

## GEOG 639 Advanced Spatial Analysis

Winter 2024  
120949

| Section | Days | Time        | Location |
|---------|------|-------------|----------|
| LEC 01  | TR   | 14.00-15.15 | ES342    |
| LAB B01 | F    | 8.00-10.45  | ES415    |

|  |                             |
|--|-----------------------------|
| Instructor: Dr. S. Bertazzon                                     | Office: ES 336              |
| Telephone: 403-220-7355  | Email: bertazzs@ucalgary.ca |
| Email communication will be through your UCalgary email address. | Office hours: TBA           |

The **Department of Geography** condemns the longstanding and continued injustices against those marginalized by racism, sexism, homophobia, transphobia, classism, xenophobia, able-bodied normativity, mental health profiling, and other forms of prejudice. We are pained by the fact that injustices are unevenly borne. <https://arts.ucalgary.ca/news/anti-racism-statement>

### **Territorial Acknowledgement**

The Department of Geography would also like to acknowledge the traditional territories of the people of the Treaty 7 region in southern Alberta. The City of Calgary is also home to Métis Nation of Alberta, Region III. <https://www.ucalgary.ca/indigenous/cultural-protocol>

### **Official Course Description**

History of spatial modelling in geography; comprehensive coverages of techniques, spatial analysis and spatial modelling as currently used within GIS and remote sensing.

### **Course Objectives**

To provide students with analytical tools to help them understand spatial phenomena and to stimulate their critical thinking about spatial processes. The course will focus on the properties of spatial data and their effects on quantitative analysis. Students will learn an array of spatial analytical methods, understanding their hypothesis, strengths, and limitations; they will learn to choose the most appropriate techniques for different research questions and spatial data. Concepts and theories of spatial analysis will be discussed with reference to landmark and current literature.

### **Course Learning Outcomes**

The Department of Geography is committed to student knowledge and skill development. The table below lists the key learning outcomes for this course, the program-learning outcomes to which they contribute, and the expected level of achievement.

| Course Learning Outcomes  | PLO(s)*       | Level(s)**    |
|---|---------------|---------------|
| Implement tools to assess the properties of spatial data                | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Apply analytical tools to reduce variance in spatial modelling          | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Critically employ indices to assess spatial autocorrelation             | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Critically employ indices to assess spatial non-stationarity            | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Identify spatial clusters and assess their significance                 | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Apply geostatistical techniques   | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Critically implement spatial autoregressive modelling where appropriate | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |
| Critically implement local modelling where appropriate                  | 1,2,3,4,5,6,7 | 1,2,3,3,1,3,3 |

\*PLOs = Program Learning Outcomes: 1 = reflect and communicate diverse human-environment perspectives, 2 = identify and explain human-environment

processes, 3 = implement sampling, data collection, analyses and communication methods, 4 = analyze spatial and temporal aspects of human-environment systems, 5 = employ knowledge, arguments, and methodologies for solving human-environment problems, 6 = evaluate geospatial data and manipulate it to create cartographic products, 7 = communicate geographic concepts using oral, written, graphic, and cartographic modes, and 8 = demonstrate literacy skills.

\*\*Levels: 1 = Introductory, 2 = Intermediate, and 3 = Advanced.

### **Prerequisites**

Consent of the Department

Geog.686 or equivalent knowledge. That is: understanding of descriptive and multivariate statistics; basic understanding of regression analysis; basic GIS skills; ability to manipulate data and conduct basic analyses; applied knowledge of scripting (preferably in R).

### **Course Format**

Unless government- and university-imposed public health measures are reintroduced, ALL classes and tutorials will be offered synchronously.

### **Learning Resources**

One or more of the following textbooks is recommended.

De Smith M. J., Goodchild M. F. & Longley P. (2018). *Geospatial analysis: a comprehensive guide to principles techniques and software tools* (6th ed.).

Chun Y. & Griffith, D. A. (2013). *Spatial Statistics and Geostatistics*. SAGE Publications, Ltd. (UK).

Griffith, D.A., Li, B. G. (2022). *Advanced Introduction to Spatial Statistics*. Edward Elgar Publishing Inc.

Rogerson, P. A. (2021). *Spatial Statistical Methods for Geography*. SAGE Publications, Ltd. (UK).

Moraga, P. (2023). *Spatial Statistics for Data Science: Theory and Practice with R*. Chapman & Hall/CRC Data Science Series.

Additional references may be suggested during the course.

### **Learning Technologies and Requirements**

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology.

- A computer with a supported operating system, as well as the latest security and malware updates
- A current and updates web browser
- Webcam (built in or external)
- Microphone and speaker (built in or external) or headset with microphone
- Broadband internet connection

### **Important Dates**

The last day to drop this course and receive a tuition fee refund is **January 18, 2024**. The last day to add or swap a course for **Winter 2024** is **January 19, 2024**. The last day to withdraw from this course is **April 9, 2024**. Please note that the University is closed on January 1, February 19, March 29, April 1, 2024.

For additional detailed course information posted by the instructor, visit the course Desire2Learn page online at <https://d2l.ucalgary.ca/d2l/home>.



**Grading (Weighting)**

|                      |     |
|----------------------|-----|
| Labs and assignments | 30% |
| Tests                | 35% |
| Final project        | 35% |

Class Participation is not formally graded, but students are strongly encouraged to share their ideas, contributions, and questions in class.

There is no final examination.

- It is essential to pass all components to pass the course as whole, as specified below

In order to obtain the minimum graduate level passing grade (B-), *students must obtain no less than 70% in each of the following three course components:*

1. Total sum of all the labs and assignments;
2. Total sum of Test 1 and Test 2;
3. Total sum of the project component (i.e., proposal, written report, and presentation).

Lab exercises are due at the beginning of the lab session the week after the assignment (unless otherwise specified).

The final project is an opportunity to perform an insightful spatial statistical analysis on a research topic chosen by each student. Detailed guidelines will be provided in class. The final project (i.e., implementation, written report, and presentation) must be consistent with the project proposal. *If the final project is not consistent with the proposal, the proposal will receive a 0 grade.*

- Only pens, pencils and erasers are allowed in exams. No other materials or devices are allowed.
- **Late policy:**

Lab assignments and all project components are due on the date specified in the class calendar (presented in class and available in D2L). They are due at 8.00 a.m. MDT/MST on that date. There are no exceptions and any piece of work handed in late will be subject to an immediate 10% penalty followed by a 10% reduction in grade for each day thereafter (weekends and holidays included). Special circumstances shall be supported by appropriate documentation.

**Grading System**

|          |    |         |    |         |    |
|----------|----|---------|----|---------|----|
| 96 – 100 | A+ | 77 – 80 | B  | 59 – 61 | C- |
| 90 – 95  | A  | 71 – 76 | B- | 55 – 58 | D+ |
| 86 – 89  | A- | 65 – 70 | C+ | 50 – 54 | D  |
| 81 – 85  | B+ | 62 – 64 | C  | 0 – 49  | F  |

**Flexible Grade Option (CG Grade)**

<https://www.ucalgary.ca/pubs/calendar/current/f-1-3.html>

**Should a student miss a required component of the course, they should contact the instructor as soon as possible.**

In the event that a student misses a midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required see: <https://www.ucalgary.ca/pubs/calendar/current/m-1.html>

Please refer to <https://www.ucalgary.ca/registrar/registration/appeals/student-faq> for frequently asked questions concerning the provision of a medical note/statutory declaration.

### Supplementary Fees

Not applicable.

***For additional detailed course information posted by the instructor, visit the course Desire2Learn page online at <https://d2l.ucalgary.ca/d2l/home>.***

### **SUPPLEMENTAL INFORMATION**

#### **University of Calgary Academic Integrity Policy**

Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. The University Calendar includes a statement on the principles of conduct expected of all members of the university community (including students, faculty, administrators, any category of staff, practicum supervisors, and volunteers), whether on or off university property. This statement applies in all situations where members of the university community are acting in their university capacities. All members of the university community have a responsibility to familiarize themselves with the principles of conduct statement, which is available at: [www.ucalgary.ca/pubs/calendar/current/k.html](http://www.ucalgary.ca/pubs/calendar/current/k.html).

#### **Plagiarism, Cheating, and Student Misconduct**

The University of Calgary is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect.

Academic dishonesty is not an acceptable activity at the University of Calgary, and students are **strongly advised** to read the Student Misconduct section in the University Calendar at: [www.ucalgary.ca/pubs/calendar/current/k-3.html](http://www.ucalgary.ca/pubs/calendar/current/k-3.html). Often, students are unaware of what constitutes academic dishonesty or plagiarism. The most common are (1) presenting another student's work as your own, (2) presenting an author's work or ideas as your own without adequate citation, and (3) using work completed for another course. Such activities will not be tolerated in this course, and students suspected of academic misconduct will be dealt with according to the procedures outlined in the calendar at: <https://www.ucalgary.ca/legal-services/university-policies-procedures/student-academic-misconduct-procedure>

For students wishing to know more about what constitutes plagiarism and how to properly cite the work of others, the Department of Geography recommends that they attend Academic Integrity workshops offered through the Student Success Centre: <https://www.ucalgary.ca/student-services/student-success/learning/academic-integrity>

#### **Instructor Intellectual Property**

Information on Instructor Intellectual Property can be found at <https://www.ucalgary.ca/legal-services/university-policies-procedures/intellectual-property-policy>

#### **Freedom of Information and Protection of Privacy**

Freedom of Information and Protection of Privacy (FOIP) legislation in Alberta disallows the practice of having students retrieve assignments from a public place, such as outside an instructor's office, the department office, etc. Term assignments will be returned to students individually, during class or during the instructor's office hours; if students are unable to pick up their assignments from the instructor, they must provide the instructor with a stamped, self-addressed envelope to be used for the return of the assignment.

#### **Human subjects**

Students in the course are not expected to participate as subjects or researchers when research on human subjects may take place.

#### **Internet and electronic communication device information**

There are restrictions on the use of laptops and tablets in class if they are used to take notes or find information relevant to the class, and if there is no disturbance or distraction of other students or the instructor. Phones must be turned off during

class, unless you have previously identified yourself to the instructor as a health care or law enforcement professional.

### **Referencing Standard**

In written work presented in this class, the two accepted methods for referencing the work of others will be (1) Chicago Manual of Style: <https://www.chicagomanualofstyle.org/home.html> or (2) American Psychological Association: <https://apastyle.apa.org/products/publication-manual-7th-edition> .

### **Resources and Writing Support**

Please note writing support resources provided by the Student Success Centre <https://ucalgary.ca/ssc/resources/writing-support> and the library <https://libguides.ucalgary.ca/guides/>

### **Exams & Deferrals**

Exam deferrals are granted with a legitimate reason, e.g., illness and scheduling conflicts due to work and/or extra-curricular activities. Please inform the instructor in advance via e-mail or in person to reschedule.

<https://www.ucalgary.ca/registrar/exams>

### **Posting of Grades and Picking-up of Assignments**

Graded assignments will be returned by the instructor or teaching assistant personally during scheduled lecture or laboratory periods, unless they are made available electronically through the course D2L webpage. Grades and assignments will not be available at the Department of Geography's main office and assignments cannot be dropped off at the Department Office.

### **Academic Accommodations**

It is the student's responsibility to request academic accommodations, according to the university policies and procedures listed in the University Calendar.

The student accommodation policy can be found at: <https://www.ucalgary.ca/pubs/calendar/current/b-6-1.html>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities:

<https://www.ucalgary.ca/legal-services/university-policies-procedures/accommodation-students-disabilities-procedure>

Students needing an accommodation based on a protected ground other than disability should communicate this need, preferably in writing to their instructor or the Department Head (email: [freeman@ucalgary.ca](mailto:freeman@ucalgary.ca)).

### **Documentation for Absences or Missed Course Assessments**

Students who are absent from class assessments (tests, participation activities, or other assignments) should inform the instructor as soon as possible. Instructors may request that evidence in the form of documentation be provided. If the reason provided for the absence is acceptable, instructors may decide that any arrangements made can take forms other than make-up tests or assignments. For example, the weight of a missed grade may be added to another assignment or test. For information on possible forms of documentation, including statutory declarations, please see

<https://www.ucalgary.ca/pubs/calendar/current/m-1.html>

### **Copyright Legislation**

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright <https://ucalgary.ca/legal-services/university-policies-procedures/acceptable-use-material-protected-copyright-policy> and

requirements of the copyright act at (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Act.

### **Course evaluations and student feedback**

Student feedback will be sought at the end of the course through the standard University Student Ratings of Instruction (USRI) and Faculty course evaluation forms.

### **Wellness and Mental Health Resources**

The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness, and academic success and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support, or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, <https://www.ucalgary.ca/wellnesscentre/services/mental-health-services>) and the Campus Mental Health Strategy website (<http://www.ucalgary.ca/mentalhealth/>).

Students requiring assistance are encouraged to email the **Student at Risk line** if they or others appear to need wellness assistance: [sar@ucalgary.ca](mailto:sar@ucalgary.ca) For more immediate response, please call: 403-210-9355 and select option #2.

### **Sexual Violence Policy**

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. Please see the policy available at <https://www.ucalgary.ca/legal-services/university-policies-procedures/sexual-and-gender-based-violence-policy>

### **Contact Information for Student and Faculty Representation**

- Student Union VP Academic 403-220-3911, [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca)
- Students Union Representatives for the Faculty of Arts – 403-220-3913, [arts1@su.ucalgary.ca](mailto:arts1@su.ucalgary.ca), [arts2@su.ucalgary.ca](mailto:arts2@su.ucalgary.ca), [arts3@su.ucalgary.ca](mailto:arts3@su.ucalgary.ca), [arts4@su.ucalgary.ca](mailto:arts4@su.ucalgary.ca)
- Student Ombuds Office information can be found at: [www.ucalgary.ca/ombuds/](http://www.ucalgary.ca/ombuds/)

### **Emergency Evacuation/Assembly Points**

Assembly points for emergencies have been identified across campus. Assembly points are designed to establish a location for information updates from the emergency responders to the evacuees; from the evacuated population to the emergency responders. For more information, see the University of Calgary's Emergency Management website: <https://www.ucalgary.ca/risk/emergency-management>. In case of emergencies and fire drills, please note the ICT Food Court is the assembly/muster point.

### **Campus Safewalk**

Campus Security, in partnership with the Students' Union, provides the Safewalk service, 24 hours a day, to any location on Campus, including the LRT station, parking lots, bus zones, and university residences. Contact Campus Security at 220-5333 or use a help phone, and Safewalkers or a Campus Security officer will accompany you to your campus destination.