GPHY 482/489 Spatial Analysis
Course Syllabus – Spring 2021

Instructor

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Teaching Assistant

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Course description

This course introduces students to the need for spatially information analyses of data generated across space, and explore where non-spatially informed analyses may fail. We will explore basic spatial analytic methods used across scientific disciplines; across social, physical, and biological sciences.

The course is designed such that students will develop an understanding of quantitative analysis of spatial data, including techniques for pattern analysis, classification, and interpolation within a GIS environment. The freely available, and increasingly used R statistical software package will be the primary environment in which we learn to apply these analyses.

Learning Outcomes

Successfully completing this course will enable the student to:

- Understand how to identify the need to utilize spatially informed analytic techniques;
- Understand the basic descriptive and inferential spatial analyses used in Geography;
- Apply and interpret appropriate spatial analytic techniques for specific research questions in Geography;
- Expand workforce relevant skills in R, pertaining to the analysis of spatial data.

Required textbooks:

Brunsdon, C., and Comber, L. 2018. An Introduction to R for Spatial Analysis and Mapping. **2nd Ed.** Sage. Brunsdon, C. , and Comber, L. 2015. *An Introduction to R for Spatial Analysis and Mapping*. Sage. (ISBN 13: 978-1-4462-7295-4)

Course Calendar

Day	Date	Week	*Topic*
Tues	12-Jan	1	Course Introduction
Thurs	14-Jan		Student Introductions - Student perspectives on spatial data and spatial analysis
Tues	19-Jan	2	What is Spatial Data and why do other methods fail?
Thurs	21-Jan		
Tues	26-Jan	3	Spatial Autocorrelation and Exploratory Spatial Data Analysis
Thurs	28-Jan		**Detailed Review of Final Project Expectations and Timeline**
Tues	2-Feb	4	Regression Analyses I
Thurs	4-Feb		
Tues	9-Feb	5	Regression Analyses II; Working with R
Thurs	11-Feb		
Tues	16-Feb	6	Working with GIS Function and Spatial Data in R
Thurs	18-Feb		
Tues	23-Feb	7	Point Pattern Analyses I
Thurs	25-Feb		**Dataset identification and problem statement due**
Tues	2-Mar	8	Point Pattern Analyses II
Thurs	4-Mar		No Class - Student Break
Tues	9-Mar	9	Lattice Analysis I
Thurs	11-Mar		**Introduction and brief literature review due**
Tues	16-Mar	10	No Class - Student Break
Thurs	18-Mar		
Tues	23-Mar	11	Lattice Analysis II
Thurs	25-Mar		**Exploratory Spatial Data Analysis (ESDA) results due**
Tues	30-Mar	12	Localized Analysis I
Thurs	1-Apr		**Proposed Methods of Analysis due**
Tues	6-Apr	13	Localized Analysis II
Thurs	8-Apr		
Tues	13-Apr	14	Additional topics to bring everything together I
Thurs	15-Apr		**Results due**
Tues	20-Apr	15	Additional topics to bring everything together I
Thurs	22-Apr		
Tues	27-Apr	16	
Thurs	29-Apr		**Final Submission Due**

Typical Course Flow

Sunday Evening – Week's Lecture and readings will be posted to Moodle. To maximize your in-class time, the video should be watched (and readings read) prior to class on Tuesday. This allows you to be ready to work on the homework/lab in class and ask informed questions.

Tuesday – The week's assignment will be posted to Moodle prior to class start (8:30 am). This assignment will be due one week following assignment date; before class starts. Due dates and times are always listed at the top of the assignment and on Moodle.

Thursday – The homework/lab key for assignment submitted on Tuesday will be posted in either text and/or video format. Utilize this time to continue working on current assignments. It is expected that all homework and labs can be completed during the two class periods.

Required Assignments and Final Project:

Homework/Labs -15 (20 points each = 300 total points)

All assignments will be primarily derived from lecture video material, readings, and the Brunsden textbook. Note that some questions will be found in the lecture, and not otherwise answerable. The assignments consist of both discussion and problem-solving questions. Homework will typically be assigned on the Tuesday corresponding with the lecture, and due **BEFORE THE BEGINNING OF CLASS** one week after it was assigned. **Homework will not be accepted late.** All homework must be submitted in word, excel, or pdf via **Moodle** (other file types may be assigned and noted in assignment). You may work together on assignments, but everyone is required to turn in their own original assignment. DO NOT just copy and "save as" someone else's assignment. If two or more assignments are copies of one another, both will receive zero credit.

I understand this will continue to be a challenging semester with COVID still influencing much of our lives. If you have issues or concerns around your ability to complete an assignment on time as a result of illness or other interference, come talk to me (or email/phone call) prior to the due date (this does not typically mean the night before or morning of the due assignment) and we can discuss a course of action.

Final Project (500 points)

All students will complete a final project/research paper, using one or more techniques learned in class. This project will consist of identifying a dataset and relevant question to be evaluated. The project will be completed in stages throughout the course. The stages include:

1. Dataset identification and problem statement (50 points);
2. Introduction and brief literature review (100 points);
3. Exploratory Spatial Data Analysis (ESDA) results (100 points);
4. Proposed Methods of Analysis (50 points);
5. Results (100 points);
6. Final Submission (100 points).

Grading Policy

Course grades will be based on the following components:

Homework/Labs	300 points
Final Project:	500 points
Total Points Available	**800 points**

Grade	Points Needed	Grade	Points Needed	Grade	Points Needed
A	752	**B-**	624	**D**	480
A-	720	**C+**	592	**F**	<480
B+	688	**C**	560		
B	656	**C-**	528		

Course guidelines and policies:

Student Conduct Code

The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students are expected to understand their rights and responsibilities provided under the *Student Conduct Code*

Attendance

Given the flipped nature of this course, students are expected to watch lecture material prior to scheduled class times. Instructor will be available throughout the scheduled periods to answer homework, lab or project questions. For first several weeks, this will be via zoom, followed by a mix of office and zoom time. This will be updated and conveyed as needed. Since we will not be routinely meeting in person, there is no excused absence policy. See homework submission section for policies related to on time submissions.

Course withdrawal and other important dates

Use this link for a list of official Dates and Deadlines for 2021 Spring Semester. Responsibility is upon the students to know the dates for withdrawal and other relevant registration issues.

Disability modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.