

STAT 3380 Section A01
An Introduction to Nonparametric Analysis
Fall 2022

Time Mondays, Wednesdays & Fridays, 10:30 a.m. – 11:20 a.m.
Location 204 Armes
CRN 21203

Instructor Dr. Zeny Mateo (She/Her)
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Web Pages UMLearn: <http://umanitoba.ca/umlearn>
R Download: <https://cran.r-project.org/mirrors.html>
R Studio Download: <https://rstudio.com/products/rstudio/download/>

Office Hours: Room 319 Machray Hall
Monday 2:30 p.m. – 3:30 p.m.
Tuesday 1:30 p.m. – 2:30 p.m.
Wednesday 2:30 p.m. – 3:30 p.m.

If the above times are not convenient for you, please email me to arrange an alternate time to meet. I will do my best to return all email messages within 24 hours.

Territory Acknowledgment

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota and Dene peoples, and on the homeland of the Métis Nation. We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

Textbook

Applied Nonparametric Statistics by Wayne W. Daniel, second edition, Brooks/ Cole, Duxbury Thompson Learning 1990 ISBN 0 –534 –38194 – 4. You can secure this by buying on the **website of Amazon.ca** There are two to three copies of the book available in the Science Library of the University of Manitoba.

References

- Practical Nonparametric Statistics by W. J. Conover, Third edition, John Wiley and Sons, Inc. 1999 ISBN 0 471-16068-7
- Nonparametric Statistical Methods by Myles Hollander and Douglas A. Wolfe, Second edition, John Wiley and Sons, 0 - 471 1945

Evaluation

Quizzes (best 2 of 3)	15%
Project	15%
Midterm Test	30%
Final Examination	40%

Quizzes

Quizzes and exams in this course are **closed book**. **There will be three short (3) quizzes throughout the term**. The instructor will inform students of the material covered on each quiz at least one week in advance. The quizzes will be given in class lecture time on the following tentative dates schedule: **Friday, September 30, Friday, October 21 and Friday, November 18**. As much as possible, they will be graded within one week.

The quizzes are worth 15% of your final grade , and **only the best 2 out of 3 quizzes will count towards your final grade** (i.e your lowest quiz mark will be dropped). **There will be no make -up quizzes - if you have to miss a quiz due to illness or another valid reason, and provided that you have submitted a self-declaration form to your instructor within 24 hours, that quiz will count as your lowest quiz mark, which will be dropped.**

Subject to the caveat in the paragraph below, the following are the minimum percentage grades required to receive each of the various letter grades: A⁺ (90%), A (80%), B⁺ (75%), B (70%), C⁺ (65%), C (60%), D (50%).

There is an **additional requirement** for obtaining a C in the course: **to obtain a grade of C or better, you must obtain at least 50% on the final examination.**

Research Project

Part of your assessment for this course will be a submission of a project. The goal of this assessment is to analyze some real data sets using both the a nonparametric and a parametric approach. The data set and research questions should be of typed that could be analyzed using the nonparametric methods we have studied in this course. This research project will

require a research objective, data collection, analysis, summary and interpretation of the results. More details will be discuss in our class lecture.

Exam Information

The Midterm Test will be held on **Wednesday, November 2, 2022 from 6:00 p.m.–7:30 p.m. (1.5 hours)** More details will be discussed in class regarding the Midterm Test and Final examination. The final exam will be two (2) hours in duration and will be scheduled by the Student Records Office. **Please note that there will be no deferred test.** In case a student will not be able to write his Midterm test for valid reason, the weight of the Midterm Test will be adjusted to the Final examination.

Software

The software R- Studio software will be used sometimes in this course to show the analysis and solutions of some problems. However, the interpretation of the output is the most important thing that we need to understand in this course. So please download the and installed R and R- Studio programs depending on your operating system where the links are found in the first page.

Course Outline

Unit 1 – Introduction

Unit 2 – Review of Basic Statistics

- Some Important Terminology
- Hypothesis testing; Statistical Significance versus Practical Significance, Type I error, Power of the Hypothesis Test; Efficiency of Hypothesis Tests
- Estimation
- Measurement scales: Nominal, Ordinal, Interval and Ratio
- Nonparametric Statistics : History, Advantages and Disadvantages, When to use Nonparametric Procedures.

Unit 3 – Procedures that Utilize Data from a Single Sample

- Making Inferences about a Location Parameter: One– sample Sign Test, Wilcoxon Signed–Rank Test
- Making Inferences about a Population Proportion: Binomial Test
- One–Sample Run Test for Randomness

- Cox–Stuart Test for Trend

Unit 4 – Procedures that Utilize Data from Two Independent Samples

- Making Inferences about the difference between two location parameters: Median Test, Mann–Whitney Test

Unit 5 – Procedures that Utilize Data from Two Related Samples

- Procedures for Testing Hypotheses about Location Parameters: Sign Test for Two Related Samples, Wilcoxon Matched–Pair Signed Rank Test
- Confidence Interval Procedures for the Median Difference
- Test for Two Related Samples When Data Consists of Frequencies

Unit 6 – Chi–Square Tests of Independence and Homogeneity

- Mathematical Properties of the Chi–square Distribution
- Chi–square Test of Independence
- Chi–square Test of Homogeneity

Unit 7 – Rank Correlation and other Measures of Association

- Spearman Rank Correlation Coefficient
- Kendall’s Tau
- Point Biserial Coefficient of Correlation

Unit 8 – Procedures that Utilize Data from Three or More independent Samples

- Extension of the Median Test
- Kruskal–Wallis One–Way Analysis of Variance by Ranks
- Multiple Comparison

Unit 9 – Procedures that Utilize Data from Three or More Related Samples

- Friedman Two–way Analysis of Variance by Ranks
- Multiple–Comparison Procedure for use with Friedman Test
- Durbin’s Test for Incomplete Block Design

Unit 10 – Optional Topics (if time permits)

- Making Inferences about the Equality of Two Dispersion Parameters: Ansari– Bradley Test
 - Cochran’s Test for Related Observations
 - Test for Normality: Lilliefors Test, Kolmorov– Smirnov Test and Goodness-of-Fit Test
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Academic Integrity

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. The following link describes various types of academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation), and offers several resources to help students understand and avoid academic dishonesty:

<http://umanitoba.ca/student-supports/academic-supports/academic-integrity>

The Student Discipline Bylaw, which describes the potential consequences of academic dishonesty, can be found at the following link:

http://umanitoba.ca/admin/governance/media/Student_Discipline_Bylaw_-_2018-09-01.pdf

An academic integrity and student conduct tutorial can be found at the following link. For this course, it is recommended in particular that you view the parts on Tests & Exams and Inappropriate Collaboration.

http://umanitoba.ca/student/resource/accessibility/files/AI-Student-Conduct-Tutorial/story_html5.html

All students are required to complete a short Academic Integrity quiz in *UM Learn*. If you receive a score of 100% on this quiz, you will receive a 1% bonus towards your final grade in the class. The quiz must be completed by **Monday September 26 at noon**. You cannot receive credit for this course if you do not complete this quiz.

Voluntary Withdrawal

The voluntary withdrawal date is **November 22** (by which time you will have received your marks for the first two quizzes, and the midterm test). If you are unlikely to be successful in the course, or are not achieving the grade that you are aiming for, you should consider a VW from the course. Students enrolled in the course after the VW deadline will be assigned a final grade.

Authorized Withdrawal

In some instances, medical or compassionate circumstances arise in a student's life that prevent them from performing as they would in normal circumstances. If you are in this position, please contact a Faculty academic advisor to discuss your options. Be prepared to provide documentation, which supports your situation.

Copyrighted Material

All course notes, assignments, tests, exams, practice questions and solutions are the intellectual property of your instructor or the Department of Statistics. **The reproduction, posting or distribution of these materials is strictly forbidden without their consent.** It is **illegal** to upload any course material to any website. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright>.

Recording of Class Lectures

Your instructor holds copyright over the course materials, presentations and lectures which form part of this course. **No audio or video recording of lectures or presentations is allowed in any format** without permission from your instructor.

Class Communication

The University requires all students to activate an official University email account. Please note that all communication between you and your instructor must comply with the Electronic Communication with Students Policy. Please see

http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html

You are required to obtain and use your U of M email account for all communication between yourself and the university.

Professional Conduct

Students in the University community can freely express their thoughts, opinions, and beliefs; however, they must observe the Respectful Work and Learning Environment Policy (<https://umanitoba.ca/about-um/respectful-work-and-learning-environment-policy>) and treat each other, staff, and faculty with respect. Students who are alleged to have breached the Respectful Work and Learning Environment Policy will be investigated and disciplined according to the Student Non-Academic Misconduct and Concerning Behaviour Procedure.

Academic Accommodations

Student Accessibility Services

Students who have, or think they may have, a disability (e.g., mental illness, learning, medical, hearing, injury-related, visual) are encouraged to contact Student Accessibility Services to arrange a confidential consultation. Instructors are notified by Student Accessibility Services what accommodations their registered students require, which will help the instructor determine fair, feasible and reasonable academic accommodations without compromising academic standards. This takes time and planning, so reach out at the start of term.

SAS students can write their exams and tests in spaces organized by the SAS Exam Centre; however, they must register with the SAS Exam Centre a few weeks in advance. Please be sure to do so to receive the accommodations.

Student Accessibility Services

<http://umanitoba.ca/student-supports/accessibility>

520 University Centre

204-474-7423

Student.accessibility@umanitoba.ca

Medical Notes and Other Documentation

The Self-Declaration for Brief and Temporary Absences Procedure and Policy will be effective on September 1, 2022 and therefore students will not be required to present medical or other documentation for absences due to extenuating circumstances of 72 hours or less; however, you must complete the form at the following link:

<https://umanitoba.ca/governance/sites/governance/files/2022-06/self-declaration-for-brief-and-temporary-student-absences-fillable-form-final-for-website.pdf>

You must submit the form to your instructor in lieu of any medical or other documentation. Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than 72 hours. You only need to submit this form if you miss an assessment. You do **not** need to fill out this form if you are missing a lecture or a tutorial. Note that personal vacations or work obligations are **not** considered valid excuses to miss assessments.

Final Exams

If you have conflicting scheduled final exams, or if you miss a final exam due to illness or some other valid reason, **you must contact an academic advisor in your home faculty** (<http://umanitoba.ca/academic-advisors/>) as soon as possible to apply for a deferred exam. Deferred final exams are **not** arranged through your instructor or the department. Note that the granting of a deferred exam is not necessarily guaranteed.

Health and Safety

The University of Manitoba is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to the COVID-19 pandemic or other campus-wide emergency, it is possible that this course will move to a fully remote delivery format. Should the instructor be required to stay at home for an extended period and an alternate instructor not be available, the course may move temporarily to a remote delivery format.

Mask Wearing

In a face-to-face environment, our commitment to safety requires students to observe all COVID guidelines set by the University (<https://umanitoba.ca/coronavirus>). While on campus and in class, you must wear masks as stipulated in current University policies, procedures, and guidelines. The University highly recommends the use of KN-95 masks; the minimum requirement is a ATSM Level 2 Medical mask. Both mask types are available at many locations on campus. Students who fail to comply are subject to disciplinary action in accordance with the Student Discipline Bylaw and the Non-Academic Misconduct and Concerning Behaviour Procedure. If you do not follow masking requirements, you will be asked to leave the learning space and may only return to the class already in progress when you have complied with this requirement. Repeated issues will result in disciplinary action as previously noted. **Students should not eat or drink during class time.**

Illness

Remember: **STAY HOME IF YOU HAVE SYMPTOMS OR ARE ILL.** If you received a positive COVID test result, or if you have symptoms without testing, you must follow the instructions at <https://umanitoba.ca/covid-19/health-safety>. Specifically,

- You should **isolate for 5 days** after your symptoms started and until you have no fever and your other symptoms have improved over the past 24 hours.
- If you don't have symptoms and test positive, you should **isolate for 5 days** after your test date.

If you become ill while at the university, you should leave the classroom, lab, or workspace immediately. Once at home, complete the MB self-assessment and follow the directions

that are provided. Please remain off-campus until cleared to return in accordance with self-assessment, testing results, and UM recommended isolation procedures.

Complete the COVID-19 case reporting form at <https://umanitoba.ca/covid-19/case-reporting>.

Mental Health Support

For 24/7 mental health support, you can contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling.

Student Counselling Centre: <http://umanitoba.ca/student/counselling/index.html>
474 University Centre or S207 Medical Services
204-474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on- and off-campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

Student Support Intake Assistant: <http://umanitoba.ca/student/case-manager/index.html>
520 University Centre, Fort Garry Campus
204-474-7423

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.

University Health Service: <http://umanitoba.ca/student/health/>
104 University Centre, Fort Garry Campus
204-474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact the university's Health and Wellness Educator if you are interested in peer support from Healthy U or information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.

Health and Wellness Educator:

<https://umanitoba.ca/student/health-wellness/welcome-about.html>

britt.harvey@umanitoba.ca

469 University Centre, Fort Garry Campus

204-295-9032

Live Well @ UofM

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site: <http://umanitoba.ca/student/livewell/index.html>.

Your Rights and Responsibilities

As a student of the University of Manitoba, you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The Academic Calendar (<https://umanitoba.ca/registrar/academic-calendar>) is one important source of information. View the sections of University Policies and Procedures and General Academic Regulations. While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final grade appeals. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form: <http://umanitoba.ca/registrar/>.
- You are expected to view the General Academic Regulation section within the Academic Calendar, and specifically read the **Academic Integrity** regulations. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/>. View the **Student Academic Misconduct** procedure for more information.
- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected to conduct yourself in an appropriate respectful manner.

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an Academic Advisor within **your** registered faculty/college or school for questions about your academic program and regulations.

Contact **Student Advocacy** if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>
520 University Centre
204-474-7423
student_advocacy@umanitoba.ca