Geography 306, Spring 2019 University of Maryland College Park

Introduction to Quantitative Methods for the Geographic and Environmental Sciences

Lecture: M W 9-9:50am, 1118 Tydings Hall
Lab: Section 0101: W 12-1:50pm, LEF 1136; Section 0102: W 2-3:50pm, LEF 1136

Instructor: Naijun Zhou, Ph.D., 1159 LeFrak Hall, njzhou@umd.edu, office hours: M W 11-11:50am

Teaching Assistant (***you're welcome to visit all the following hours, no matter your section***):
Section 0101: Calvin Lynn
Office hours: Tuesday 9-11am, 1113 LeFrak
Section 0102: Christina Garvey, christina.garvey1@gmail.com
Office hours: Wed. 4-6pm, 1113 LeFrak

Course Website: ELMS

Course Objectives

Geographers, and other environmental and social scientists use quantitative methods such as statistics, to measure, describe, and make estimates about variables across the landscape. Developing solid skills in quantitative analysis should be a priority for any student in these fields.

The class covers the fundamentals of statistical analysis, including geographic data display, data description and summary, statistical inference and significance tests, analysis of variance, correlation, regression and basic spatial statistics. At the conclusion of this course, students should be able to:

- develop an understanding of important theoretical concepts in statistical analysis;
- gain experience in the application of statistics to spatial and other data using a statistical software *R*.

Class Organization

Class time will be devoted to lectures and computational labs. Lecture will cover theoretical material and applications, and the labs will be devoted to solve additional problem sets and learn the practical mechanics of using *R*.

Textbooks

We have no required textbooks. The following books are recommended.

- McGrew, J. Chapman and Charles B. Monroe. (2000). *An Introduction to Statistical Problem Solving in Geography*, Boston: McGraw Hill. ISBN: 978-1577666332. Note: other versions published by Waveland Press is also acceptable, ISBN: 1-57766-633-X.
- Verzani, John. (2005). *Using R for Introductory Statistics*. Chapman & Hall/CRC Press. ISBN: 1-58488-4509. A free and simpler (and older) version of this book is available at: https://cran.r-project.org/doc/contrib/Verzani-SimpleR.pdf .
- *R* reference book: *An Introduction to R*, free download at http://www.r-project.org/ (click "**Manuals**").

Requirements and Other Important Information

- **EIGHT** labs and **FOUR** discussion sessions of using *R* software to solve statistical problems. Each lab compliments the lecture.
- **SEVEN** homework assignments, each has questions from the corresponding lectures and labs. Each homework assignment will be distributed on ELMS. Completed homework (in Word) must be turned in on ELMS when they are due. **You are expected to start the work early. Never underestimate the time you will spend on the assignments**.
- **ONE** take home practical test, which will use ***R*** to solve statistical questions learned in the semester.
- **THREE** in-class, non accumulative, open book, open notes exams. Each exam will consist of two 50-minute tests. The exams include the materials covered in lectures. The exam format is very similar as the homework assignments.
- Bring a **CALCULATOR** to each class.
- **Late homework penalty**. The late homework penalty is: 1 point for every 12 hours (time stamped by ELMS). That is, if your homework is late for less than 12 hours, the final numerical score will be the score

less 1. The penalty is 2 points if the work is late for 12 to 24 hours, etc., and 0 point after 60 hours even if you do the homework correctly.

- ALL materials including lecture slides, announcements, lab instructions and homeworks will be posted on ELMS. Check ELMS frequently. **Note: handouts are distributed in class, and the slides do NOT contain details. COME to the lectures and labs!**
- The instructor will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide the instructor with a University of Maryland DSS Accommodation form. This form must be presented to the instructor no later than 2/11/2019.
- The required software for this class is ***R***. The software is available in the Geography Open Lab. ***R*** is the open source and one of the most powerful and versatile statistical packages. You are highly advised to download it free at http://www.r-project.org and install the software on your own computer.
- **This course may require considerable time** to learn the statistical concepts, the software, and the problem sets. You can expect to make the following time commitment on average: 2 hours of lecture per week, 2 hours of lab per week, and 5 hours of homework and/or readings each week.
- **E-mail policy**: for efficient communication with Dr. Zhou, please send your email to njzhou@umd.edu instead of ELMS message. Please make sure you send to **my correct** email address (very often other people forward 306 student emails to me) ☺
- **COMMUNICATE**! Feel free and do not hesitate to contact the instructor and the TA if you have any concerns, critiques and suggestions. They are ALWAYS welcome, and the earlier the better.

Schedule

Date	Lecture (M W)	Optional Readings	Lab (Tu/W)	Assignment Due
Introduction				
1/28, 1/30	Introduction to Statistics	Chapter 1 (McGrew)	Lab 1: Introduction to R	
Descriptive Statistics				
2/4, 2/6	Descriptive Statistics	Chapter 2, 3 (McGrew)	Lab 2: Descriptive Statistics	
Inferential Statistics				
2/11, 2/13	Probability	Chapter 5 (McGrew)	Discussion	HW 1 (2/11)
2/18, 2/20	Probability	Chapter 5 (McGrew)	Lab 3: Probability	
2/25, 2/27	Estimation in Sampling	Chapter 7 (McGrew)	Lab 4: Confidence Interval	HW 2 (3/1)
3/4, 3/6	Sampling	Chapter 6 (McGrew)	Discussion	
3/11, 3/13	**Exam 1.1 & 1.2: 9-9:50am, 1118 TYD**		NO LAB	HW3 (3/11)
3/18, 3/20	**Spring Break**			
3/25, 3/27	One Sample Tests	Chapter 8 (McGrew)	Lab 5: Hypothesis Testing	
4/1, 4/3	Two Sample Tests	Chapter 9 (McGrew)	Discussion	HW4 (4/5)
4/8, 4/10	ANOVA: Multiple Sample Tests	Chapter 10 (McGrew)	Lab 6: ANOVA	
Statistical Relationship Between Variables				
4/15, 4/17	**Exam 2.1 & 2.2: 9-9:50am, 1118 TYD**		NO LAB	HW5 (4/15)
4/22, 4/24	Correlation	Chapter 13 (McGrew)	Lab 7: Correlation	
4/29, 5/1	Regression	Chapter 14 (McGrew)	Lab 8: Regression	HW6 (5/3)
5/6, 5/8	Goodness of Fit	Chapter 11 (McGrew)	Discussion	HW7 (5/10)
5/13	Advanced Topics; Conclusion		Practical Test distributed: 5/10	Practical Test due: 11:59pm, 5/14
TBA	**Exam 3**			

Notes: 1) This is a tentative schedule, which is subject to revision by the instructor.
2) The date of Exam III will be determined by the University after mid-semester.
3) The optional reading is from the recommended textbook.

Grading

My baseline grade for the course, which assumes that you complete the work in good faith, on time, with serious effort, and with a certain degree of success, is a "B." To do better, you need to give something extra; to do worse, you need to give something less.

The numeric points of student's work will be evaluated as:

Assignment Type	Number of Assignments	Points Per Assignment	Total Points (sum to 100)
Homework 1, 2, 3, 4, 5, 6, 7	7	5	35

Exam 1, 2, 3	3	15	45
Lab & Lecture attendance (taken for every lab & lecture)	N/A	N/A	5
Practical Test	1	15	15

The final letter grade is based on the calculated numeric points in the table, and will be graded as: A: 85.0-100%, B: 75.0-84.9%, C: 65.0-74.9%, D: 55.0-64.9%, F: <55.0%.

Academic Misconduct and Disruptive Behavior

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity for all undergraduate and graduate students. All students are responsible for upholding these standards for this course. **It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism**. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu. Students are also expected to treat each other, the TA and the Instructor with respect.

Within our class, students may work together on problem sets, however, each student absolutely must turn in their own work, from their own computer, and any discussion must be theirs alone, and not attributable to another person or group. Students may not use any textual discussion, calculations or programs from any other student or group of students.