

GEOG 3211A – Spatial Data Analysis (Spatial Statistics)

Course Outline: Section 001 Fall 2024

This course is taught in-person

1. Course Information

*Details about design and delivery of the course are listed below in Section 6



| Classes Start | Fall Reading Week | Classes End | Study day(s) | Exam Period |
|---------------|-------------------|-------------|----------------|---------------|
| September 5 | October 14-20 | December 6 | December 7 & 8 | December 9-22 |

September 13, 2024: Last day to add a second-term half course

September 30, 2024: National Day for Truth and Reconciliation (observed as a non-instructional day at Western).

October 14, 2024: Thanksgiving Holiday

November 30, 2024: Last day to drop a first term half course without penalty



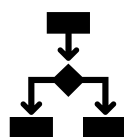
| Course Instructor | Contact Information | Office Hours |
|------------------------|---------------------|--------------------------|
| Professor Jinhyung Lee | jinhyung.lee@uwo.ca | By appointment via email |

| Teaching Assistant(s) | Contact Information | Office Hours |
|-----------------------|---------------------|--------------|
| TBD | TBD | TBD |

2. Calendar Description

Topics include exploratory spatial data analysis, global and local spatial statistics, spatial autocorrelation, spatial regression models, and geographically weighted regression.

The emphasis will be on developing analytical skills with practical applications using statistical software and geographic information systems & sciences.



2 lecture hours, 2 laboratory hours, 0.5 course

Prerequisite(s): Third or fourth year status at the University, Geography 2220A/B and one of Geography 2210A/B, Biology 2244A/B or Statistical Sciences 2244A/B, or other equivalent, or permission of the instructor.

Prerequisite checking is the student's responsibility

Senate Regulations state, “unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.”

3. Textbook

A HIGHLY **RECOMMENDED** textbook is below:



Guangqing Chi and Jun Zhu, *Spatial Regression Models for the Social Sciences* (2019), ISBN 154430207X, Sage Publications.

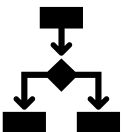
All other course material including lecture slides and lab tutorials will be posted to OWL Brightspace: <https://westernu.brightspace.com/>

Any changes will be indicated on the OWL site and discussed with the class

4. Course Objectives and Format

Course objectives:

- I. Understand a variety of spatial statistical methods for analyzing geographic data.
- II. Obtain skills in using reproducible geographic data science (e.g., Python programming) and GIS software for analyzing spatial data.
- III. Interpret results obtained by using methods of spatial statistics.



| Mode | Dates | Time | Frequency |
|---------------------|---------|----------------|-----------|
| Lecture – in-person | Mondays | 1:30 – 2:45 PM | Weekly |
| Lab – in-person | Mondays | 3:00 – 5:30 PM | Weekly |

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click [here](#). [Using the right browser is important, especially when using different features integrated with OWL]

If students need assistance, they can seek support on the [OWL Help page](#). Alternatively, they can contact the [Western Technology Services Helpdesk](#). They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Generative AI Policy

Overall, this course does not strictly constrain your use of generative AI tools (e.g., ChatGPT, Dall-E). You are encouraged to utilize these emerging AI tools creatively. However, **there is one exception: you cannot use these tools to write your drafts** (e.g., Assignments). Using generative AI tools to edit your writing (e.g., for grammar errors) is acceptable, but you should not rely on them to create the original draft. **Getting technical help (e.g., R/Python code) or information (e.g., search queries) from generative AI tools is permissible.** However, please be mindful of the potential biases and inaccuracies in the responses from generative AI tools.

6. Course Content and Schedule

General

| Week | Dates (Monday) | Topic | Lab |
|------|----------------|-----------------------------------------------------------------------------------------|----------------------------------------------|
| 1 | Sep 2 | N/A | N/A |
| 2 | Sep 9 | Course overview and introduction + CyberGISX Python environment set-up | CyberGISX preparation |
| 3 | Sep 16 | What is spatial data and spatial statistics? + Exploratory spatial data analysis (ESDA) | Lab 1 Assignment 1 |
| 4 | Sep 23 | Point pattern analysis - Part 1 | Lab 2 Assignment 1 help |
| 5 | Sep 30 | Point pattern analysis - Part 2 | Lab 3 Assignment 2 |
| 6 | Oct 7 | Spatial autocorrelation - Part 1 (Pre-spatial autocorrelation) | Assignment 2 help |
| 7 | Oct 14 | Thanksgiving Holiday | N/A |
| 8 | Oct 21 | Exam 1 | N/A |
| 9 | Oct 28 | Spatial autocorrelation - Part 2 (Global and local spatial autocorrelation) | Lab 4 Assignment 3 |
| 10 | Nov 4 | Spatial regression - Part 1 (Introduction to regression) | Assignment 3 help |
| 11 | Nov 11 | Spatial regression - Part 2 (Spatial lag and error models) | Lab 5 Assignment 4 |
| 12 | Nov 18 | Spatial regression - Part 3 (Geographically weighted regression) | Assignment 4 help |
| 13 | Nov 25 | Lab 6 + Assignment 4 help | Assignment 4 help |
| 14 | Dec 2 | Exam 2 | N/A |

Lab

| | Topic | Date | Format |
|-------|-------------------------------------------------|--------|-----------------------------------------------------------------|
| Lab 1 | Intro to Python and CyberGISX Jupyter Notebook | Sep 16 | In-class, hands-on exercises with live-demonstrations by the TA |
| Lab 2 | Spatial data and basic mapping using Python | Sep 23 | |
| Lab 3 | Point pattern analysis using Python | Sep 30 | |
| Lab 4 | Global and Local Moran's I using Python | Oct 28 | |
| Lab 5 | Spatial regression using Python | Nov 11 | |
| Lab 6 | Geographically weighted regression using Python | Nov 25 | |

Exam

| | Scope | Time | Format |
|--------|-----------|----------------------------------------------------|-----------------------------|
| Exam 1 | Week 1-7 | In class time, Monday, Oct 21 st , 2024 | Short/long answer questions |
| Exam 2 | Week 9-13 | In class time, Monday, Dec 2 nd , 2024 | Short/long answer questions |

Assignment

| | Topic | Assigned date | Due date |
|--------------|-----------------------------------------------|---------------|----------|
| Assignment 1 | Exploratory spatial data analysis using GeoDa | Sep 16 | Varies |
| Assignment 2 | Point pattern analysis using Python | Sep 30 | |
| Assignment 3 | Spatial autocorrelation analysis using Python | Oct 28 | |
| Assignment 4 | Spatial regression analysis using Python | Nov 11 | |

7. Communication



- Students should check the OWL site every 24 – 48 hours
- For any other communication, the centrally administered **e-mail account** provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts [here](#).
- Emails will be monitored daily; students will receive a response in 24 – 48 hours, **excluding weekends**

8. Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

| Assessment | Weighting |
|--------------|-----------|
| Assignment 1 | 10% |
| Assignment 2 | 15% |
| Assignment 3 | 17.5% |
| Assignment 4 | 17.5% |
| Exam 1 | 20% |
| Exam 2 | 20% |

The evaluation methods described in the course outline are essential requirements for the course.

Students are responsible for material covered in the lectures as well as the assigned chapters/sections in the text.



- All assignments are due at **11:55 pm EST** unless otherwise specified.
- Assignments will be accepted up to **48 hrs** after their scheduled due date, excluding weekends (e.g., if your lab is due on a Tuesday, you have until Thursday to hand it in).
- After an assessment is returned, students should **wait 24 hours** to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days.

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

| | | |
|----|----------|-----------------------------------------------------------------|
| A+ | 90-100 | One could scarcely expect better from a student at this level |
| A | 80-89 | Superior work which is clearly above average |
| B | 70-79 | Good work, meeting all requirements, and eminently satisfactory |
| C | 60-69 | Competent work, meeting requirements |
| D | 50-59 | Fair work, minimally acceptable |
| F | below 50 | Fail |

Information about late or missed evaluations:

- Assignments will **NOT be accepted for grading more than 48 hours** (excluding weekends) after the scheduled due date & time (e.g., if your assignment is due on a Tuesday, you have until Thursday to hand it in).
- Late assessments **without** an academic consideration request will be subject to a late penalty of **10 %/day**.
- Late assessments **with** an academic consideration request - please discuss the new submission deadline with Dr. Lee.

Grades will not be adjusted on the basis of need. It is important to monitor your performance in the course. Remember: *You* are responsible for your grades in this course.

9. Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: [Academic Accommodation for Students with Disabilities](#).

General Information about missed work:

University policy on academic considerations are described [here](#). This policy requires that all requests for academic considerations must be accompanied by a self-attestation. Further information about academic considerations, and information about submitting this self-attestation with your academic consideration request may be found here.

Please note that any academic considerations granted in this course will be determined by the instructor, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course outline.

Absence from Course Commitments

Students must familiarize themselves with the [Policy on Academic Consideration – Undergraduate Students in First Entry Programs](#)

Students missing course work for medical, compassionate or extenuating circumstances can request academic consideration by completing a request at the central academic consideration portal. Students are permitted one academic consideration request per course per term without supporting documentation. Note that supporting documentation is **always** required for academic consideration requests for examinations scheduled by the office of the registrar (e.g. December and April exams) and for practical laboratory and performance tests typically schedule during the last week of the term. Students should also note that the instructor may

designate one assessment per course per term that requires supporting documentation. This designated assessment is described elsewhere in this document. Please note that any academic considerations granted in this course will be determined by the instructor of this course, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course outline. Supporting documentation for academic considerations for absences due to illness should use the Student Medical Certificate or, where that is not possible, equivalent documentation by a health care practitioner.

Course Assessments that Require Supporting Documentation

For this course the following assessment has been designated as requiring supporting documentation:

Exam 2 (December 2, 2024)

Accommodation for Religious Holidays

Students should review the policy for Accommodation for Religious Holidays. Where a student will be unable to write examinations and term tests due to a conflicting religious holiday, they should inform their instructors as soon as possible but not later than two weeks prior to writing the examination/term test. In the case of conflict with a midterm test, students should inform their instructor as soon as possible but not later than one week prior to the midterm.

10. How to Be Successful in this Class:

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule time at the start of each week to get organized and manage your time.
2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
3. Follow weekly checklists created on OWL or create your own to help you stay on track.
4. Take notes as you go through the lesson material. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively.
5. Connect with others. Try forming a study group and try meeting on a weekly basis for study and peer support.
6. Do not be afraid to ask questions. If you are struggling with a topic, check the online discussion boards or contact your instructor(s) and or teaching assistant(s).
7. Reward yourself for successes. It seems easier to motivate ourselves knowing that there is something waiting for us at the end of the task.



11. Academic Offences

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

12. Western's Commitment to Accessibility

The Department of Geography and Environment strives at all times to provide accessibility to all faculty, staff, students and visitors in a way that respects the dignity and independence of people with disabilities.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2147 for any specific question regarding an accommodation. [Information regarding accommodation of exams](#) is available on the Registrar's website.

More information about "[Accessibility at Western](#)" is available.

13. Mental Health

If you or someone you know is experiencing distress, there are several resources here at Western to assist you. Please visit Western's [Health and Wellness website](#) for more information on mental health resources.

14. Support Services

[Western's Support Services](#)
[Student Development Centre](#)

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

15. Important Dates

September 5: Classes resume

September 13: Last day to add a first term half course

October 14: Thanksgiving Holiday – Department Office Closed

October 14-20: Fall Reading Week (No classes; Department Office open)

November 30: Last day to drop a first term half course or a full course without penalty

December 6: Classes end

December 7 and 8: Study days

December 9-22: Examination Period