

SYLLABUS STAT 6610

Applied Nonparametric Statistics
Autumn 2023 (full term)
3 credit hours

COURSE OVERVIEW

Instructor

Instructor: Dr. Steephanson Anthonymuthu

Email address: E-mail: anthonymuthu.1@osu.edu

Office: Pomerene Hall 108

Office hours: Wednesday 12:45 am-1:45 pm, or by appointment.

Zoom office hours: Thursdays 09:00 - 10:00 am

Zoom link:

Class Time:

Mon-Wed-Fri 10:20 am -11:15 am Cunz Hall 140

Grader:

Sibo Peng (peng.695@osu.edu)

Prerequisites

STAT 5301, STAT 6201, or STAT 6302, or equivalent, or permission of instructor.

Course description

This course serves as an introduction to applied nonparametric statistics. The area of nonparametric statistics is vast, and the term “nonparametric” is used in many ways. The focus of this course will be on

the use of rank-based procedures; these are non-parametric in the sense that they are distribution free and valid under weaker assumptions when compared to parametric procedures. Although this is an applied course, there will be some theory to help understand the core concepts behind rank-based procedures. Most of computations will be carried out using hand to illustrate the inner workings of the procedures. There will also be a computing component that will be done using the open-source statistical software R.

Course learning outcomes

By the end of this course, students should successfully be able to:

- Understand difference between nonparametric and parametric statistical procedures when nonparametric techniques are needed and useful.
- Grasp foundational concepts of statistical tests based on ranks, their associated confidence intervals, and point estimates.
- Identify appropriate statistical methods for a particular inference.
- Realize the importance of checking assumptions of the underlying probability models under which inferences are valid.
- Understand the concepts of asymptotic relative efficiency and large sample approximation.

Course delivery:

This course meets Mondays, Wednesdays, and Fridays in Campbell Hall 209 from 10:20 am - 11:15 am. Lectures will be delivered in person during the scheduled class meeting times. Students are expected to attend and participate in these in-person class meetings. Class meetings will be used to provide in-depth investigation of the topics for the week using a lecture format. Students will participate in these class sessions by engaging in discussions prompted by the instructor and by asking and answering questions. Students should plan to take notes during class.

Carmen:

This class will use Carmen. In Carmen, you will find copies of the syllabus, homework assignments, lecture notes and other important documents. Carmen will also be used to keep track of your assignment grades. Additionally, materials for lectures will be uploaded to Carmen.

COURSE MATERIALS AND TECHNOLOGIES

Textbook

Hollander, M., Wolfe, D. A., & Chicken, E., Nonparametric Statistical Methods, Third Edition (2014), Wiley.

The electronic version of the textbook can be accessed via library.

<https://library.ohio-state.edu/record=b8340960~S7>

Course technology

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** ocio.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu
- **TDD:** 614-688-8743

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration (go.osu.edu/video-assignment-guide)
- Recording, editing, and uploading video (go.osu.edu/video-assignment-guide)

Required equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.
- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; <http://www.r-project.org/>). This software package is available as a free software.

Carmen access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (go.osu.edu/add-device).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (go.osu.edu/install-duo) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

GRADING AND FACULTY RESPONSE

How your grade is calculated

Homework: Homework will be posted on a regular basis (probably bi-weekly) based on the lectures covered during the week. Students are expected to return their homework as a pdf file via CARMEN on or before the deadlines. Late homework submissions will not be accepted. Each student must produce his/her own homework to be returned in. Feel free to ask me for help after you have made an attempt of the questions.

Exams: The midterm and final will be delivered remotely via Carmen. The final exam will take place at the time and date established by the University. Information regarding the exams will be posted well in advance through the course website. A basic calculator is allowed. You will be permitted to have one standard sized sheet of written notes to the midterm exam and the final. There will be no make-up exams.

Project: A project, either based on a research paper on a nonparametric statistical methodology or based on a real-data application related to your major, will be completed by each student. The topic selected by the student must be approved in advance by the instructor by the 6th week of classes. Students need to

submit a short (up to 8 page) paper and deliver a presentation in the later part of the course. A more detailed rubric will be provided on the Carmen site.

The course grade will be based on the following weighting of assessment components: 30% of total homework assignment grades, 25% of midterm, 25% of final, and 20% of project each of which is over 100 points.

ASSIGNMENT CATEGORY	POINTS
Homework	30
Midterm	25
Final	25
Project	20
Total	100

See course schedule below for due dates.

Descriptions of major course assignments

- **Exams:** You must complete the midterm and final exams yourself, without any external help or communication. Biweekly homework is also expected to be completed on your own.
- **Written assignments:** Your written assignments, including discussion posts, project should be your own original work. In formal assignments, you should follow [MLA/APA/Chicago etc.] style to cite the ideas and words of your research sources.
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- **Collaboration and informal peer-review:** The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on an exam or homework assignment is not permitted. If you're unsure about a particular situation, please ask ahead of time.

Late assignments

Late submissions will not be accepted. Please refer to Carmen for due dates. However, in case of an emergency or exceptional circumstances (sudden onset of illness, unexpected family situations, etc.) arise and you are unable to submit after the original due, contact the instructor to discuss the possibility of an extension.

Grade Disputes

It is extremely important that you pay attention to your grades on a regular basis. If you feel that an assignment has been graded incorrectly or unfairly, you must speak with your instructor within **one week** of getting your grade on that assignment. We will not re-grade assignments at the end of the semester or offer any extra credit if you are not satisfied at that time with your final course grade, especially since you will have known all semester what is expected of you to earn your desired grade in this course.

We believe strongly that grades are earned, not given. If you need to achieve a certain grade in this course, be careful to complete all assignments, plan appropriate time for studying, come to office hours/tutor room and ask questions, review feedback you receive on graded activities so you can talk to us about any problems you missed, and get help as needed in order to achieve your goal. We hope your grade in the course will be just as important to you on Day 1 as it is at the end of the semester, especially since you will have known the expectations of this course all semester and are in control of deciding what grade to earn. We do not bump grades at the end of the semester, we do not have extra credit and we cannot change grades based on a person's circumstances. Do not expect your exams to be curved; they may or may not depending on how the class does. We do not curve the final total points at the end.

IMPORTANT! Keep track of your grades!!

Grading scale

The course grade will be assigned based on the following grading scale:

93-100: A
 90-92: A-
 87-89: B+
 83-86: B
 80-82: B-
 77-79: C+
 73-76: C
 70-72: C-
 67-69: D+
 60-66: D
 below 60: E

Instructor feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-4357(HELP)** at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within **7 days**.

- **Email:** I will reply to emails within **24 hours on days when class is in session at the university**. (i.e., Monday – Friday, excluding university holidays; list of holidays at <http://registrar.osu.edu/staff/bigcal.asp>)
- **Discussion board:** I will check and reply to messages in the discussion boards every **24 hours on school days**.

OTHER COURSE POLICIES

Discussion and communication guidelines

A significant component of our interactions in this class will occur through lectures. Please remember to be respectful and thoughtful, and to maintain a supportive learning community where everyone feels safe and where people can disagree amicably.

Academic integrity policy

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university’s *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)

Student Services and Advising

University Student Services can be accessed through BuckeyeLink. More information is available here: <https://contactbuckeyelink.osu.edu/>

Current students in the MAS, MS and PhD in Statistics should consult the department's program guide for details on the requirements. Questions should be directed to the student's advisor, the Graduate Studies Chair, Dr. Xinyi Xu (xu.214@osu.edu).

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Land Acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte,

Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greenville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land.

More information on OSU's land acknowledgement can be found here: <https://mcc.osu.edu/about-us/land-acknowledgement>

Your mental health

As a student you may experience a range of issues that can cause barriers to learn, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand resources are available at go.osu.edu/ccsondemand. You can reach an on-call counselor when CCS is closed at 614- 292-5766, and 24-hour emergency help is also available through the 24/7 National Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org. The Ohio State Wellness app is also a great resource available at go.osu.edu/wellnessapp.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

"The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic,-or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the [Safe and Healthy Buckeyes site](#) for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu."

Weather or other short-term closing University

Should in-person classes be canceled, I will notify you as to which alternative methods of teaching (Zoom lectures or other modes) will be offered to ensure continuity of instruction for this class. Communication will be via Carmen, email or other mode of communication.

Religious Accommodations

Our inclusive environment allows for religious expression. If you need to request accommodations based on faith, religious or a spiritual belief system in regard to examinations, other academic requirements or absences, please provide your course instructor with written notice of specific dates for which you need alternative accommodations at the earliest possible date.

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

For more information about religious accommodations at Ohio State, visit odi.osu.edu/religious-accommodations.

Accessibility of course technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Canvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Collaborative course tools

COURSE SCHEDULE

Refer to the Carmen course for up-to-date assignment due dates.

Week	Dates	Topics, Readings, Assignments, Deadlines
1	8/23 & 8/25	Review of Basic Concepts from Classical (Parametric) Statistics, and Comparison with the Nonparametric Approach (1.1 - 1.8)
2	8/28, 8/30, & 9/1	The Dichotomous Data Problem (2.1 - 2.3)
3	9/6 and 9/8	Sign Test Procedures for the One-Sample Location Problem and for Paired Replicates Data; Asymptotic Relative Efficiency (3.4, 3.5, 3.6, 3.8, 3.11)
4	9/11, 9/13 & 9/15	Signed Rank Procedures for the One-Sample Location Problem and for Paired Replicates Data (3.1, 3.2, 3.3, 3.7, 3.11)
5	9/18, 9/20, & 9/22	The Two-Sample Location Problem (4.1, 4.2, 4.3, 4.5)
6	9/25, 9/27, & 9/29	Two-Sample Test for General Differences (5.1, 5.2, 5.4) Project topic selection deadline (9/30)
7	10/2, 10/4, & 10/6	More lectures, Midterm Review
8	10/9 & 10/11	The One-Way Layout; Multiple Comparisons Procedures (6.1, 6.2, 6.5, 6.7)
9	10/16, 10/18, & 10/20	The Two-Way Layout (7.1, 7.2, 7.3, 7.4)
10	10/23, 10/25, & 10/27	Kendall's Tau Procedures for the Independence Problem (8.1, 8.2) &
11	10/30, 11/1, & 11/3	An asymptotically distribution-free Confidence interval based on the Kendall Statistic, an asymptotically distribution-free confidence interval based on Efron's Bootstrap and ranks (8.3, 8.4, 8.5)
12	11/6, 11/8, 11/10	A Distribution-Free Test for the Slope of the Regression Line (Theil) (9.1, 9.2, 9.3)
13	11/13, 11/15, & 11/17	Asymptotically Distribution-Free Rank-Based Tests for General Multiple Linear Regression Nonparametric Regression Analysis & Efficiencies of Regression Procedure (9.4, 9.6, 9.8) & Project submission is due (11/18) -presentation times will be communicated this week
14	11/20	Project Presentations
15	11/27, 11/29, 12/1	Project Presentations

Week	Dates	Topics, Readings, Assignments, Deadlines
16	12/4, 12/6	Lecture

Holidays:

- Sep 04: Labor Day - no classes.
- Oct 12-13: Autumn Break - no classes.
- Nov 10: Veterans Day observed - no classes.
- Nov 22-23: Thanksgiving Break begins - no classes.
- Nov 24: Indigenous Peoples' Day/Columbus Day observed – no classes.

Disclaimer

This syllabus should be taken as a reliable guide for the course content. However, you cannot claim any rights from it, and I reserve the right to change due dates or the methods of assessment. Official announcements will always be those made in lectures.