

Quantitative Methods in Geography
GTECH 30100/70200
Fall 2019 Syllabus

Instructor: Allan Frei, afrei@hunter.cuny.edu
Office Hours: by appointment
Course Times: Wednesdays, 9AM-12PM
Course Room: 1090B-2 Hunter North (small lab)

Course Overview

The focus of this course is on the application of statistical methods that are common in geographic research. The goal is to understand these techniques so that you can later interpret and use them in an intelligent and appropriate manner; and so that you can learn how to explore related techniques independently. This course is “applied” in the sense that we focus on the application of these techniques more than on the derivation of equations. While we review information from introductory statistics courses, we focus on their application, using examples from physical and social science. This course will prepare you for more advanced spatial analysis topics covered in courses such as GTECH 70500.

The course has six sections. The last section will be taught only if we have time near the end of semester, and will include topics that might be of interest or that are more advanced.

1. Getting Started: importing and exploring data, descriptive vs inferential stats, Intro to SPSS
2. Preliminary concepts: Probability distributions, stochastic number generation, tests for normality, central limit theorem, transformations, parametric and nonparametric correlation
3. Bivariate Regression: OLS, logistic regression, trend analysis, non-linear model fitting
4. Calibration / Validation
5. Multiple Linear Regression (MLR): stepwise regression, influence analysis
6. Data reduction: principle components analysis (PCA)
7. Additional topics (if we have time) may include: autocorrelation, spatial issues, cluster anal, weighted regression, quantile regression, robust/computer intensive methods, intro to R

Prerequisites

The prerequisite for this course is an introductory statistics course such as STAT 11300 or STAT 21300 at Hunter College (or equivalent with permission of instructor).

Expected Learning Outcomes: After completing this course, you should be able to perform the following:

1. **Explore and model a data set.** Receive a file with data, evaluate its completeness, summarize both univariate and multivariate data in both numerical and graphical format using Exploratory Data Analysis techniques, and identify appropriate models for describing the probability distribution of the data
2. **Develop bivariate statistical models,** including Ordinary Least Squares Regression, calibration and validation
3. **Develop multivariate statistical models** using Multiple Linear Regression, Stepwise MLR, and outlier analysis
4. **Develop data reduction models** using Principal Components Analysis (PCA), and use PCA to identify

the dominant signals in a multivariate data set.

Textbook

No text book is required for this course. We will use online resources and additional information provided by the professor through blackboard

Software

No experience with any particular software package is absolutely required, although it is expected that students have familiarity with EXCEL, which we will be using for a variety of exercises. The primary statistical software package to be used is SPSS. Other software may be demonstrated.

Evaluation

Final grades are based on the following. No extra credit assignments are given.

	<u>% of Course Grade</u>	
	<u>undergrads</u>	<u>grads</u>
5 HW Assignments:	75%	72.5%
3 Quizzes:	25%	22.5%
Grad Student Presentation		5%

Assignments

Assignments will usually be discussed in class on the day they are due. Therefore, **ASSIGNMENTS ARE DUE BEFORE THE BEGINNING OF CLASS ON THE DUE DATE. LATE ASSIGNMENTS WILL NOT BE ACCEPTED.** All assignments must be submitted via blackboard. Some assignments may include different and/or additional work for graduate students.

Quizzes Three quizzes will be given during the semester. They are typically administered at the beginning of class prior to starting a new lecture topic. They will usually require 40-60 minutes. No makeup quizzes will be given without prior permission from the professor.

Graduate Student Presentations

Graduate students are also required to meet with Prof. Frei near the beginning of the semester to discuss their interest in this class, and to discuss their presentation to the class at the end of the semester. The presentation is to be about journal articles related to the course material, or statistical analyses related to the students own research.

Attendance/Lateness

Prompt attendance, and full participation, is required.

Communication with the Professor

To communicate with the professor: All email messages about this course should go to afrei@hunter.cuny.edu, should include "GTECH 301/702" in the subject line, and should be signed with your full name as it appears on Blackboard or CUNYFirst. I try to respond promptly, but please do not hesitate to contact me again if I do not respond to your email within two days, or sooner if you need more urgent attention!

The professor will communicate with you: using the email address that Blackboard has.

Blackboard

Most material provided to students, and material submitted by students, will be through Blackboard. You will access homework assignments, check grades, upload your assignments, and submit your work, through Blackboard. Other material may be available on line.

Grading Policy

All grading for this course will follow the CUNY grading policy, which for undergraduates can be found at <http://catalog.hunter.cuny.edu/content.php?catoid=37&navoid=10621> and for graduate students at <http://catalog.hunter.cuny.edu/content.php?catoid=38&navoid=10811>.

Incomplete (IN) Grades

A final grade of IN (incomplete) will be given only under extraordinary and documented circumstances.

CR/NC Grades

The CR/NC grade is available only to undergraduate students that have fulfilled the requirements of the course, i.e., complete all course requirements, including all exams/quizzes, assignments, etc. CR/NC request forms must be submitted to the professor no later than 15 minutes prior to the beginning of the last quiz. Graduate students do not have the CR/NC option. The college's policy of CR/NC can be found at <http://catalog.hunter.cuny.edu/content.php?catoid=37&navoid=10489>.

Lab Access

The lab(s) (HN-1090B-1) are as of this writing open 7 days a week, 7:00 AM until 11:00 PM, unless the college is official closed, and students with appropriate access are entitled to work in these labs when the labs are not being used for teaching. Additional information on labs and lab policies is [available here](#). **EATING, DRINKING, OR SLEEPING IN THE LABS ARE STRICTLY PROHIBITED. YOUR LAB ACCESS MAY BE DENIED IF YOU BREAK THESE RULES.** If you require access to the department's dedicated computer labs (HN 1090B-1 or HN 1090B-2) on a day or days when the college is officially closed you must notify the Assistant to Chair at least five business days prior so that arrangements can be made with Hunter College's Office of Public Safety to allow you to enter.

Class Environment

To ensure that all class members feel welcomed and equally able to contribute to class discussions, we will all endeavor to be respectful in our language, our examples, and the manner in which we conduct our discussions and group work. If you have any concerns about the environment of the class, please contact the professor.

Hunter College Policy on Academic Integrity

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. Be sure and reference all material you use. If you have any questions, please contact me!

Students with a Disability

In compliance with the *Americans with a Disability Act* and with Section 504 of the *Rehabilitation Act*, Hunter College is committed to ensuring educational access and accommodations for all its registered students. Hunter College's students with disabilities and medical conditions are encouraged to register with the Office of

AccessABILITY for assistance and accommodation. For information and appointment contact the Office of AccessABILITY located in Room E1214 or call (212) 772-4857 /or TTY (212) 650-3230.

Hunter College Policy on Sexual Misconduct

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationship. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

- a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College’s Public Safety Office (212-772-4444)
- b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College’s Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, HE1123. The CUNY Policy on Sexual Misconduct Link is: <http://www.cuny.edu/about/administration/offices/la/Policy-on-Sexual-Misconduct-12-1-14-with-links.pdf>.

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Syllabus Changes

This syllabus and schedule are guides for the course and are subject to change without advance notice. All changes will be announced on Blackboard, by email, and/or in class.

Tentative Schedule (Subject to Change)

Week	Date	Topic	Assignment Due / Quiz Dates
1	8/28	1. Getting Started: importing and exploring data, descriptive vs inferential stats, Intro to SPSS 2. Preliminary Concepts: Probability distributions, stochastic number generation, tests for normality, central limit theorem, transformations, parametric and nonparametric correlation	
2	9/4	2. (cont’d) 3. Bivariate Regression: OLS, logistic regression, trend analysis, non-linear model fitting	HW1. Getting started: importing and exploring data (required, but not counted towards grade)
3	9/11	3. (cont’d)	HW 2. Preliminary Concepts
4	9/18	3. (cont’d)	
5	9/25	4. Calibration / Validation	Quiz 1. Preliminary Concepts
6	10/2	4. (cont’d)	

	10/9	No class	
	10/16	No class	
7	10/23	5. Multiple Linear Regression (MLR): stepwise regression, influence analysis	HW3. OLS Regression Calibration, Model Validation Graduate student presentation topics must be approved
8	10/30	5. (cont'd)	
9	11/6	5. (cont'd)	Quiz 2. Bivariate Regression Calibration, Model Validation
10	11/13	5. (cont'd)	
11	11/20	6. Data reduction: principle components analysis (PCA)	HW4: MLR
12	11/27	6. (cont'd) PCA	
13	12/4	6. either (cont'd) PCA	HW5: PCA
14	12/11	Grad Student Presentations	
Finals Week	12/18	Wednesday, December 18 from 9:10 AM to 12 noon.	Quiz 3. MLR, PCA, possibly extra topics