NC STATE UNIVERSITY

SYLLABUS

PA 766 ADVANCED QUANTITATIVE RESEARCH IN PUBLIC ADMINISTRATION

FALL 2025

INSTRUCTOR: Serena Kim
OFFICE: Caldwell 209A
E-MAIL: serena_kim@ncsu.edu
PERSONAL WEB: serenakim.org
COURSE COMMUNICATION: Google Chat

CLASS DAYS & TIMES: Thur 3:00 – 5:45pm
COURSE STRUCTURE: Hybrid
CLASS LOCATION: 113 Tompkins Hall
COURSE WEBSITE: courseweb.site/pa766-2025
OFFICE HOURS: Schedule an Appointment

COURSE OVERVIEW

UNIVERSITY COURSE CATALOG DESCRIPTION

Review of advanced quantitative procedures commonly applied in public administration research with emphasis on multivariate models found in leading journals in the discipline. Illustrative topics include the application of specialized regression models, generalized linear models, event history models, mixed and multilevel models, and structural equation models to topics in public administration.

COURSE OBJECTIVES

This course explores advanced quantitative methods in applied social science research, with particular attention to topics in public policy and management. Because the field of quantitative analysis is continually evolving, the course emphasizes not only how methods work, but also their underlying assumptions and intended purposes. A strong hands-on component will provide opportunities to practice using tools developed by statisticians and software developers. By the end of the course, students will have built a solid methodological foundation in the techniques covered, developed the ability to judge which methods are appropriate in different contexts, and gained the skills to implement basic models independently. In addition, each student will produce an original empirical paper, with particular emphasis on the data, methods, and results sections.

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LEARNING OBJECTIVES

By the end of this course, students will be able to achieve the following learning objectives (LOs):

- ❏ **Application of Generalized Linear Models (GLMs) (LO1)**: Students will be able to specify and estimate GLMs, evaluate model assumptions, and interpret results for policy and management research.
- ❏ **Implementation of Advanced Diff-in-Diff Models (LO2)**: Students will be able to apply difference-in-differences models to time-varying treatments and interpret causal estimates.
- ❏ **Application of Machine Learning Models (LO3)**: Students will be able to use basic machine learning methods for prediction, apply regularization and cross-validation, and assess when these models are appropriate in policy analysis.
- ❏ **Conducting and Interpreting Factor Analysis (LO4)**: Students will be able to execute exploratory factor analysis, evaluate factor structures, and interpret latent constructs in applied settings.
- ❏ **Writing and Reading Research Manuscripts (LO5)**: Students will be able to critically read empirical research articles and produce clear, well-structured manuscripts that include data, methods, and results sections.

Course Structure

This course is delivered in a hybrid format, meaning it has asynchronous and synchronous components. Asynchronous components are delivered through the Course Website. Learning activities in this course include reading assignments, videos, presentations, quiz, peer evaluations, and individual projects.

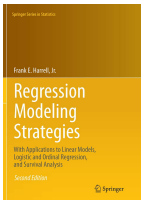
Course Prerequisites

PA 715 Quantitative Policy Analysis and PA 765 Quantitative Research in Public Administration, or equivalent coursework. Students are expected to have the following foundational knowledge and skills prior to enrolling in this course:

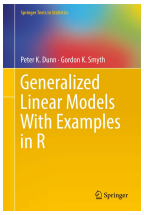
- Proficiency in core statistical estimation concepts, including interpretation of coefficients, standard errors, confidence intervals, and hypothesis testing.
- Familiarity with the language of quantitative research, including variables, parameters, models, estimators, and statistical significance.
- Ability to conduct and interpret basic statistical analyses such as t-tests, chi-square tests, ANOVA, and ordinary least squares (OLS) regression.
- Competence in using statistical software to manage datasets, run analyses, and generate output.
- Capacity to read empirical research articles with statistical content and interpret tables, figures, and regression results.

Textbooks and Course Materials

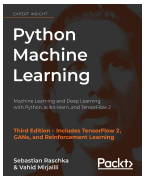
Required Text



Title: Regression Modeling Strategies: With Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis
Author: Frank E. Harrell Jr.
Publisher: Springer
Publication Year: 2016
Available at: catalog.lib.ncsu.edu/catalog/NCSU3532709



Title: Generalized Linear Models With Examples in R
Author: Peter K. Dunn & Gordon K. Smyth
Publisher: Springer
Publication Year: 2018
ISBN-13: 978-1441901170
Available at: catalog.lib.ncsu.edu/catalog/NCSU5535938



Title: Python machine learning : machine learning and deep learning with python, scikit-learn, and tensorflow 2
Author: Sebastian Raschka & Vahid Mirjalili
Publication year: 2019
Available at: catalog.lib.ncsu.edu/catalog/NCSU5909490

Optional Text

- Peter Martin. An Regression Models for Categorical and Count Data. SAGE Publications, 2021.
- Hal Daumé III, A Course in Machine Learning.

Online Resources

- Econometrics: Mastering Econometrics with Joshua Angrist
- Writing Social Science Research Papers: USC Libraries
- Publicly Available Demographics Datasets: PolicyMap (NCSU Login Required)

Software and Tools

The primary programming environments for this course will be `Python` and `R`, which we will use in Google Colab during class meetings. Students are free to use other platforms or tools, as long as they can complete the assignments. In addition, we will use `Stata` for selected exercises, since it offers particularly streamlined workflows for survival analysis and advanced difference-in-differences estimations (tasks that are less direct to implement in `R` or `Python`).

Digital Course Components

The following are the digitally-hosted course components:

- **Course Website**: All course materials, including readings and publicly-available videos, will be uploaded to the Course Website.
- **Google Chat**: A private chat space designed to facilitate classroom discussions and provide support for course assignments. Use both the instructor and your peers as resources.
- **Moodle**: Platform for grades, announcements, and important updates.
- **Google Forms**: Tool for submitting assignments and completing peer reviews.
- **Panopto**: Access to course recordings. Class meeting recordings are only available to enrolled students.
- **Google Colab**: Cloud-based coding environment used for hands-on exercises, data analysis, and replication of course examples in `Python` and `R`, accessible directly through a web browser without the need for local software installation.

Communication Guidelines

Communication with the Instructor

- **Preferred Mode of Communication**: The preferred mode of communication for course activities is Google Chat. This platform allows us to track questions and discussions effectively over time. Responses can be expected within one business day (i.e., not over the weekend).
- **Email Guidelines**: If you prefer email or need to share documents, you can email the instructor at serena_kim@ncsu.edu. Responses can be expected within two business days (i.e., not over the weekend). If I email you directly, please reply within two business days. It is recommended that you check your NC State email at least once per day to stay up-to-date on course communications. Please include a clear, specific, and concise subject line.

Grading & Feedback

Assignments & Evaluation Procedure

Component	Weight	Period	Learning Obj.
1. Problem Set	**45%**		
Problem Set 1	15%	Week 01–04	LO1
Problem Set 2	15%	Week 05–08	LO2
Problem Set 3	15%	Week 09–14	LO3
2. Paper Review	**10%**	Week 07-09	LO5
3. Final Project	**35%**	Week 01–16	
Paper	10%	Week 15-16	LO1 – LO5
Presentation	25%	Week 15-16	LO1 – LO5
4. Quiz	**10%**	Week 01–13	LO1 – LO4

1. Problem Set

This is an individual assignment. While collaboration with classmates is encouraged, you must write your own answers independently. You are welcome to ask questions and discuss ideas, but each student is responsible for producing their own written responses. There will be three problem sets during the course, each containing several questions. All submissions must be typed and submitted electronically. Some problems will require the use of statistical tools or software. Submissions will be made through Moodle on Gradescope, with Turnitin enabled.

2. Paper Review

In this assignment, you will practice the process of reviewing an empirical paper as if you were serving as a referee for a peer-reviewed journal. Your task is to evaluate the paper's methods, data, and the strength and validity of its arguments and results. The assignment has two components. First, you will give a ten-minute presentation in class summarizing your assessment of the paper. Second, you will submit a one-page written review that reflects the professional style of a scholarly referee report. These tasks are designed to develop your ability to read research critically and to communicate constructive feedback in both oral and written forms.

3. Final Project

Each student will prepare an original research paper. Your paper should develop a research design on a topic related to public administration or nonprofit management and include the following sections: (1) abstract, (2) introduction, (3) (brief) literature review, (4) data, (5) methods, (6) results, and (7) discussion and conclusion. The paper should not exceed 7,000 words (excluding the abstract, references, and appendices). At least one visualization of your analysis results must be included. You may use any quantitative analysis techniques, including those learned in other courses. Please consult the instructor with any questions. Final projects will be presented on the last day of class.

4. Quiz

There will be three quizzes during the semester, each consisting of approximately five multiple-choice questions. Quizzes are open-book, but the use of search engines or Large Language Models (LLMs), such as ChatGPT or Gemini, is not permitted. Quizzes must be taken in person and will cover material from previous lectures. To earn full credit, you must correctly answer at least 80% of the quiz questions across the semester. If your overall accuracy is below 80%, your final quiz grade will be scaled in proportion to your performance relative to the 80% threshold, and then multiplied by the full points.

Late Assignments

Late assignments will be accepted, but the grade will be reduced by 10% for each 24-hour period past the deadline.

Basis for Final Grade

A (95-100), A- (90-94.9), B+ (85-89.9), B (80-84.9), B- (80-82), C+ (75-79.9), C (70-74.9), C- (70-72), D+ (68-69), D (63-67), D- (60-62), F (0-59).

Grade Dissemination

Grades and assignments in this course will be returned on Moodle.

Requirements for earning a grade of "Satisfactory"

Requirements for earning a grade of "Satisfactory" If you are taking this course for credit only (S/U), your grade will be reported as S (Satisfactory) when course work is equivalent to C- or better or U (Unsatisfactory) when course work is equivalent to less than a C-. For more information, see the Credit Only Courses regulation.

Requirements and procedures for auditing this course

Auditing this course is approved on a case-by-case basis. Please contact the course instructor to attain approval. Refer to the audit regulation for more information and links to required forms.

Course Schedule

NOTE: This hybrid course does not meet every week. While I will strive to adhere to this plan, the specific topics covered each week may vary. Please stay attentive to course announcements on Moodle and Google Chat for updates or adjustments to the schedule. **All materials, assignment instructions, and due dates will be posted on the Course Website.**

Module	Date	Mode*	Topic	Assignment
01	08/21	Multimodal	GLM 1: MLE & Binary Dependent Variables	
02	08/28	In-Person	GLM 2: Ordinal Dependent Variables	
03	09/04	In-Person	GLM 3: Categorical Dependent Variables	Quiz 1
04	09/11	Multimodal	Advanced DiD 1: Synthetic Control	Problem Set 1
05	09/18	Multimodal	Advanced DiD 2: Time-Variant Treatments	
06	09/25	Multimodal	ML 1: Introduction to Machine Learning	
07	10/02	In-Person	ML 2: Supervised ML – Classification	Quiz 2
	10/09	NA	Instructor at Conference	Problem Set 2
08	10/16	Remote	Paper Review Presentation	Paper Review
	10/23	NA	Final Project Idea Consultation (One-on-One)	
09	10/30	Remote	ML 3: Supervised ML – Regression	
10	11/06	Multimodal	ML 4: Unsupervised ML – Applications to NLP	
11	11/13	In-Person	Factor Analysis 1: EFA (By Dr. William Swann)	Quiz 3
12	11/20	Multimodal	Factor Analysis 2: CFA (By Dr. William Swann)	
	11/27	NA	Thanksgiving	Problem Set 3
13	12/04	In-Person	Paper & Presentation	Final Project

* Notes on the Methods of Session Delivery: **"In-Person"** refers to classes held physically on campus with no option to join remotely via Zoom. **"Multimodal"** indicates the instructor will be on campus, and students may choose to attend either in person or online via Zoom. However, in-person attendance is encouraged, as the instructor cannot actively monitor Zoom for questions during the session. **"Remote"** refers to synchronous online sessions conducted exclusively via Zoom with real-time interaction. **"Online"** indicates fully virtual sessions conducted asynchronously (*no* meetings on campus or Zoom), with pre-recorded videos available on the course website.

† Acronyms: MLE = Maximum Likelihood Estimation; DiD = Difference-in-Differences; ML = Machine Learning; NLP = Natural Language Processing; EFA = Exploratory Factor Analysis; CFA = Confirmatory Factor Analysis.

Course Policies & Procedures

Diversity and Inclusion Statement

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course. I aim to create an inclusive environment where students' learning needs are met, and the diversity of experiences, identities, and viewpoints enriches our shared learning. I strive to present materials and activities that acknowledge and respect differences in gender identity, sexual orientation, disability, age, socioeconomic status, ethnicity, race, religion, culture, and perspective. Your feedback on enhancing the inclusivity and effectiveness of the course is welcome. If you have suggestions for improving your experience or that of your peers, please feel free to reach out. I also have made an effort to avoid scheduling major deadlines during significant religious holidays. If any deadline conflicts with your religious observances, please contact me at (serena_kim@ncsu.edu) so we can make appropriate adjustments.

Student Rules of Conduct

Students and faculty share responsibility for maintaining an appropriate and respectful learning environment. The NC State REG 11.35.05 Code of Student Conduct sets expectations for behavior in both virtual and physical classrooms, as well as consequences for violations. While diverse viewpoints and interpretations of course content are welcome, any behavior that disrupts others' ability to learn and succeed will be addressed. **Students are expected to adhere to the following rules of conduct** to maintain a productive and respectful learning environment:

- **Respect and Inclusion**: Treat all members of the class—peers, instructors, and guests—with respect. Discrimination, harassment, or inappropriate behavior of any kind is strictly prohibited. This includes professional courtesy and sensitivity toward individuals and topics involving race, color, national origin, gender identity, sexual orientation, disability, age, socioeconomic status, ethnicity, religion, culture, perspective, or other background characteristics.
- **Engage Constructively**: Contribute to class discussions and group work in a positive and respectful manner. Allow others the opportunity to share their perspectives without interruption or judgment.
- **Maintain Academic Integrity**: Follow NC State's policies on academic integrity. Plagiarism, cheating, or unauthorized collaboration on assignments is not allowed.
- **Be Prepared and Focused**: Complete all assigned readings, tasks, and exercises before class. During sessions, silence personal devices, avoid distractions, and stay engaged. Activities such as phone calls, use of headphones, persistent talking, whispering, and web surfing unrelated to the course are prohibited.
- **Communicate Professionally**: Use respectful, professional language in all communications, including emails, discussions, and written assignments.
- **Respect Class Time and Privacy**: Arrive on time for all meetings and inform the instructor in advance if you need to arrive late or leave early. Do not record or share course content, discussions, or other students' work without explicit permission from the instructor and all involved parties.
- **Use Course Tools Appropriately**: Use course-related tools, such as Google Chat, Moodle, and other digital platforms, solely for their intended educational purposes.

Failure to adhere to these behavioral standards may result in disciplinary action. Significant violations may lead to a failing grade for the course and will be reported to the appropriate authorities.

Incomplete grades and withdrawals

Information on incomplete grades can be found at REG 02.50.03 – Grades and Grade Point Average. If you encounter a serious disruption to your work not caused by you and you would have otherwise successfully completed the course, contact your instructor as soon as you can to discuss the possibility of earning an incomplete in the course for the semester, including an agreement on when the remaining work must be done in order to change the grade to the appropriate letter grade. If you must withdraw

from a course or from the university due to hardship beyond their control, see Withdrawal Process and Timeline | Student Services Center for information and instructions.

Artificial Intelligence (AI) Policy

The use of Large Language Models (LLMs) such as ChatGPT, Gemini, Perplexity, Phind, Jasper is permitted in this course under the following policies. However, LLMs may produce content that is incorrect, biased, or misleading. Therefore, it is the student's responsibility to verify the accuracy and appropriateness of any content generated by an LLM before including it in their assignments.

Allowed Uses

- ✔ **Code Assistance**: LLMs may be used to generate or debug Python and R code, but students are responsible for ensuring the code is correct.
- ✔ **Brainstorming**: LLMs can be used to brainstorm ideas, such as identifying omitted variables in a model and refine your ideas.
- ✔ **Table Formatting**: LLMs can help combine and format tables. However, please make sure the output from LLM is correct – LLMs make mistakes.
- ✔ **Reference Organizing & Formatting**: LLMs can be used to organize and format references in a coherent style such as APA, Harvard, or Chicago.
- ✔ **Text Editing**: LLMs can be used to correct spelling, typos, and grammar in already written text. Two explicitly allowed prompts in this course are: "Correct grammar, spelling, and punctuation errors" and "Improve clarity and readability without changing the original content."

Prohibited Uses

- ⊘ **Drafting Text**: LLMs should not be used to draft your writing. For example, you cannot provide a single sentence or a short outline and have the LLM generate an entire paragraph or section for your assignment. You cannot have LLM draft the explanation and motivations of your analysis and data visualization. All written content must be your own work.
- ⊘ **Generating Figures**: LLMs cannot be used to create figures for your assignments.
- ⊘ **Data Analysis**: Students are not allowed to upload datasets to LLMs for analysis or to automatically generate results.
- ⊘ **Uploading Our Course Materials to LLM Platforms**: Do not upload any part of this course slides, assignments, or datasets provided by the instructor to LLM platforms. Doing so may violate intellectual property rights.
- ⊘ **Calculations**: LLMs cannot be used for performing calculations. General calculators may be used instead.

Academic Integrity: Students have the responsibility to ensure that their work remains original. The use of LLMs must comply with the university's academic integrity policies. Plagiarism, whether facilitated by an AI tool or any other source, is strictly prohibited. Students must properly cite all sources and ensure their work is the result of their independent effort. For example, originality checking software can be used in this course to detect the originality of the student submission.

❗ **Documentation Requirement:** Unless explicitly exempt, every assignment must include a section clearly detailing how LLMs were used, **including the specific prompts**. If LLMs were not used, students should state: "LLMs were not used in this assignment."

Failure to adhere to the AI Policy may result in academic penalties, including potential failure of the course, in accordance with the university's policies on academic misconduct. Students are encouraged to ask the instructor for clarification about these policies as needed.

University Policies

Academic integrity and honesty

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct 11.35.01 sections 8 and 9. Therefore, students are required to uphold the Pack Pledge: "I have neither given nor received unauthorized aid on this test or assignment." Violations of academic integrity will be handled in accordance with the Student Discipline Procedures. Please refer to the Academic Integrity web page for a detailed explanation of the University's policies on academic integrity and some of the common understandings related to those policies.

Student Privacy

Originality Checking Software: Software (e.g., Turnitin) may be used in this course to detect the originality of student submissions.
Class recording statement: In-class sessions are recorded in such a way that might also record students in this course. These recordings will NOT be used beyond the current semester or in any other setting outside of the course.
Class privacy statement: This course requires online exchanges among students and the instructor, but NOT with persons outside the course. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Other Policies

Students are responsible for reviewing the NC State University Policies, Rules, and Regulations (PRRs) which pertain to their course rights and responsibilities:

- Equal Opportunity and Non-Discrimination Policy Statement and and Additional References
- Code of Student Conduct
- Grades and Grade Point Average
- Credit-Only Courses
- Audits

STUDENT RESOURCES

Academic and Student Affairs maintains a website with links for student support on campus, including academic support, community support, health and wellness, financial hardship or insecurity, and more. Find Help on Campus.

Disability resources

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office (DRO). For more information on NC State's policy on working with students with disabilities, please see the Policies, Rules and Regulations page maintained by the DRO and REG 02.20.01 Academic Accommodations for Students with Disabilities. **Please reach out to the instructor (serena_kim@ncsu.edu) to submit an accommodation letter within the first three weeks of the semester.**

Safe at NC State

At NC State, we take the health and safety of students, faculty and staff seriously. The Office for Institutional Equity and Diversity supports the university community by providing services and resources to support and guide individuals in obtaining the help they need. See the Safe at NC State webpage for resources.

Supporting Fellow Students in Distress

As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a healthy and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's well-being or yours. If you feel this way, I would encourage you to report this behavior to the NC State CARES website. Although you can report anonymously, it is preferred that you share your contact information so they can follow-up with you personally.

Course Evaluations

ClassEval is the end-of-semester survey for students to evaluate instruction of all university classes. The current survey is administered online and includes 12 closed-ended questions and 3 open-ended questions. Deans, department heads, and instructors may add a limited number of their own questions to these 15 common-core questions.

Each semester students' responses are compiled into a ClassEval report for every instructor and class. Instructors use the evaluations to improve instruction and include them in their promotion and tenure dossiers, while department heads use them in annual reviews. The reports are included in instructors' personnel files and are considered confidential.

Online class evaluations will be available for students to complete during the last two weeks of the semester for full semester courses and the last week of shorter sessions. Students will receive an email directing them to a website to complete class evaluations. These become unavailable at 8am on the first day of finals. More information about ClassEval.

- ClassEval Website
- Contact ClassEval Help Desk: classeval@ncsu.edu

Syllabus Modification Statement

Our syllabus represents a flexible agreement. It outlines the topics we will cover and the order we will cover them in. Dates for assignments represent the earliest possible time they would be due. The pace of the class depends on student mastery and interests. Thus minor changes in the syllabus can occur if we need to slow down or speed up the pace of instruction. To ensure course continuity, changes made to the method of instructional delivery, course structure, course schedule, number of assignments, grading or other aspects of the course after the start of the term will be communicated to all students in written form (e.g., dated syllabus revision or syllabus addendum) when course changes are implemented.