THE OHIO STATE UNIVERSITY

College of Arts and Sciences
Department of Geography

SYLLABUS

GEOG 5229: Emerging Topics in GIS

Spatial data analytics in R

Autumn 2025
3 credit hours
3:55-5:15 TR, Derby 135

CONTENTS

COURSE OVERVIEW

Instructors

Instructor: Dr. Huyen Le

Email: le.253@osu.edu

Office hours: 2-3 Monday, 2:30-3:30 Thu, and by appointment (request via email)

Prerequisites

GEOG 5210 or equivalent (with basic knowledge of spatial data), or as approved by the instructor.

Course description

This course introduces you to R, one of the most popular programming languages, and spatial analysis in R. We will start with the basics of R programming, and transition to R spatial data processing, analysis, and mapping. The lab examples in this class cover various applications of spatial data analytics in the real world, such as urban studies, transportation, environmental sciences, and public health.

Course learning outcomes

Upon successful completion of this course, students should be able to:

1. Demonstrate familiarity with common R libraries for spatial data analysis and visualization
2. Identify various approaches to load, read, and write spatial data
3. Writing R scripts process and analyze non-spatial and spatial data
4. Visualize spatial data in R
5. Apply various data analysis techniques to make sense of spatial data in real-world applications

HOW THIS COURSE WORKS

Mode of delivery: This class is in-person. All learning materials will be uploaded on Carmen Canvas. There will be additional components:

- General lectures on R functions, workflow, and applications
- In-class quizzes and group exercise/discussion
- Labs
- In-person office hours.

Credit hours and work expectations: This is a **3-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (instructor content, group and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

Communications with instructor: Questions related to class materials should be posted on Carmen Canvas discussion forum. Make sure you include a detailed description of the problem and attach a screenshot if applicable. You are encouraged to help your classmates out if you know the answers, but make sure you are not violating the code of student conduct (e.g., do not upload your assignment or show them the exact answer to complete their assignments). ***Email me if you have questions related to personal issues and/or when you want to send me the code. Make sure that you put "GEOG 5229" in the subject line.***

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

Geocomputation with R, Robin Lovelace, Jakub Nowosad, & Jannes Muenchow, CRC Press.
This book is freely available online at https://geocompr.robinlovelace.net/index.html.

Recommended texts:
An introduction to R for spatial analysis and mapping, Chris Brunsdon and Lex Comber, Sage 2nd edition.
There will be other supplemental readings such as academic peer-reviewed journal articles that are available through the OSU library website and CarmenCanvas.

Course technology

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** ocio.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu
- **TDD:** 614-688-8743

Technology skills needed for this course

- Newest R and RStudio version
- Familiarity with spatial analysis in ArcGIS or QGIS
- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration (go.osu.edu/video-assignment-guide)
- Recording, editing, and uploading video (go.osu.edu/video-assignment-guide)

Required equipment

- Computer: current Mac (Mac OS) or PC (Windows 10 or higher) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested

- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

- Most recent (or 2nd most recent) version of R, which is a free and open source program for statistical computing and graphics (https://www.r-project.org/). Its privacy policy can be found at https://www.r-statistics.com/privacy-policy/.
- RStudio version 1.2.1335 or newer (https://rstudio.com/products/rstudio/), which is a shell for enhanced visualization and programming. Its privacy policy can be found at https://www.rstudio.com/about/privacy-policy/.
- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

Carmen access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (go.osu.edu/add-device).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (go.osu.edu/install-duo) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

GRADING AND FEEDBACK

How your grade is calculated

All submissions must be made via Carmen Canvas on the due date to be considered on time. All lab assignments are due on Monday 11:59 PM except for holidays.

CATEGORY	POINTS	OCCURRENCE	DUE DATES
Participation (including discussion, quizzes, short lab outputs)	15%	Multiple	N/A
Lab assignments	60%	Multiple	Monday (check Canvas for specific dates)

CATEGORY	POINTS	OCCURRENCE	DUE DATES
Final project	25%	Once, with 3 milestones	TBD
Total	**100%**		

Participation (15%)

Class participation is required and accounts for 15% of the total grade. Attendance will be taken through online Carmen quizzes and/or real-time in-class quizzes, as well as in-class discussions based on the readings.

If you have excuses, please notify me before class. Excuses after class, except for certain emergencies, will not be accepted.

Lab assignments (60%)

You will have multiple lab assignments throughout the semester. The lab assignments are designed to help you apply the R functions introduced in class to real-world mini-projects such as traffic crashes, air quality modeling, and assessing equity issues. Instructions will be provided to guide you through the steps in the lab. Discussion forums and office hours will be available to help you troubleshoot the coding problems that you encounter in the lab.

You will submit the HTML outputs from your R markdown code for grading, along with a short memo to summarize the results. Detailed guidelines and rubrics are available on Carmen Canvas.

Final project (25%)

You are expected to consult with me during the semester about the topic, data gathering, and analysis. You will turn in a short proposal, half-time progress, and final paper for grading on Carmen Canvas.

Extra credit (up to 2%)

There may be potential for extra credit when you volunteer for local planning agencies (e.g., MORPC, Franklin County Public Health) on certain activities, such as deloying and maintaining air quality sensors (no prior knowledge required) or performing simple analyses. Please note that these activities are only available contingent on these agencies' need, and the number of slots might be limited. I will post any opportunities on Carmen Canvas when they become available.

Details about each assignment, including guidelines and rubric, will be made available on Carmen Canvas.

Late submissions

By default, late submissions of assignments and final project (or paper) are subject to 5% grade reduction for each late day. **I will NOT accept submissions that are more than 10 late days, unless you have permission from me before or on the due date.** Late submission is always better than no submission.

You have one opportunity to extend your deadline for one day during the semester (indicate it in your submission to get full credit). This extension will be applied to an assignment of your choice (including the final paper). No permission is required; you will indicate in your submission that you are using the one-day extension. We suggest

that you use this opportunity wisely and reserve it for the end of the semester when the workload is unusually high.

In case of personal and family emergencies, please notify me as soon as possible so that we can work out a new submission time. Such extensions will be granted on a case-by-case basis. If you fail to notify the instructor by 5 days after the deadline, your excuses will not be accepted and all blanket policies in this class will apply.

Grading scale

A	A-	B+	B	B-	C+	C	C-	D+	D	E
≥93%	90-92%	87-89%	83-86%	80-82%	77-79%	73-76%	70-72%	67-69%	60-66%	<60%

Feedback and response time

We are providing the following list to give you an idea of our intended availability throughout the course. (Remember that you can call **614-688-4357(HELP)** at any time if you have a technical problem).

- **Grading and feedback:** For large assignments, you can generally expect feedback within **20 school days**, unless emergencies occur to the instructor.
- **Email:** I will reply to emails within **48 hours on school days when class is in session at the university**.

OTHER COURSE POLICIES

Academic integrity policy related to AI

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

Using AI as a research or troubleshooting tool is permitted in this class with caution: current large language models are known for producing misleading information (i.e., AI hallucination) or codes that don't operate correctly on your machine. **You may not use direct AI outputs as part of your papers in this class. All usage of AI for class assignments should be acknowledged at the end of your paper.** We strongly recommend that you use version control while working on your assignment (e.g., Google Docs or Microsoft Word that syncs to your OneDrive or other cloud services).

If we suspect that a student has committed academic misconduct in this course, we are obligated by university rules to report my suspicions to the Committee on Academic Misconduct (COAM). COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact us.

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Additional OSU Policies

The following website: https://ugeducation.osu.edu/academics/syllabus-policies-statements/standard-syllabus-statements contains the Ohio State University's policies regarding:

- Academic Misconduct
- Artificial Intelligence and Academic Integrity
- Religious Accommodations
- Disability Statement with Accommodations for Illness
- Intellectual Diversity
- Grievances and Solving Problems
- Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The following website: https://ugeducation.osu.edu/academics/syllabus-policies-statements/optional-syllabus-statements contains the Ohio State University's policies regarding:

- Counseling and Consultation Services / Mental Health Statement
- Content Warning Language
- Military-Connected Students

COURSE SCHEDULE

This schedule is subject to change. Last updated: 8/25/2025. Please check CarmenCanvasregularly for the most up-to-date schedule.

Week	Start dates	Topics	Major submissions (subject to changes)
1	**8/26**	Introduction: Installing R, RStudio, and libraries Basic R functions and operations	
2	**9/2**	Visualizing non-spatial and spatial data ***Play with Swirl***	
3	**9/9**	Mapping in R	
4	**9/16**	Mapping with R (cont) Non-spatial data processing	**X**
5	**9/23**	Spatial data processing	

Week	Start dates	Topics	Major submissions (subject to changes)
6	**9/30**	Spatial data processing (cont)	
7	**10/7**	Loading and working with data from APIs Geocoding Application: Traffic crash analysis	**X**
8	**10/14**	Application: Traffic crash analysis 2 ***Autumn break - no class on Thu***	**X**
9	**10/21**	Application: Traffic crash analysis 2 (cont) Application: Accessibility – Shortest distance and floating catchment area	
10	**10/28**	Application: Accessibility – Shortest distance and floating catchment area (cont)	**X**
11	**11/4**	Application: Environmental exposure	**X**
12	**11/11**	***No class on Tue - Veteran's Day*** Application: Accessibility – Transit access and travel time isochrones	**X**
13	**11/18**	Application: Accessibility – Transit access and travel time isochrones (cont) Application: Spatial social network analysis	**X**
14	**11/25**	***Thanksgiving break*** ***No class on Tue and Thu.*** *Work on your final project on Tue.*	
15	**12/2**	Work on final project Final project presentations	
16	**12/9**	**Class wrap-up** *No class on Thu*	**Final project**