GEO4167C/GEO6161- Intermediate Quantitative Analysis

Department of Geography

UNIVERSITY OF FLORIDA, Fall 2023

Intermediate Quantitative Analysis / Methods

GEO 4167c / GEO 6161 (3.0 credit hours) # 23143 / # 23144

Instructor: Timothy J. Fik, Ph.D. (Associate Professor)
Prerequisite: ***GEO 3162 / GEO 6160*** or Equivalent Stats course with permission
Tuesdays (T), period 5: 11:45AM – 12:35PM (TUR 3012)
Thursdays (R), period 4-5: 10:40AM – 12:35PM (FAC-Fine Arts C, 0127)
Instructor's Office: 3137 Turlington Hall; Instructor's e-mail address: fik@ufl.edu
Formal Office Hours:
Tuesdays -- 1:00PM – 4:00PM or by appointment
Thursdays -- 1:00PM – 3:00PM or by appointment
Classes Begin Thursday, August 24th, 2023

Course Materials (Power-point presentations and assigned readings in pdf format) will be uploaded to the on-line course Lecture folder on the Canvas Website after the lecture has been given. Click on "Files" and then select the appropriate folder.

Please Read the entire course syllabus before asking questions pertaining to course policies, procedures, expectations, requirements, due dates, etc. The course syllabus is the Canvas Home-page for this course.

Course Format. This course will take on a traditional "live" (brick-and-mortar) setting. Lectures will be given "live" in the designated rooms (see syllabus for time and location). Viewing assignments will be given throughout the semester, along with supplemental readings that expand on material and topics presented in lectures. Physical office hours as posted: TUR 3137. There will be NO ZOOM lectures or remote viewing for this course. Class attendance is mandatory.

This course will utilize the Canvas portal for the dissemination of information, communication, announcements, feedback and discussion. Students should use Canvas for submission of assignments and term projects. Lab assignments and term projects will not be accepted via the instructor's e-mail. There will be folders and links set up to facilitate submission and the dissemination of information and reading/viewing materials. Due dates for labs, course updates, selected and recommended readings, and announcements will be posted as the semester unfolds. Students are expected to sign in to the Canvas portal from time to time to access supplemental readings and lecture materials, view announcements and uploaded Power-points of in-class presentations, and to stay informed.

Course Overview

GEO 4167x/GEO 6161 surveys various statistical modeling techniques that are widely used in the social, behavioral, and environmental sciences. Lectures will focus on several important topics… including common indices of spatial association and dependence, linear and non-linear model development, model diagnostics, and remedial measures. The lectures will largely be devoted to the topic of **Regression Analysis / Econometrics, and the General Linear Model**. Applications will involve regression models using cross-sectional, quantitative, qualitative, categorical, time-series, and/or spatial data. Selected topics (see below, in no particular order) include, yet are not limited to, the following:

Classic Least Squares Regression & Extensions of the General Linear Model (GLM)
Matrix Algebra approach to Regression and the GLM
Join-Count Statistics (Dacey's Contiguity Tests), Spatial Auto-correlation
Error Assessment
Dummy Variables & Interactive Variables
Overview of Step-Wise Regression Procedures
Model Diagnostics & Test procedures for Normality, Independence, Equality of Variance...
Trend Surface Analysis and Polynomial Regression
Measures of Leverage & Influence (e.g., Cook's distance, Hat values, DFitts criteria, etc.)
Overview of Robust Regression Models and M-Estimators
Time-Series Analysis (including DL, AR, MA, ARMA, and ARIMA models)
Model Specification, Functional Form, and Data Transformations
Overview of LPM, Probit, and Logit Models / Spatial Probit extension
Introduction to Spatial Regression/Spatial Econometrics (SAR, CAR, Spatial Filtering)
Introduction to Principal Components and PC Regression
Regression Alternatives (overview)

Course Objectives

(1) Familiarize students with procedures, statistics, diagnostics, and remedial measures commonly used in the application of Regression Analysis and Intermediate-level Econometric-type modeling;

(2) Allow students to gain knowledge and experience in applied quantitative methods through various readings and viewings, take-home lab assignments, and the completion of a final term project; and

(3) Give students experience in preparing a research paper in which they identify a research question and evaluate hypotheses, construct a model, generate statistical results, and present statistical findings for a project of their choosing.

Required and Recommended Reading Materials

Basic Econometrics, Damodar Gujarati (2004) 4th edition – this is the recommended textbook for this course. The text is a fantastic go-to reference book on **Applied Regression Analysis**. A pdf version will be available on Canvas. In short, students do not have to purchase a textbook for this course. **Assigned sections of the Gujarati text and other supplemental readings will be available in pdf form. Students are responsible for reading all of the assigned material. Note that although the recommended textbook is couched from an "econometrics perspective", the techniques and procedures presented have universal applicability in the social, behavioral, economic, and environmental sciences. Other books of interest, recommended (n.b., used copies of many of these classics are available on the web or via the digital library):**

Statistical Methods for Geography, by P. Rogerson (2001) or 2nd edition (2006); Sage Publications.

Multiple Regression in Practice, by Berry & Feldman, Quantitative Applications in the Social Sciences #50, Sage Publications. (a highly recommended monograph for those of you seeking a quick, yet intense overview of regression analysis)

Time-Series Analysis: Regression Techniques, Ostrom, Quantitative Applications in the Social Sciences #9, Sage Publications (highly recommended for students interested in honing their time-series skills)

Regression Analysis chapters in Burt, Barber, and Rigby's "***Elementary Statistics for Geographers***" (3rd edition), Guilford Press. This is the same book we've use for the Introductory Quantitative Methods course (GEO 3162c/6160). See the sections/chapters on Multiple Regression Analysis: Chapters 12-14 for more detailed information.

Course Components (totaling 500 points overall)—

- **2 Labs @ 50 points each -- 100 points (Due date TBD/TBA) -- 20% of final course grade**
- **Attendance and Participation -- 50 points -- 10% of the final course grade**
- **Term project proposal -- 50 points (Due Date: by Oct. 17th, 4:00PM) -- 10% of the final course grade**
- **Term project/paper -- 300 points (Due Date: by Dec 5th by 4:00PM) -- 60% of the final course grade**

Paper/Write-up -- ***200 points*** + Power-Point presentation -- ***100 points***

Student Performance Evaluation and Grades

Performance in the course (and a final course grade) will be determined by the total points earned **out of a possible 500 points**, and based on an overall percentage (see below). The breakdown is as follows:

91.0-100% = A

90.0-90.9% = A-

87.0-89.9% = B+

80.0-86.9% = B

78.0-79.9% = B-

75.0-77.9% = C+

65.0-74.9% = C

60.0-64.9% = C-

57.0-59.9% = D+

50.0-56.9% = D

45.0-49.9% = D-

00.0-44.9% = E

Grade Values for Conversion

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF	I	NG	S-U
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	.67	0	0	0	0	0

Penalty for "late" labs or proposals, submitted after due dates (TBD/TBA) = **–10 points per day late.**

Note that it is the student's responsibility to acquire copies of the labs and complete/submit the lab assignments by the assigned due dates (TBD/TBA). It is the student's responsibility to submit lab write-ups and associated output files to the instructor... as well as a term project proposal by the assigned due dates. All Final Term Projects must be submitted to the Canvas portal by the posted due date.

Final term projects must be submitted by the posted due date. Note: No late submissions will be accepted. No exceptions.

Attendance may be taken periodically. Poor attendance will result in very low points for the attendance component. Note that class attendance and participation component of this course is worth 50 points or 10% of your final grade.

Note: The Instructor's Powerpoint slides will be made available in .pdf form on Canvas, provided that class attendance remains consistently good throughout the semester. Note that if attendance drops off, the Powerpoint presentations/lectures will no longer be available on-line.

A Note on Extra Credit: There may be a few extra credit assignments given in class, where students can earn additional points for completing those (should they choose). Of course, these extra-credit assignments are optional.

Term Project: Applied Regression/Spatial Analysis

The term project must demonstrate a working knowledge of regression analysis in an application involving cross-section, spatial, and/or temporal data to address a specific research question (and to test designated hypotheses). The project must incorporate techniques or methods discussed in the course, extensions thereof, or other equivalent Intermediate-level techniques. Research topics must be pre-approved by the instructor (in advance), and students are responsible for acquiring, collecting, and managing their own data and database, as well as model construction, development and assessment. Students are also responsible for generating all related output and a final write-up in electronic form (or hard copy should they prefer). E-copies of the term project must be submitted through the Canvas portal, NOT by e-mail. Students may upload their lab work, proposals and projects to the Canvas Website. Please make sure that your file is of a reasonable size; especially for projects with high-resolution graphics (e.g., projects with remote sensing imagery). ***Students are responsible for analyzing their own data and results, and are required to write and submit a final term report/paper/write-up, not to exceed 25 pages in length.***

Term Project Due Date (Submission of Final Term Paper/Report & related Power-point):

Tuesday, December 5th (by the end of my office hours: 4:00PM).

Note: this date/deadline may be subject to change.

If asked to do so…graduate students must be prepared to present their findings to the class in a short, approximately 20-minute, 20-slide (minimum) power-point presentation (time permitting… and this depends, of course, on the number of people enrolled this term).

Note: No Late Project write-ups will be accepted. All Projects and related materials must be submitted by December 5th, by 4:00PM. Again, no late projects will be accepted. There will be No exceptions. Failure to submit a term project write-up will result in a score of zero.

Term Project Guidelines for Intermediate Quant

Overall the Term Project/Paper (not to exceed 25 pages of text) and Power-point summary (not to exceed 25 slides) is worth a total of **300 points** or **60%** of your final course grade. Your term project/paper is worth 200 points and summary Power-Point .ppt/.pptx presentation is worth 100 points. These submissions should demonstrate a working knowledge of regression analysis (at the Intermediate Level) and/or the use of an applied modeling/statistical/quantitative technique in an analysis involving spatial and/or temporal data; highlighting all pertinent findings in a formal and scientific manner. You will be graded based on the performance of your peers and my expectations based on your status as an undergraduate or graduate student. *Note that my expectations are higher for the graduate students enrolled in this course; especially doctoral students.*

Note: The Proposed Term Project (topic and procedures) ...prior to its start-up and completion, must be pre-approved by the Instructor. In other words, please run the topic and proposed analysis by the Instructor to get the go-ahead. The proposal is worth 10% of your final course grade... and must be formally submitted by the due date and time (TBD/TBA)

Specifically, you are required to carry out an analysis utilizing a "regression-based" approach or model (or equivalent intermediate quantitative methods procedure) to explain/predict or account for variation in some variable of interest. The project must include a write-up of the results, an overview of the model, technique, and methods used, and a detailed discussion of the data, findings, and results.

All relevant graphs, plots, charts, and statistical summary tables should be submitted along with a summary and write-up in paper form, not to exceed 25 pages in length (submitted as a Word .doc/.docx file or pdf with standard 1" margins and 12-point font...Times Roman or Helvetica

preferred, double-spaced text, with no excessive fillers, footers or headers). The paper should have a cover sheet showing the student's name, course number, and the title of the work. Note: the cover page does not count as a page of text. Students should also attach related computer-generated output as an appendix to their paper as needed. A bibliography or List of References should also be attached to the paper. The cover page, bibliography/list of references, and appendix pages do not count as pages of text.

Note: Only the most important graphics and output tables should be embedded in the body of the paper; the remaining graphics and tables should be included as part of an appendix. An accompanying Power Point presentation (.pptx or pdf) must be submitted along with your paper. It should be a condensed summary of the paper highlighting the research topic, problem statement, objectives, hypotheses, the model, the data, the techniques used, any relevant and important tables and graphics, a summary of the results, as well as a brief overview of directions for future research.

If asked, graduate students should be ready to present their work to the class during the last few lecture periods of the semester (and give an approx. 20 minute presentation, which will be followed by a brief Q&A session). The Power-point summary of your analysis should be (a) limited to no more than say 30 slides (maximum), and (b) submitted as a .ppt/pptx file along with your term paper. **Note: Submission of Assignments/Labs, Finals Projects, and Power Points WILL NOT BE ACCEPTED via e-mail. All submission must be uploaded to the Canvas website.**

The project write-up/paper/report must be typed, double-spaced, using a standard 12pt font (e.g., Times Roman or Helvetica) with standard 1" margins. It must include a detailed discussion of the topic and results, with relevant background information on your subject of interest, a literature review, a problem statement, and hypotheses (submitted file as a Word .doc/.docx or as a .pdf file).

The term paper/project/report should have a cover/title page clearly showing the student's name, the course number (either GEO 4167c for undergraduates; GEO 6161 for graduate students), and the title of the project/paper. Note: the cover page does not count as a page of text. In addition to the cover/title page, the write-up should include the following items…

Overview of Project/Topic (i.e., Short Abstract)

Introduction and **Statement of the Problem**

Literature Review, Background Information ***section I***

Hypotheses (clearly defined)

Description of variables, model, and method(s) used

Theoretical justification of the Model/Analysis

Description of the Data used in the analysis

Summary table(s) highlighting the pertinent results ***II***

Interpretation and Summary of Results

Discussion of Relevant Findings

Conclusions

Implications and Directions for Future Research ***III***

Statistical Appendix (computer-generated output or other supporting material / code)

Literature cited page(s) **/ Bibliography / Reference**s ***IV***

Note: ***section IV*** *materials do not count as pages of text.*

Term Papers/Projects/Final Reports, Power-point summaries, and Lab write-ups WILL NOT be accepted via e-mail. Regarding the term paper/project… again, the cover or title page, statistical appendix, and bibliography do not count as official pages of text. The overall length of text and discussion should not exceed 25 pages in length.

Note that you will be graded on content, quality, and effort! The paper should be presented in a format that is similar and consistent with a paper/draft submitted to a professional journal for peer review.

Also, the write-up must be page-numbered. Failure to turn in a final term project by the posted due date and time, as specified in this syllabus, will result in a score of zero for the project and a grade of "E" for the course. In short, no "Incompletes" will be given out this term for any reason.

A note of the use of statistical software

Students are encouraged to use a statistical software program to assist them in their computation and estimation of various statistics and models. **Note, however, that this is not a course in how to use a software package, so students are on their own when it comes to learning and using statistical software.** I'd suggest familiarizing yourself with any of the following packages: **SPSS**, **NCSS**, **SAS**, ***MiniTab***, **SYSTAT**, **LIMDEP**, or **STATA**. Student versions of these software packages are available at discount rates… so shop around. You should seriously consider learning **SPSS or NCSS (**or another stats package) as statistical software is widely used in social and environmental science research…. especially if you are planning to engage in graduate-level research. For those of you who are unfamiliar with **SPSS**, there is a great book to help get you started. It is entitled: "***How to Use SPSS***", by Pyrczak publishing. Software help books such are widely available on Amazon.com and through various textbook sellers on the web.

Note that **NCSS** – **Number Crunching Statistical Software** – is one of the better all-around statistical packages for Regression Analysis, in my opinion. It has been one of my go-to packages for some time now. **LIMDEP, SAS and STATA** are also very good for students wishing to go the advanced hard-core Econometric modeling or the Experimental Data Analysis routes (respectively)… but they do require learning a language and the various command codes as there are many intricacies and nuances associated with the procedures offered.

For those of you wishing to concentrate specifically on "spatial data analysis" and Geographic Information Systems (**GIS**) applications, and/or ***Geographically Weighted Regression (GWR)***, the **Spatial Analyst** toolkit in **ArcGIS** will undoubtedly serve you well. In addition, **GEODA** is a fairly user-friendly software/freeware program that can be used for applied spatial regression and/or spatial econometric modeling. For those of you programming in the **language R**, please attach relevant code with your final write-up (in a technical appendix). There has been a big push toward R programming in the last decade. Learning the R language can be beneficial to those with unique data analysis applications. There's a good deal of R code available over the Internet, and it can be easily adapted to meet your needs.

A Note on Courtesy-- Please refrain from engaging in the following activities while the class is in session: texting, tweeting, cell-phone conversations, checking voice-mails, social networking, on-line surfing, website browsing, checking your e-mail, sending Instagrams, Tweeting, Facebooking, Snap-Chating, Pinterest posting, TikToking, etc. Do the social media thing on your own time! Students should not engage in texting, taking videos or photos, or web-surfing. Note that I DO NOT tolerate students starring into their laptops or phones while I am lecturing. In addition, I find that talking or conversing with other students while the instructor is speaking and presenting lecture material is rude and unacceptable.

Term Proposal / Term Project Due Dates/Times:

<u>Term Project Proposal</u>: Submit on or before Tuesday, October 17th, 2023 by the my office hours (4:00PM).

Please submit a tentative proposal (.docx/pdf file; 1-3 pages in length) on or before the due date/time listed above. Note that the proposed project description and/or direction may be subject to change upon feedback from Instructor. Before proceeding to work on your final term project, the project must be approved by the Instructor. In short, I'd advise you to submit your proposals early to secure feedback and acceptance.

The proposal should be between 1-3 pages in length (not to exceed 3 pages of text).

The proposal must be an overview or synopsis of your proposed term project: research problem, objectives, hypotheses, data, methods to be used, etc (as much as possible). Of course, the scope and focus of your analysis may change as you work on your projects. Any major changes, however, should be cleared with your instructor.

<u>Final Term Project/Paper/write-up</u> (.docx/pdf), Power-point (.pptx) due date and time:

Tuesday, December 5th, 2022, submitted by the end of my office hours (4:00PM).

Note: Remaining enrolled after the first week of classes is an acknowledgment that you as a student agree with the terms, policies and conditions outlined in this syllabus (as posted).

Good Luck and Good Journey! GO GATORS!