Geography 306, Fall 2015 University of Maryland College Park

Introduction to Quantitative Methods for the Geographic and Environmental Sciences

Lecture: Monday 10-11:50am, 1124 LeFrak Hall
Lab: Wed 1-2:50pm (0101), 1136 LeFrak; Monday 1–2:50pm (0102), 1138 LeFrak Hall

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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

Recommended text: 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.

Recommended text: 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 Important Information

- **SEVEN** labs 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. The exams include the materials covered in lectures. The exam format is very similar as the homework assignments.
- Bring a **CALCULATOR** to each class.

- Attendance at all lectures and labs is mandatory. Lab and lecture absences, late work and make-up exams are given for University approved excused absences, and students must notify the TA and/or the Instructor at least **24 hours BEFORE** the due date. Students also need to provide valid documents for absence, late work and make-ups. Otherwise, **no late work and make-up requests will be accepted**.
- Students are expected to have completed reading assignments, if any, before class.
- ALL materials including lecture slides, announcements, lab instructions and homeworks will be posted on ELMS. Check ELMS frequently.
- 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 9/14/2015.
- 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 rule**: for efficient communication, please send your email to njzhou@umd.edu and waylandj@umd.edu instead of ELMS message.
- **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 and Readings

Date	Lecture Topics	Readings	Lab (M/Wed)	Due
		Introduction		
8/31	Introduction to Statistics	Chapter 1 (McGrew)	Lab 0: Introduction to R	
9/7	**NO CLASS. LABOR DAY**		NO LAB	
		Descriptive Statistics		
9/14	Geographic Data; Descriptive Statistics	Chapter 2, 3 (McGrew)	Lab 1: Descriptive Statistics	
		Inferential Statistics		
9/21	Probability	Chapter 5 (McGrew)	Discussion	HW 1 (9/21, 9/23)
9/28	Probability	Chapter 5 (McGrew)	Lab 2: Probability	
10/5	Sampling	Chapter 6 (McGrew)	Discussion	HW 2 (10/5, 10/7)
10/12	**Exam I: 10-11:50am, 1124 LEF**		NO LAB	
10/19	Estimation in Sampling	Chapter 7 (McGrew)	Lab 3: Confidence Interval	
10/26	Elements of Inferential Statistics	Chapter 8 (McGrew)	Lab 4: Hypothesis Testing	HW3 (10/26, 10/28)
11/2	Analysis of Variance: Two Sample Tests	Chapter 9 (McGrew)	Discussion	HW4 (11/2, 11/4)
11/9	Analysis of Variance: Multiple Sample Tests	Chapter 10 (McGrew)	Lab 5: ANOVA	HW5 (11/9, 11/11)
		Statistical Relationship Between Variables		
11/16	**Exam II: 10-110:50am, 1124 LEF**		NO LAB	
11/23	Correlation	Chapter 13 (McGrew)	Lab 6: Correlation	
11/30	Regression	Chapter 14 (McGrew)	Lab 7: Regression	HW6 (11/30, 12/2)
12/7	Goodness of Fit	Chapter 11 (McGrew)	Take Home Practical Test distributed: 12/10 Discussion	HW7 (12/7, 12/9)
12/12	Practical Test due on ELMS, 11:59pm, 12/13			
TBA	**Exam III**			

Notes: 1) This is a tentative schedule, which is subject to revision by the instructor.
2) As a non-standard course, the date of Exam III will be determined by the University until mid-semester.

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 I, II, III	3	15	45
Lab attendance (taken for every lab, overall considered)	7	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.