



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 6530

INTRODUCTION TO SPATIAL STATISTICS

SPRING 2026

Course overview

Instructor

Instructor: Radu Herbei

Email address: herbei.1@osu.edu

Office hours: By appointment, via Carmen Zoom or in person (Zoom link provided on Carmen).

Office Location: CH 223.

Course description

STAT 6530 provides an introduction to the statistical analysis of spatial data. Topics include: defining geostatistical, areal and point processes, visualizing spatial data, covariance functions, prediction, kriging, spatial autoregressive models, intensity functions, and others.

Course learning outcomes

- Students will be able to conduct appropriate exploratory data analyses when observations are collected over a spatial domain.
- Students will be able to select an appropriate probabilistic model for spatial data.
- Students will be able to develop some theoretical results regarding spatial probability models.
- Students will perform statistical inference (parameter estimation, prediction) for spatial probability models.

Course materials

- *Applied Spatial Statistics for Public Health Data*, by Waller and Gotway, Wiley 2004. You can access the e-book here: <https://onlinelibrary.wiley.com/doi/book/10.1002/0471662682>
- *Statistics for Spatial Data*, by N. Cressie, Wiley, 1993. Book is accessible here: <https://onlinelibrary.wiley.com/doi/book/10.1002/9781119115151>
- *Statistical Methods for Spatial Data Analysis*, by Schabenberger and Gotway, Chapman and Hall, <https://doi-org.proxy.lib.ohio-state.edu/10.1201/9781315275086>
- *Hierarchical Modeling and Analysis for Spatial Data*, by Banerjee, Carlin and Gelfand, <https://www.taylorfrancis.com/books/mono/10.1201/b17115/hierarchical-modeling-analysis-spatial-data-bradley-carlin-sudipto-banerjee-alan-gelfand>

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenZoom
- Collaborating in CarmenWiki
- Recording a slide presentation with audio narration
- Recording, editing, and uploading video

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- Throughout the course the primary computing language we will use is called R (<http://www.r-project.org>). Students should be relatively familiar with R from its use in the pre-requisite courses. Here is some information:
 - You can download R for Windows, Mac and Linux from the CRAN archive at <https://cran.r-project.org>
 - An in-depth introduction to R is available at <http://cran.r-project.org/doc/manuals/R-intro.pdf>
- **Microsoft Office 365 ProPlus** All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft’s Student Advantage program.
 - Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform.
 - Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.

Course delivery

The class meets on WF from 11:30am – 12:25am in EC0243. The class is offered “in-person”. Unless mandated by the University, the class will not have a parallel online content-delivery system. At the instructor’s discretion, certain lectures may be recorded and/or delivered online only. The instructor is available for office hours via CarmenZoom or in-person, by appointment. Please send me an email asking for an appointment and I will do my best to find the earliest time that is convenient for both us.

Grading and faculty response

Grades

Assignment or category	Percentage
Attendance and In-Class Participation	10%
7 x In-class Assessments (10% each)	70%
2 x Take-home data analysis projects (10% each)	20%
Total	100%

Assignment information

Homework: I will not assign and collect homework for grading purposes. The textbooks listed above contain a collection of practice problems. Students are encouraged to attempt many of these problems in preparation for in-class assessments. A weekly list of suggested practice problems and/or tasks will be available on Carmen.

In-class participation. Students are expected to attend each class and participate in the discussion (ask and answer questions, share opinions, etc.). I will take attendance on a random basis. If you'll miss a class, I hope that you will send me a short note, to let me know.

In-class assessments: We will have regular (every two weeks) in-class assessments. These will take roughly 30 minutes. Each assessment will contain 2-3 problems or narrative questions on the topics covered in class most recently. The tentative dates for these assessments are:

- A1: January 23, 2026. (Friday)
- A2: February 6, 2026. (Friday)
- A3: February 20, 2026. (Friday)
- A4: March 6, 2026. (Friday)
- A5: March 27, 2026. (Friday)
- A6: April 10, 2026. (Friday)
- A7: April 24, 2026 (Friday)

Take-home projects. There will be two take-home data analysis projects. Information will be available on Carmen well in advance and you will have a minimum of two weeks to complete these projects. Your write-up will be submitted via Carmen. The tentative dates for submitting these projects are: (1) end of February and (2) end of the semester. Specific dates will be provided later.

Late assignments

Generally, late assignments are not accepted, and written documentation is required for missed assignments. If you are unable to complete an assignment on time, please get in touch with me *as soon as possible* so we can discuss your situation.

Grading scale

93–100: A 90–92.9: A- 87–89.9: B+ 83–86.9: B
 80–82.9: B- 77–79.9: C+ 73–76.9: C 70–72.9: C-
 67–69.9: D+ 60–66.9: D Below 60: E

Faculty feedback and response time

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

Grading and feedback

For large assignments, you can generally expect feedback within **7 days**.

E-mail

I will reply to e-mails within **24 hours on school days**.

Discussion board

I will check and reply to messages in the discussion boards every **24 hours on school days**.

Attendance, participation, and discussions

Student participation requirements

The following is a summary of everyone's expected participation:

- Since the class is offered in-person, students are required to attend class **in person**.
- **Logging in: AT LEAST ONCE PER WEEK**
Be sure you are logging in to the course in Carmen each week, including weeks with holidays or weeks with minimal online course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Office hours and live sessions: OPTIONAL OR FLEXIBLE**
My office hours, are optional. If you wish to discuss an assignment with me, please contact me if you need a time outside my scheduled office hours.
- **Participating in discussion forums: OPTIONAL**
You are encouraged to participate in discussion forums, if you choose to do so.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** Your solutions must be clean (no excessive cross-outs). You must use logical arguments and you must justify each step of your derivation. You should remember to write using good grammar, spelling, and punctuation.

- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Other course policies

Health and safety

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (<https://wexnermedical.osu.edu/features/coronavirus>) includes the latest information about COVID-19 as well as guidance for students, faculty and staff.

I expect that you will read and follow the guidelines and requirements for campus safety, which are available at <https://safeandhealthy.osu.edu>.

Student academic services

Student academic services offered on the OSU main campus
<http://advising.osu.edu/welcome.shtml>.

Student support services

Student support services offered on the OSU main campus: <https://studentlife.osu.edu>

Academic integrity policy

Policies for this course

- **Quizzes and exams:** You must complete the take-home projects by yourself, without any external help or communication. Specific instruction on what is allowed will be given once the assignments are posted to Carmen.
- **Written assignments:** Your written assignments, including discussion posts, should be your own original work. You are encouraged to ask a trusted person to proofread your assignments before you turn them in--but no one else should revise or rewrite your work.

- **Re-using past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- **Falsifying research or results:** All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer-review:** The course includes opportunities for collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

ACADEMIC MISCONDUCT

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the [Committee on Academic Misconduct](#) (COAM) expect that all students have read and understand the University's [Code of Student Conduct](#), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

ARTIFICIAL INTELLIGENCE AND ACADEMIC INTEGRITY

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite, and others. These tools will help

shape the future of work, research and technology, but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship, or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas or other work that is not your own. These requirements apply to all students undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

RELIGIOUS ACCOMMODATIONS

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement **and** the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to

work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the [Civil Rights Compliance Office](#).

Policy: [Religious Holidays, Holy Days and Observances](#)

DISABILITY STATEMENT (WITH ACCOMMODATIONS FOR ILLNESS)

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If students anticipate or experience academic barriers based on a disability (including mental health and medical conditions, whether chronic or temporary), they should let their instructor know immediately so that they can privately discuss options. Students do not need to disclose specific information about a disability to faculty. To establish reasonable accommodations, students may be asked to register with Student Life Disability Services (see below for campus-specific contact information). After registration, students should make arrangements with their instructors as soon as possible to discuss your accommodations so that accommodations may be implemented in a timely fashion.

If students are ill and need to miss class, including if they are staying home and away from others while experiencing symptoms of viral infection or fever, they should let their instructor know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations.

slds@osu.edu

<https://slds.osu.edu/>

098 Baker Hall, 113 W. 12th Ave

614-292-3307 phone

INTELLECTUAL DIVERSITY

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

GRIEVANCES AND SOLVING PROBLEMS

According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-8-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

CREATING AN ENVIRONMENT FREE FROM HARASSMENT, DISCRIMINATION, AND SEXUAL MISCONDUCT

The Ohio State University is committed to building and maintaining a welcoming community. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office (CRCO):

Online reporting form: <http://civilrights.osu.edu/>

Call 614-247-5838 or TTY 614-688-8605

civilrights@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who

supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Copyright disclaimer

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. **You must obtain my permission before sharing any of the materials associated with this course with others not enrolled in the class.**

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

Tentative Schedule

Week	Dates	Topics, Readings, Assignments, Deadlines
1	1/12 – 1/16	Introduction. Geostatistical processes.
2	1/19 – 1/23	Gaussian processes.
3	1/26– 1/30	Variograms.
4	2/2 – 2/6	Variogram estimation.
5	2/9 – 2/13	Inference for geostatistical processes.
6	2/16 – 2/20	Inference for geostatistical processes.
7	2/23 – 2/27	Prediction (kriging).
8	3/2 – 3/6	Areal processes.
9	3/9 – 3/13	Gaussian Markov random fields (GMRF).
10	3/16 – 3/20	SPRING BREAK.

Week	Dates	Topics, Readings, Assignments, Deadlines
11	3/23 – 3/27	Autoregressive models.
12	3/30 – 4/3	Point processes.
13	4/6 – 4/10	Point processes.
14	4/13 – 4/17	Poisson, Hawkes, Cox processes.
15	4/20 – 4/24	Intensity estimation. Ripley's K-function.