorded. Most weeks will adhere to the following format: The first meeting of the week will contain (1) me lecturing about methods and (2) us discussing how the week’s readings employ the methods. The second meeting of the week will take place in lab whereby we will apply the methods learned in lecture/discussion using real data in R. All students are expected to actively participate, which means not only being present, but reading all material and engaging in class discussions. This is a survey course for different techniques and approaches in dealing with these data in R.

Course Readings

All required reading material will be posted on Canvas. It is composed of a combination of the following:

1. Journal articles and research reports
2. My handouts

For most topics, in lieu of an article or book chapter, I will provide lecture handouts in advance of the assigned class.

There are also a set of weekly optional readings listed at the end of the syllabus that provide applications of the methods. The other major course material are lab guides, which will be released Tuesday morning each week on the lab website. Many of the R lab guides will closely follow two textbooks. These textbooks are not required, but are great resources.

The first textbook provides the foundation for using R


The textbook is free online at: http://r4ds.had.co.nz/introduction.html

The second textbook covers spatial data in R


The textbook is free online at: https://geocompr.robinlovelace.net/

Course Software

R is the only statistical programming language used in this course, as it has become an increasingly popular program for data analysis in the social sciences. R is freeware and you can download it on your personal laptop and desktop computers (along with
**RStudio**, which is a user friendly interface for R). Note that although the course does not require students to have experience with R, this class does not spend too much time introducing students to the program. In other words, this is a not an introduction to R programming. The lab guides will provide as much detail as possible to execute tasks and functions, but you will likely run into tasks that will require you to go beyond the guides. My suggestion is to (1) look up RDS or GWR as they are excellent resources; (2) work with a classmate to solve the problem together; or if (1) and (2) fail search online. You are expected to do as much independent learning of the software as I teach in the labs. We will also use the GIS program ArcGIS Online.

**Course Requirements**

Students are expected to complete the following course requirements

<table>
<thead>
<tr>
<th>Assignments (4 x 15%)</th>
<th>60%</th>
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</thead>
<tbody>
<tr>
<td>Final course project</td>
<td>40%</td>
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</table>

**Assignments**

Students are required to complete four homework assignments during the quarter which are due approximately every 2 weeks (Assignment 1 will be due in 1 week so it will be shorter). The assignments will largely correspond to the material covered in lectures and labs. Each assignment will ask students to apply methods in R. Collaboration of ideas among participants is encouraged, but the assignments must be completed independently. For each assignment, you will need to submit an R Markdown Rmd and its knitted file on Canvas. Complete assignment guidelines can be found here: [https://crd230.github.io/hw_guidelines.html](https://crd230.github.io/hw_guidelines.html).

Late submissions will be deducted 10% per 24 hours until 72 hours after the submission due time. After 72 hours your submission will not be graded. No exception unless you provide documentation of your illness or bereavement before the due date. If you cannot upload the assignment on Canvas due to technical issues, you must email it as an attachment to me by the submission due time.

**Course project**

Students will conduct a research project using methods discussed in class on a topic of their choosing. A full description of the project can be found in the file final_project_description.pdf located on Canvas. All students must submit a Prospectus. Students have two final project options: (1) StoryMap presentation and a Policy Brief; (2) Final paper and a presentation of any format. Students will present their projects in class. See the agenda for the due dates for each of the deliverables.

**Course Communication**

All office hours will be conducted either in person or Zoom. Please visit office hours with any questions or issues about the material or the course itself before it is too late (i.e., the day before an assignment is due). Please begin the subject line for all emails with “CRD 230:” and maintain professional email etiquette. Email responses may take a couple days, and email will not be checked regularly during evenings and weekends.

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general, any question or concern requiring a reply longer than two sentences is best discussed in office hours.

All course announcements and class material will be on either the course website or Canvas. A discussion board is also available on Canvas to facilitate discussion for getting help from your peers and the instructor.

**Code of Conduct**

Academic Misconduct: Plagiarism and other forms of academic dishonesty will not be tolerated and will have serious consequences. All completed assignments must be original work. If you plagiarize, you will receive a zero on the assignment and suffer disciplinary action. Examples of plagiarism include copying or paraphrasing the work of another person without citing the source, or allowing another person to copy your work. If you are not sure whether something is plagiarism or are unfamiliar with the University Code of Academic Conduct, see http://sja.ucdavis.edu/cac.html. Students who cheat or plagiarize will be reported to the Office of Student Support and Judicial Affairs. Those who violate campus rules on academic misconduct are subject to disciplinary sanctions, including suspension and dismissal from the University. Ignorance of these rules is no defense!

Special Circumstances: Students requiring special accommodations (e.g., disabilities, religious holidays) should notify the instructor by end of the first week so appropriate arrangements can be made. Students sometimes experience personal problems during the term that interfere with their learning. If this happens to you, please meet with an instructor as soon as possible to discuss appropriate resources and develop a plan for managing your coursework.

**COVID-19 Statement**

Masks are still strongly recommended by our public health officials and by UC Davis for vaccinated and unvaccinated people. The university supports those who wish to continue to mask indoors, including those who are immunocompromised or otherwise concerned. Yolo county's official recommendation is that we should be careful and thoughtful and support those who wish to wear a mask while not penalizing those who elect to not wear a mask or make assumptions about why they are doing so.


Your health and well-being are of paramount importance. You may also be primary care givers and might have substantial and increased demands on your time. You may not be
able meet the requirements of the course, for any number of other reasons. Reach out to us, if you need any help, including if you need extensions or want to take an Incomplete or deal with it differently. We will deal with these on ad-hoc basis.

During the quarter, you may be required to quarantine or self-isolate to avoid the risk of infection to others. Quarantine is the separation of those who have been exposed to someone with Covid-19 but who are not ill; isolation is the separation of those who have tested positive for Covid-19 or been diagnosed with COVID-19 by symptoms. Check the UC Davis COVID-19 reporting site for information regarding your responsibility in reporting a COVID-19 positive test: https://safetyservices.ucdavis.edu/coronavirus/reporting-concerns-confirmed-cases

These uncertain times can be difficult, and many students may need help in dealing with stress and mental health. The following are several helpful university resources available to students. Student Health and Counseling Services (SHCS): General information at 752-2300 (shcs.ucdavis.edu); Making an appointment (https://shcs.ucdavis.edu/hem); Call the 24 hour SHCS Counseling Line (530) 752-0871 for crisis support; Counseling Services at shcs.ucdavis.edu/services/counseling.html; For urgent needs you can call 752-2349 or walk in to speak with an advice/triage nurse. For confidential Advice Nurse services when SHCS is closed, students can call the Student Health Advice Nurse at 752-2349. Drop-in Workshops provide workshops on Mindfulness, Self-Care, Coping with Anxiety, and Coping with Emotions, among others (https://shcs.ucdavis.edu/services/groups). Each Aggie Matters helps de-stigmatize mental health concerns and provides consolidated mental health resources to students (https://eachaggiematters.ucdavis.edu).

Need help knowing where to go or what to do as a student: https://ebeler.faculty.ucdavis.edu/resources/faq-student-resources/
**Course Agenda**

*The schedule is subject to revision throughout the quarter. See Course Readings to see full reading references and optional readings.*

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
<th>Assignment due</th>
<th>Project due</th>
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<tbody>
<tr>
<td>M 1/9</td>
<td>Introduction to class</td>
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<td></td>
<td>Introduction to the U.S. Census</td>
<td>Handout 1</td>
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<tr>
<td>W 1/11</td>
<td>Introduction to R</td>
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<td>M 1/16</td>
<td>Martin Luther King Jr. Day: No class</td>
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<tr>
<td>W 1/18</td>
<td>Working with U.S. Census data in R</td>
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<tr>
<td>M 1/23</td>
<td>Introduction to spatial data</td>
<td>Handout 2</td>
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<tr>
<td>W 1/25</td>
<td>Introduction to spatial data in R</td>
<td></td>
<td>HW 1</td>
<td></td>
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<tr>
<td>M 1/30</td>
<td>Big data and Open data</td>
<td>Handout 3</td>
<td></td>
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<tr>
<td>W 2/1</td>
<td>Working with Open and Big data in R</td>
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<td>M 2/6</td>
<td>Spatial accessibility</td>
<td>Handout 4</td>
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<tr>
<td>W 2/8</td>
<td>Spatial accessibility in R</td>
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<td>HW 2</td>
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<td>M 2/13</td>
<td>Community vulnerability</td>
<td>Handout 5</td>
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<td>Date</td>
<td>Topic</td>
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<td>Project due</td>
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<td>W 2/15</td>
<td>Community vulnerability in R</td>
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<td>M 2/20</td>
<td>President’s Day: No Class</td>
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<tr>
<td>W 2/22</td>
<td>Spatial autocorrelation in R</td>
<td>Handout 6</td>
<td>HW 3</td>
<td></td>
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<td>M 2/27</td>
<td>Spatial regression</td>
<td>Handout 7</td>
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<td>Proposal</td>
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<tr>
<td>W 3/1</td>
<td>Spatial regression in R</td>
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<td>M 3/6</td>
<td>Social network analysis</td>
<td>Handout 8</td>
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<td>W 3/8</td>
<td>Social network analysis in R</td>
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<td>HW 4</td>
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<td>W 3/15</td>
<td>TBD</td>
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<tr>
<td>TBD</td>
<td>In-class presentations. Time and Location TBD</td>
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<td>Presentation</td>
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<tr>
<td>TBD</td>
<td>Final project paper/policy brief due on Canvas</td>
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<td>Final report</td>
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Course Readings

Introduction to the U.S. Census

Handout 1: Introduction to the U.S. Census

Optional: None

Introduction to Spatial Data

Handout 2: Introduction to Spatial Data

Optional:


Big Data and Open Data

Handout 3: Urban Analytics: Introduction to Big Data and Open Data

Optional:


**Spatial Accessibility**

Handout 4: Spatial Accessibility

Optional:


**Community Vulnerability**

Handout 5: Measuring Community Vulnerability

Optional:


Spatial Autocorrelation

Handout 6: Spatial Autocorrelation

Optional:


Spatial Regression

Handout 7: Spatial Regression

Optional:


**Social Network Analysis**

**Handout 8: Social Network Analysis**

**Optional:**


**Story Maps**


**Optional:**
