

STA 490 – Statistics Capstone

Fall 2022

CONTACT INFORMATION

Instructor: Cheng Peng, Ph.D.

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Office: 25 University Avenue RM 107

Classroom: Mitchell Hall 203

Meeting Time: Tuesday/Thursday - 9:30 AM – 10:45 AM

Office Hours:

Day	Time	Location
Monday	3:30 PM – 5:30 PM	UNA 107
Tuesday	12:45 PM – 1:45 PM, 3:30 PM – 4:30 PM	UNA107
Thursday	12:45 PM – 1:45 PM, 3:30 PM – 4:30 PM	UNA107

ZOOM Link: Available on the course web page and D2L as well.

Course Web Page: <https://pengdsci.github.io/STA490/>

COURSE DESCRIPTION

The course will synthesize lessons learned throughout the student's career to prepare students for work as professional statisticians. Topics will include report writing, presentations, statistical consulting, sampling design, and resume writing.

COURSE LEARNING OUTCOMES

After finishing this course, students will be able to

1. appropriately use a wide variety of statistical methods to solve real-world applications.
2. use a statistical programming language to perform rigorous data analysis.
3. effectively utilize data to address practical questions.
4. identify sources of bias and avoid misinterpretations.
5. communicate effectively about statistics in both written and oral forms using both technical and non-technical language.
6. complete formal projects integrating their statistics and application domain knowledge.

CLASS PARTICIPATION EVALUATION SCALE

Adapted from Bean, J. C. & Peterson, D. (1998). Grading classroom participation. New Directions for Teaching and Learning, 74, 33-40. Participation is evaluated using the following scale:

10 points

come to class prepared.

contribute readily to the conversation but doesn't dominate it.

make thoughtful contributions based on the literature that advances the conversation.

show an interest in and respect for others' contributions.

participate actively in all groups.

7 points

come to class prepared and makes thoughtful comments when called upon.

contribute occasionally without prompting; shows interest in and respect for others' views.

participate actively in small groups.

5 points

participate in the discussion, but in a problematic way: talk too much, ramble, interrupt the instructor and others, or do not acknowledge cues of annoyance from others.

3 points

come to class prepared but only minimally contribute.

ASSESSING STUDENT LEARNING OUTCOMES

Three major projects will be used to assess students' learning outcomes. The detailed evaluation components are outlined in the following components:

- (1). Class participation (30%)
- (2). Project #1: Sampling techniques (30%)
- (3). Project #2: Survey and analysis (30%)
- (4). Project presentation (10%)

A letter grade will be assigned based on performance in the course according to the following scale:

Grade	Quality Points	Percentage Equivalents	Interpretation
A	4.00	93-100	Excellent
A-	3.67	90-92	
B+	3.33	87-89	Superior
B	3.00	83-86	
B-	2.67	80-82	
C+	2.33	77-79	Average
C	2.00	73-76	
C-	1.67	70-72	
D+	1.33	67-69	Below Average
D	1.00	63-66	
D-	0.67	60-62	
F	0	< 60%	Failure

Refer to the Undergraduate Catalog for a description of NG (No Grade), W, Z, and other grades.

CLASS POLICIES

- **Attendance and Participation**

Attendance in the class is mandatory. Actively participating in class discussion is required in this class and is one of the components of the final course grade.

- **Late Assignments**

Late assignments will be accepted. However, all late assignments will be subject to a penalty deduction.

TENTATIVE TOPICS

This is a project lead course. The topics that are described in the course description are delivered through the following projects outlined in the following tentative thematic projects.

Week 01: Logistics and Technical Tools

- A laptop with relevant software programs installed.
- Outline of the topics for the semester
- Computational tools: R, RStudio, R Markdown, and Github
- R Markdown document template
- Create Github repositories

Topic #1: Effective Communication Strategies and Tools

Week 02: Github – A Collaborative and Communication Platform

- Code and data sharing via Github
- Host a professional web page on Github
- Template of your professional web page

Week 03: Computing and Reporting

- R and R Studio
- Best practices for coding
- Analytic report writing
- Reporting analysis with R Markdown

Week 04: Effective Presentation and Communication

- Design an analytic presentation – ideas and strategies
- Effective storytelling
- Use of visual aids

Topic #2: Data Collection and Information Extraction

Week 05: Review of Statistics Methods

- Descriptive Statistics
- Summary of inferential statistics: confidence intervals and testing hypothesis

- Linear regression models
- Logistic regression model.

Week 06: Sampling Techniques

- Getting to know the first working data set
- Study designs and sampling plans
- Sampling with R

Week 07: Sampling A Finite Population – Methods and Techniques

- Defining study population
- Descriptive statistics and basic visual analytics
- Comparing the performance of three sampling plans

Week 08: Reporting Sampling Project

- Setting up three sampling plans
- Defining performance metrics
- Finalizing the sampling
- project #1 report due

Topic #3: Survey Design and Analysis

Week 09: Survey Instrument Design

- Best practices of statistical consulting
- Questionnaire design
- Likert scales: analysis and interpretation
- Survey instruments: Self-compassion and gratitude survey

Week 10: Managing Survey Data

- Handling missing values
- Modifying demographic variables
- Survey scales and subscales
- Methods of information aggregation

Week 11: Statistical Methods of Information Aggregation

- Principal component analysis (PCA)
- Total and mean score vs PCA score
- Applications to Self-compassion and gratitude instruments
- Formulation research questions
- Survey research project proposal

Week 12: SAP and Project Report

- Choose a data set for the project
- Perform EDA and EVA
- Regression models to build
- Draft a statistical analysis plan (SAP)

Week 13: Regression Analysis and Project Report

- Regression modeling the relationship between compassion and gratitude

- Relationship between compassion and gratitude adjusted with demographics
- Finalizing the project report based on the SAP.
- Project #2 due

Week 14: Preparing Project Presentation

- Project presenting in 15 minutes (including 5 minutes for QA).
- Prepare a slide deck

UNIVERSITY POLICIES AND RESOURCES

ACADEMIC & PERSONAL INTEGRITY

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the University website at www.wcupa.edu.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at <https://www.wcupa.edu/universityCollege/ossd/>. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

EXCUSED ABSENCES POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a**

person under 18 years of age) when the abuse allegedly occurred to the person designated in the **University Protection of Minors Policy**. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: <https://www.wcupa.edu/admin/diversityEquityInclusion/sexualMisconduct/default.aspx>

INCLUSIVE LEARNING ENVIRONMENT AND ANTI-RACIST STATEMENT

Diversity, equity, and inclusion are central to West Chester University's mission as reflected in our [Mission Statement](#), [Values Statement](#), [Vision Statement](#) and [Strategic Plan: Pathways to Student Success](#). We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's [Office for Diversity, Equity, and Inclusion](#) (ODEI), DEI committees within departments or colleges, the student [ombudsperson](#), and centers on campus committed to doing this work (e.g., [Dowdy Multicultural Center](#), [Center for Women and Gender Equity](#), and the [Center for Trans and Queer Advocacy](#)).

Guidance on how to report incidents of discrimination and harassment is available at the University's [Office of Diversity, Equity and Inclusion](#).

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

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