DESCRIPTION

Intermediate Quantitative Methods in Geography GEOG247 (CRN 37788) & GEOG347 (CRN 37789) concerns multivariate statistics, including multivariate linear regression, logistic regression, ANOVA and spatial statistics. Students work with the R statistical software. The prerequisite is an introductory statistics course, such as high school Advanced Placement Statistics or Clark's Intro to Quantitative Methods GEOG110 & GEOG311. This course meets the skill requirement for Geography majors and doctoral students.

SETTING	Mon. & Thru. 2:50-4:05 pm Sackler Science Center, S223 https://zoom.us/j/9957445524
PROFESSOR	Yanan Wu
E-MAIL	yanawu@clarku.edu
OFFICE HOURS	Wednesdays 11 AM - 1 PM
TEACHING ASSISTANT	Nisar, Khadija
E-MAIL	knisar@clarku.edu
TA OFFICE HOURS	Tuesdays & Thursdays 2-4 pm

STUDENT RESOURCES

TEXTS: Joseph Hair, William Black, Barry Babin, and Rolph Anderson. Multivariate Data Analysis. Edition 7 or 8. Upper Saddle River NJ: Prentice Hall.
Amazon.com usually offers prices less than $30.
Edition 8

David Diez, Mine Cetinkaya-Rundel, Christopher Barr, and OpenIntro. OpenIntro Statistics, Edition 4. Available at https://www.openintro.org/book/os/ .

REQUIRED SOFTWARE:

R & R Studio.

Install R & R Studio

COURSE SCHEDULE:

Month	Date	Day	Course Topic	Readings	Course Assignments	Submission Deadlines
JAN	13	M	Introduction to the Course		Assignment 0	
	16	R	Working w R software			
	20	M	University holiday			
	23	R	Inferential Statistics	OpenIntro Ch 5-7	Assignment 1 (inferential statistics)	
	27	M	Data Exploration (including variable transformation)	Hair Ch. 2		
	30	R	Data Exploration (including variable transformation)	Hair Ch. 2		
FEB	3	M	Bivariate Regression	OpenIntro Ch. 8	Assignment 2 (data transformation, bivariate regression)	
	6	R	Bivariate Regression	OpenIntro Ch. 8		Assignment 1
	10	M	Multivariate Regression	OpenIntro Ch. 9.1 – 9.4 Hair Ch. 5		
	13	R	Multivariate Regression		Assignment 3 (multivariate regression)	Assignment 2
	17	M	Wellness Day – No classes			
	20	R	Basic Matrix Operation			
	24	M	Issues with Multicollinearity	Hair Ch. 5		
	27	R	Issues with Multicollinearity		Assignment 4 (multicollinearity)	Assignment 3
MAR	3	M	***SPRING BREAK***			
	6	R	***SPRING BREAK***			
	10	M	ANOVA	OpenIntro, Ch 7.5;	Assignment 5 (ANOVA)	

				Hair Ch. 6		
	13	R	ANOVA			Assignment 4
	17	M	Logistic regression	OpenIntro Ch. 9.5, Hair Ch. 8	Assignment 6 (Logistic regression)	
	20	R	Logistic regression (and ROC/TOC)			Assignment 5
AAG	24	M	***Take-home exam***			
	27	R	***Take-home exam***			
	31	M	Principal Components Analysis	TBD	Assignment 7 (PCA)	
APR	3	R	Principal Components Analysis			Assignment 6
	7	M	Geographically Weighted Regression	TBD	Assignment 8 (GWR)	Assignment 7 ***Take-home exam***
	10	R	Geographically Weighted Regression	TBD		Assignment 7 ***Take-home exam***
	14	M	Spatial Autocorrelation		Assignment 9 (Spatial Autocorrelation)	
	17	R	Spatial Autocorrelation			
	14	M	Project work			Assignment 8
	24	R	Project work			
	28	M	Final presentations			
MAY	1	R	Final presentations			
	5	M	**Final report due**			

Class Operations and COVID-19

Students are expected to attend classes in person, unless they need to quarantine or isolate as detailed below. In addition, due to inclement weather (snow, ice, extreme cold), classes may also be held on Zoom. Prof. Cecil will advise if any classes will be held remotely.

In the event that one or more of us has to isolate due to COVID, the following contingencies will be made to ensure continuity of learning:

- In the event that an instructor is in quarantine, but otherwise well, lecture/lab will be delivered via Zoom.
- If the instructor is not well enough to deliver the material, then we will provide a previously recorded lecture, or, if needed, postpone the lecture/lab.
- If a student or student(s) are in isolation, they will be provided with a recording of the lecture. All classes will continue to be recorded and made available via Panopto through Moodle. Please note that, absent the need to isolate due to illness or possible COVID exposure, or a University-mandated change policy, **there will not be an option to take the class remotely or asynchronously**.

EVALUATION

Assignments	40% = night assignments weighted equally
Exam	30%
Project	30% = 5% dataset + 15% oral + 10% written

The following grading system will be used to determine final grades:

A	93.0 - 100.0	**B+**	88.0 - 89.9	**C+**	77.0 - 79.9	**D+**	67.0 - 69.9
		B	83.0 - 87.9	**C**	73.0 - 76.9	**D**	60.0 - 66.9
A-	90.0 - 92.9	**B-**	80.0 - 82.9	**C-**	70.0 - 72.9	**F**	0.0 - 59.9

Your performance throughout the semester, based on the grading components listed above, will determine your final grade.

ASSIGNMENTS

You must do the assignments in a manner that maximizes your learning. You should begin the assignment as soon as you get the instructions. You should work alone until you complete the assignment to the best of your ability. Then you should compare your work with the work of some of your classmates to enhance your understanding. If you still have questions, then seek help from the Teaching Assistant or Clark's tutoring services. If you and your classmates develop a single response to an assignment, then one of the members of your group should submit that single assignment with all of the members' names on the assignment, in which case all members of the group will receive the same grade. This will avoid duplicate submissions and make grading more efficient.

Late Submissions: Grades for *Lab Assignments* and *Problem Sets* will be reduced by 10% for each day they are late (e.g. 1-24 hrs. past deadline, 25-48 hrs. past deadline, etc.). No submissions greater or equal to 10 days late will be accepted without direct permission from the instructor based on valid and confirmable extenuating circumstances.

EXAM

Students will have at least a day to complete the exam online. The exam is the only component of the final grade in which students must work individually, meaning students are not allowed to correspond with others during the exam. Students are allowed access to their class notes, Moodle, and the internet during the exam. See Moodle for examples of past exam questions.

PROJECT

The project's purposes are:

1) to collaborate as a group
2) to apply statistical procedures
3) to interpret statistical results
4) to make an oral presentation of a statistical analysis
5) to write a report

Students work in groups of 2-3. If you want a group of a different size, then please give the rationale. You may also work as an individual if you have a particular research project you are interested in.

Each group will compile a project, deliver an oral presentation, and submit a written report. There are many datasets freely available online, so your group should be able to find one that interests you. You must organize the database for use in R. You must use your datasets to demonstrate the statistical procedures that we examine in class. Follow the recommendations in the documents that the professor supplies concerning clarity. The written report must show improvement over the oral presentation. The written report is a Word document in the format that the professor supplies via Moodle. Make your figures tell your story as much as possible.

TIME COMMITMENT & ATTENDANCE

The professor will deliver during Thursday's classes the instructions for the assignments, which will be due by 11:59 pm the following Sunday. The penalty for lateness is 1 percentage point per hour for assignments, the exam, and all parts of the project. If you want to pass this course, then you must begin assignments as soon as you receive the instructions. Monday's classes offer students opportunities to ask about the assignments. This course requires 180 hours of work per semester. This translates to 12 hours per week including class time, which means students spend 4.75 hours to prepare for each 1.25-hour class for two classes per week. You must attend all classes on-time and for the entire duration of the class. If you have a legitimate reason for not attending class, then you must communicate it to the assistants and the professor before that class. Unexcused absences will prevent the professor from giving the benefit of the doubt concerning borderline final grades. Illness is an acceptable excuse. If you have any contagious illness, then you must not attend class. Some additional excuses are acceptable and others are not acceptable. The criterion to determine whether an excuse is acceptable is whether it would

be acceptable for the professor to use the same excuse for him to be absent from class according to his principles. You must not walk out of class without explanation. If you have a condition that requires you to exit class unexpectedly, then tell the professor before class. The Add/Drop deadline is the date you begin to pay tuition irrevocably. Graduate students must receive a grade of at least B- for the course to count towards graduation. Students who cannot resist doing non-course related work during class must not take this course.

POLICIES

ACADEMIC INTEGRITY:

Please act with personal integrity and be respectful of other students. Do not engage in, or tolerate, acts of falsification, misrepresentation, or deception. Your written work must be your own. A first infraction will lead to a grade of zero on the assignment in question; a second infraction will result in course failure.

Academic integrity is a basic value for all higher learning. Simply expressed, it requires that work presented must be wholly one's own and unique to that course. All direct quotations must be identified by source. Academic integrity can be violated in many ways: for example, by submitting someone else's paper as one's own; cheating on an exam; submitting one paper to more than one class; copying a computer program; altering data in an experiment; or quoting published material without proper citation of references or sources. Attempts to alter an official academic record will also be treated as violations of academic integrity. To ensure academic integrity and safeguard students' rights, all suspected violations of academic integrity by undergraduates are reported to the College Board. Such reports must be carefully documented, and students accused of the infraction are notified of the charge. In the case of proven academic dishonesty, the student will receive a sanction, which may range from an F in the assignment or course to suspension or expulsion from the University. The complete academic integrity policy is available with Academic Advising at the following website: http://www.clarku.edu/offices/aac/integrity.cfm.

FACULTY MEMBERS ARE RESPONSIBLE EMPLOYEES

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory responsibility to report information regarding sexual misconduct or information about a crime that may have occurred at Clark. Students may speak to someone confidentially by contacting the Center for Counseling and Personal Growth at (508) 793-7678 or our faculty confidential sources: Kathleen Palm Reed, James Cordova, Sasha Adkins, and Andrew Stewart. If you would like to pursue a formal complaint through university procedures, contact Lynn Levy by email at Title-IX@clarku.edu or by phone at (508) 793-7194. If you would like to pursue a criminal complaint you can contact University Police at (508) 793-7575 or work with the Title IX Coordinator to arrange for a meeting with Worcester Police.

STUDENT ACCESSIBILITY SERVICES:

Clark University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you have or think you have a disability and require academic accommodations, you must register with Student Accessibility Services (SAS), which is located in room 430 on the fourth floor of the Goddard Library. If you have questions about the process, please contact the Director of Student Accessibility Services, Thomas Sawicki, at tsawicki@clarku.edu or accessibilityservices@clarku.edu or (508) 798-4368.

Students having special needs regarding, or concerns about, the classroom environment are urged to come to my office to discuss the issue in question. If you are registered with SAS and qualify for accommodations that you would like to utilize in this course, please request those accommodations through SAS in a timely manner. Students having disability documentation and wishing to have special accommodations made in this class should tell me during the first two weeks of the semester.

TECHNOLOGY POLICY:

You will need to have your own laptop to bring to lecture, as we will be doing in class practical work fairly frequently. Please let us know if this requirement will be a problem. Lab sessions are held in Clark University computer labs using shared/public desktop computers. While participating in class or lab, either in person or remotely, please refrain from engaging with your phone, social media, or other non-statistical websites/app during lectures and lab sessions. Please use laptops, university computers, personal computers, and/or tablets only for the purpose of taking/reviewing notes and lecture slides and/or working on assigned course material. There is no need for the use of phones, social media, or other non-statistical websites/app during lectures and lab sessions, and the Instructor and TA will observe your technology habits in the classroom. Use of technology deviating from the above will be considered under the attendance grading criteria.