

Quantitative Methods in Geography
GTECH 30100/70200
Fall 2023 Syllabus
V2: updated policy statements

Instructor: Allan Frei, afrei@hunter.cuny.edu
Office Hours: by appointment
Course Times: Wednesdays, 11:30AM - 2:20PM
Mode of Instruction: In Person
Room: 1090-B2, Hunter North Building

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 sciences. This course will prepare you for more advanced statistical and spatial analysis topics covered in other courses.

The course has four sections. Each section lasts several weeks, covering one module per week.

1. Getting Started and Modeling Univariate Data
2. Modeling Bivariate Data
3. Modeling Multivariate Data
4. Calibration / Validation (*and principle components analysis (PCA), other topics, if there is time*)

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**
3. **Develop multivariate statistical models**
4. **Calibrate and validate models** evaluate model accuracy using calibration and validation methods.

Lectures

The mode of instruction is in-person. Each week covers one module.

Textbook

No text book is required for this course. We will use online resources and additional information provided by the professor through blackboard. Two good online textbooks can be found here: <http://www.biostathandbook.com/>, [Introduction to Statistics - Open Textbook Library \(umn.edu\)](https://openstax.org/r/intro-statistics), but there are many others you can find.

Software

No experience with any statistical software package is absolutely required, although it is expected that students have familiarity with EXCEL, which we use for a variety of exercises; and with WORD, which we use for submitting assignments. The primary statistical software package to be used is SPSS.

Evaluation

Final grades are based on the following:

- 10-12 homework assignments
- three quizzes
- for grad students their final presentations

No extra credit assignments are given. All assignments are weighted equally, except for assignment 1 which is considered low impact does not affect grades. Each quiz will be weighted the same as one homework assignment. And, for graduate students, the final presentation will be given equal weight to one assignment.

Assignments

There is one module for each week, each of which typically has more than one part, and each part has an associated assignment. ASSIGNMENTS ARE DUE BEFORE THE BEGINNING OF CLASS ON THE DUE DATE, WHICH IS TYPICALLY ONE WEEK AFTER THE MATERIAL IS COVERD IN CLASS. 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. Students are allowed unlimited submissions for all assignments prior to the due date. The most recent submission that falls prior to the due date will be graded. Assignments will be graded within one week after the due date.

Quizzes There are three quizzes during the semester, one for each section 1 and 2, and 3.

Graduate Student Presentations

Graduate students are also required to discuss with Prof. Frei near the beginning of the semester their interest in this class, and their presentation to the class at the end of the semester. The presentation is to be about one or more journal articles related to the course material. If a student requests, Prof. Frei will consider allowing an alternative presentation, such as a statistical analyses related to the student's own research.

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. Make sure that you check the email that is listed under blackboard.

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 can be found: <http://catalog.hunter.cuny.edu/content.php?catoid=15&navoid=1433>.

Incomplete (IN) Grades

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

Attendance Policy

Attendance is required. More than two unexcused absences will affect a student's grade.

Software access

Options for access to SPSS software will be available on blackboard and discussed on the first day of class.

Class Environment in-person (and on Zoom if we ever use it)

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, in our examples, and in 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.

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.

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.

Hunter College's Policy on Students with Disabilities:

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical and/ or Learning) consult the Office of AccessABILITY located in Room E1124 to secure necessary academic accommodations. For further information and assistance please call (212- 772- 4857)/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. 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, on contacting the College's Public Safety Office (212-772-4444)

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) of Colleen Barry 5 (colleen.barr7@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

Policy on Sexual Misconduct can be found at <http://www.hunter.cuny.edu/diversityandcompliance/title-ix>

Preferred Gender Pronoun

All people have the right to be addressed and referred to in accordance with their personal identity. In this class, we will have the chance to indicate the name that we prefer to be called and, if we choose, to identify pronouns with which we would like to be addressed. I will do my best to address and refer to all students accordingly and support classmates in doing so as well."

Tentative Schedule (Subject to Change)

All classes are on Wednesdays from 11:30AM to 2:20PM

Week number	Module number	Date	Topics, quizzes, and other dates of interest
1	1	8/30	Section 1: Modeling Univariate Data (Modules 1-3) <ul style="list-style-type: none"> • Introduction to course, syllabus, student options for SPSS software • Module 1: what to do when you get a data file; Exploratory Data Analysis
2	2	9/6	Modeling Univariate Data: CDFs and PDFs
3	3	9/13	Modeling Univariate Data: Tests for Normality, Data Transformation
4	4	9/20	Section 2: Modeling Bivariate Data (Modules 4-7) <ul style="list-style-type: none"> • EDA, Correlation Analysis
5	5	9/27	<ul style="list-style-type: none"> • OLS Regression: Graphical and Numerical Analyses • Review for Quiz 1
6	6	10/4	<ul style="list-style-type: none"> • Non-linear OLS Regression (transformations of the independent variable) <p>QUIZ1 ON SECTION 1, MODULES 1-3</p>
7	7	10/11	<ul style="list-style-type: none"> • Nonlinear modeling: graphical presentation and curve fitting • Grad students: submit 2-3 possible articles for your final presentation
8	8	10/18	Section 3: Modeling Multivariate Data (Modules 8-11) <ul style="list-style-type: none"> • Intro to MLR and variable selection
9	9	10/25	<ul style="list-style-type: none"> • Collinearity and dummy variables • Grad students: confirm final presentation article <p>Review for Quiz 2</p>
10	10	11/1	<ul style="list-style-type: none"> • Review assignment 9b results • Residual Analysis and Outlier Analysis • QUIZ2 ON SECTION 2, MODULES 4-7
11	11, 12	11/8	<ul style="list-style-type: none"> • (module 11) Part 1 of Alternative model forms: transformation of dependent variable and heteroscedasticity • Section 4: (module 12) Calibration / Validation
12	12	11/15	(continued) Calibration / Validation
		11/22	No class
13	12, 13?	11/29	Depending on how things go... maybe... <ul style="list-style-type: none"> • (continued) Calibration / Validation • (module 13) Part 2 of Alternative model forms: logistic regression, quantile regression • Principal Components Analysis • Graduate student presentations <p>Review for Quiz 3</p>
14	<i>none</i>	12/6	Graduate Student Presentations
		12/13	Reading Day No class
Finals Week		12/14 to 12/20	(final exam) QUIZ3 ON SECTION 3, MODULES 8-11