

The University of Manitoba, Department of Statistics
STAT 3550: Nonlinear Models
Winter 2024

Lecture Time MWF, 1:30 pm – 2:20 pm
Location Room 111 Armes
Instructor Dr. Liqun Wang, email: liqun.wang@umanitoba.ca
Office Hours Wednesday 3:45 pm – 4:45 pm

Calendar Description

Nonlinear multiple regression, logistic regression, Poisson regression and generalizations, over/under dispersion, model selection techniques. May not be held with STAT 4000.

Prerequisite: One of STAT 3450, the former STAT 3470, or the former STAT 3120.

Co-requisites: [one of STAT 3100, the former STAT 3800, or the former STAT 3600] and STAT 3150.

Objectives

This course is meant to be the follow-up to STAT 3450, focusing on nonlinear regression models, including logistic, Poisson and other families of generalized linear models. By the end of this course, students should be able to understand the basic ideas and theories of statistical estimation and inference in nonlinear models. They will also be able to apply various statistical methods to real life data analysis and use statistical software R to carry out the numerical computation.

Textbook

R.H. Myers, D.C. Montgomery, G.G. Vining and T.J. Robinson (2010). *Generalized Linear Models with Applications in Engineering and Sciences, 2nd Edition*, Wiley.

Other Reference

P.K. Dunn and G.K. Smyth (2018). *Generalized Linear Models with Examples in R*, Springer.

Statistical Software

The numerical computation and data analysis are done mainly using the statistical software R. It is free downloadable from the R Project CRAN homepage <http://lib.stat.cmu.edu/R/CRAN/>. You will also need to download the software environment RStudio from <https://rstudio.com/products/rstudio/>.

Course Work and Evaluation

There will be no formal assignments. Supplementary theoretical and computing problems will be given for practice, but they are not to be handed in for credits. The computing problems involving data analysis are to be done using R(Studio). There will be two midterm tests to be done in class, tentatively scheduled on February 9 and March 15, 2024. There will be no make-up midterm test. Students who miss a test for valid reasons and notify the instructor within 48 hours will have the weight of the test added to the final exam.

The final exam will be two hours in duration and will be scheduled by the Registrar's Office. The final exam will be cumulative while emphasizing on the material after the second test. The final grade for the course will be calculated according to the following scheme:

Test #1: 25%, Test #2: 25%, Final Exam: 50%

The final letter grades are normally assigned based on the following minimum percentage grades:

A+ (90%), A (80%), B+ (75%), B (70%), C+ (65%), C (60%), D (50%), F (below 50%).

Course Topics

1. Review of linear regression models, introduction to R (about 2 weeks)
2. Nonlinear regression models, least squares estimation, maximum likelihood estimation, numerical optimization, goodness-of-fit, statistical inference (about 3 weeks)
3. Logistic and Poisson regression models, maximum likelihood estimation, goodness-of-fit, statistical inference (about 3 weeks)
4. Generalized linear models, exponential family of distributions, likelihood estimation, weighted least squares method, goodness-of-fit, statistical inference, model selection (about 3 weeks)
5. Other topics (optional, about 1 week)

Important Dates

The following dates are important to how the course will progress throughout the term. The dates are tentative and subject to change at my discretion and/or based on the learning needs of the students.

January 8: First day of classes

January 19: Last date to drop Winter term courses

February 9: Midterm Test #1 (in class)

February 19 - 23: Winter Term break (no classes)

March 15: Midterm Test #2 (in class)

March 20: Voluntary withdrawal (VW) deadline

March 29: Good Friday (no classes)

April 11: Last day of classes

April 12 - 26: Final exam period

Use of Technology

Students may make use of technology including generative artificial intelligence (genAI) tools to contribute to their understanding of course materials.

ROASS Schedule A

Schedule A of the Responsibilities of Academic Staff with regards to Students (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. Schedule A will be posted in UM Learn. A copy of it with additional information from the Faculty of Science is attached.

Schedule A For Winter 2024 Course Syllabi

How To Succeed In Your Science Courses?

The Faculty of Science is committed to delivering the high-quality education our students have come to expect. We also want to ensure that you set yourself up for success. We want you to succeed!

#1. Registration Revision Period: Use the [Registration Revision Period](#) to evaluate course syllabus. During the registration revision period you will be able to drop/add courses without any financial consequence. Speak directly with instructors if you have any questions specific to their course.

#2. Evaluate Workload: Take time to consider the workload associated with the course schedule you are planning. Be realistic about other commitments and distractions that are part of everyday life and make your course selection decisions accordingly. Please consider watching this presentation from the Academic Learning Centre for [Managing Your Time Effectively](#). If you want to discuss anything, talk to an Academic advisor in your faculty – [Academic advising](#).

#3. Commitment to Study: For an average course, you should aim to commit at least three hours of studying for every hour of lecture. Make sure you keep up with studying on a consistent basis.

#4. Reach Out for Help: If you experience issues learning the course material, reach out to your instructor, teaching assistants, supplemental instruction leaders or [Academic Learning Centre](#) for the course as soon as possible. Most content builds on previous content and deficiencies in understanding will cascade issues throughout the course. For questions about your degree program or if life stresses hinder your academic performance, contact your faculty's academic advisors immediately.

#5. Learn Efficiently, Learn to Take Notes: During the pandemic, many lectures were delivered asynchronously so students had a chance to review lecture videos when they did not catch something during the lecture. Students in lectures delivered in-person will not have the luxury of rewatching a live lecture. Therefore, you may want to review some [note-taking tips](#) offered by the [Academic Learning Centre](#) which can help you learn efficiently.

University of Manitoba Policies

As a student at the University of Manitoba (UM) 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 UM website's [Governing Documents](#) is one important source of information, in particular the Academic and Students sections. The Student Advocacy office can also help you understand policies and procedures; find their information in the UM Learner Supports section below.

Academic Calendar

The [Academic Calendar](#) is the University's official publication containing course descriptions, program and graduation requirements, as well as UM and faculty/school-specific rules, regulations and policies.

In particular, familiarize yourself with the sections University Policies and Procedures and General Academic Regulations.

Learner Support

Below you will find a select list of important supports for learners at the UM, both academic supports and otherwise. For a complete listing of all learner supports at the University of Manitoba, visit the [Student Supports website](#).

Academic Advising

Contact an [Academic Advisor](#) for support with degree planning and questions about your academic program and regulations.

Academic Learning Centre (ALC)

The [Academic Learning Centre](#) offers one-to-one tutoring, groups study sessions and workshops, as well as video and tip-sheet resources to help you throughout your academic program. All Academic Learning Centre programming, supports, and services are free for UM students.

Make an appointment for **free one-to-one tutoring**. **Content tutors** (over 90 UM courses) can help you understand concepts and learn problem-solving strategies. **Study skills tutors** can help you improve your skills such as time management and goal setting, reading and note-taking, as well as learning and test-taking strategies. **Writing tutors** can give you feedback on your academic writing, whether you are just getting started on a written assignment or already have a draft. **English as an Additional Language** specialist, Antoanela Denchuk, is available for one-to-one tutoring to help you improve your English-language academic writing skills. Use the drop-down menu, read the tutor biographies, and make an appointment for tutoring on the [Academic Learning Centre schedule](#).

Attend **Supplemental Instruction (SI)** sessions in historically difficult courses (including Chemistry, Engineering, and Computer Science). These free weekly review sessions are facilitated by a peer mentor who has previously taken the course and provide an opportunity to discuss course content, ask questions, compare notes, solve practice problems, and develop study strategies. See online for a list of SI courses and meeting times.

Register for an [Academic Success Workshop](#), where you can learn strategies to improve your writing and studying. More information on topics, dates, and registration, are found online.

Access the Academic Learning Centre's collection of [videos and tip sheets](#) to help you with many of the academic tasks you'll encounter in university.

Contact the Academic Learning Centre by calling 204-480-1481 or emailing academic_learning@umanitoba.ca. Bannatyne students can contact the Bannatyne Student Services office at 204-272-3190.

University of Manitoba Libraries

Research begins at UM Libraries. Learn at the Libraries is a great place to start, with information for students on academic writing, how to search the library, evaluating resources, and writing citations. As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about locating appropriate resources

or managing citations, and will address any other concerns you may have regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you online. When working remotely, students can also receive help online through Ask Us! chat. For further detail about the libraries' services and collections, visit the Libraries' web site.

Basic Needs

It can be difficult to learn and succeed in courses when you are struggling to meet your or your family's basic needs. Several UM and community resources are listed below if you would benefit from support with regards to housing, food, finances, and/or childcare:

- *Housing*
 - o [UM Housing](#)
 - o [Manitoba Residential Tenancies Branch](#)
- *Food*
 - o [U of M Food Bank](#)
 - o [Food Matters Manitoba](#)
- *Finances*
 - o [UM Financial Aid and Awards](#)
 - o [Manitoba Student Aid](#)
- *Child Care*
 - o [UM Child Care](#)
 - o [Manitoba Child Care Subsidy](#)
 - o [Manitoba Child Care Association](#)

English Language Centre

The [English Language Centre \(ELC\)](#) provides courses, tests, accommodations and individual support to students whose first language is not English in order to support academic success and participation in the UM community.

Health Support

Physical, mental, emotional, and spiritual health and wellness play a critical role in student success. See all of UM's resource on their [Health and Wellness](#) website, and make note of several specific UM and community supports listed below.

Mental Health Support

Winnipeg Urgent Physical and Mental Health Care

If you are an adult experiencing a mental health or psychosocial crisis, contact the [Klinic Community Health](#) 24/7 crisis line at 204-786-8686, visit the [Crisis Response Centre](#) located at 817 Bannatyne Avenue, or contact the Mobile Crisis Service at 204-940-1781.

To speak with a nurse for guidance on what health-care path to take for the issue you are facing or for general information about health resources available in Manitoba, contact [Health Links](#) at 1-888-315-9257 (toll free).

If you need urgent medical care, visit the Winnipeg Regional Health Authority's [Emergency Department & Urgent Care Wait Times](#) webpage for a list of locations and current wait times.

Student Counselling Centre (SCC)

The [Student Counselling Centre](#) provides free counselling and mental health support to UM, English Language Centre, and International College of Manitoba (ICM) students. We are open year-round, Monday through Friday from 8:30 am to 4:30 pm. Our commitment is to offer a support service to every student who contacts us.

Visit the SCC's [For Urgent Help](#) webpage or the urgent care resources listed above if you require immediate support.

Visit the SCC's [Our Services](#) webpage for more information on accessing a variety of services including individual counselling, counselling workshops and groups, support resources, and learning disability assessment services.

The SCC is located at 474 UMSU University Centre (Fort Garry Campus).

Health and Wellness Office

Students often juggle multiple demands, and we recognize that it can be difficult to find balance. For any changes you want to make to your health and wellness, the Health and Wellness Office at the UM would like to support you in your journey. We are here to help you take control of your own health and make your own decisions. We are a judgment-free space and we avoid labels whenever possible. For more information, please visit the [Health and Wellness Office](#) website.

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

Spiritual Care and Multifaith Centre

Spiritual care services are available to all, whether you identify as spiritual, atheist, religious or agnostic. [Spiritual Services](#) also offer specific denominational support for certain religious groups and by Indigenous Elders-in-Residence.

Student Support Case Management (SSCM)

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 (UHS)

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 Safety

The UM is committed to maintaining a safe learning environment for all students, faculty, and staff. For information related to COVID-19 for our campus community, please visit the page:

<https://umanitoba.ca/coronavirus>

Please stay home when you are feeling unwell.

Sexual Violence Support and Education

Sexual violence affects people of all ages, sexual orientations, genders, gender identities, abilities and relationship statuses. At the UM, we are committed to ensuring a respectful work and learning environment for all. We want to build a safe and inclusive campus community where survivors of sexual violence know they can receive the supports they need to succeed, both academically and personally.

The [Sexual Violence Resource Centre](#), located at 537 UMSU University Centre (Fort Garry campus) provides support, resources, information and referral services for any student, faculty or staff member who has been affected by sexual violence.

Indigenous Students

Staff, faculty and Elders are well-equipped to ensure your university experience is as beneficial, accessible, and successful as possible. Visit the Indigenous [Student Experience](#) website for more information on the supports and services available.

International Students

The transition to a new country and a new academic system can be both exciting and overwhelming. The International Centre (IC) is here to help you settle into life at UM. Visit the [International Students](#) website for more information.

Academic Accommodations

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.

Medical Notes and Other Documentation

The Self-Declaration for Brief and Temporary Absences Procedure and Policy is effective as of September 1, 2022 and therefore students will not be required to present medical or other documentation for absences due to extenuating circumstances of 120 hours or less, however [this form](#) must be completed and submitted to the instructor in lieu of the documentation. Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than 120 hours.

Short-Term Academic Accommodations (up to 120 consecutive hours absences)

Students who miss a lab or assessment due to an extenuating brief or temporary absence should complete a [self-declaration of brief absence form](#) and submit it to their instructor **within 48 hours of the end of the brief absence**. The instructor will discuss with the student how the missed work can be made up.

- **Students absent for over 120 hours as a result of medical, compassionate, University scholastic, University athletic or religious event will require official documentation to explain the absence.** Students should reach out to instructors early if absences are anticipated.
- **Personal vacations and work requirements are not considered acceptable absences.**

Long-Term Academic Accommodations

Students with long-term academic accommodations are usually registered with [Student Accessibility Services](#). The long-term academic accommodations are usually to accommodate long term physical or mental illness and accommodations can be in the form of notetaking, interpreting, assistive technology, and assessment accommodations.

Final Exams

Students who have conflicting scheduled exams should contact their faculty's academic advisors as soon as possible. Students who miss their exam due to extenuating, brief or temporary circumstances listed in the Self-Declaration for Brief and Temporary Student Absences Policy can apply for a deferred exam. Please note that the granting of a deferred exam is not necessarily guaranteed. **Also note that Faculty of Science students who have deferred more than two terms of final exams will be required to provide additional documentation beyond the self-declaration of brief absence form.**

Deferred Final Exams

Deferred final exams are usually written within 30 days of the regular exam. **For Winter 2024, deferred exams may be written as early as April 29, 2024.** Students missing the deferred exam will be required to apply for a re-deferred exam which is typically held the next time the course is offered (*i.e.*, missing the Winter 2024 deferred exam may mean that the next opportunity to write will be Winter 2025). The content and structure of the deferred exam may be different from that written in the regular examination period. **Students have a responsibility to check on the structure and expectations with the course instructor.**

Missed Lecture Notes

Students missing lecture notes as a result of absences are responsible for obtaining the missed content on their own accord. Contact a classmate or the course instructor for their notes but please be aware the instructor is not obliged to create notes for students as a result of absences.

Voluntary Withdrawal (VW) Policies

Voluntary withdrawal (VW) is a way for students to leave a class without academic penalty once the Registration Revision Period has ended. If you opt to voluntarily withdraw from a course, the course you have withdrawn from will be listed on your transcript; however, "VW" will appear in lieu of a grade. If you do not drop a course before the VW deadline, you will receive a final grade in the course on your transcript.

Students have the opportunity to voluntarily withdraw (VW) from this class up to March 20 ([in the event of date discrepancies, please follow the dates on the Important Dates and Deadlines webpage](#)). By then, you will have received feedback to allow you to assess your progress and determine if you are achieving the grade you are aiming for in this course. If you are unlikely to be successful in the course, or not achieving the grade that you are aiming for, you should consider a VW from the course. In advance of the VW date, you should contact your instructor to review your progress in more detail, or you may discuss the VW option with a Faculty academic advisor.

Please note that there are separate deadlines for dropping a course early in a term during the Registration Revision Period. Dropping a course means you are removing that course from your schedule, will not be charged tuition fees for that course, and the course will not appear on your transcript.

The Registrar's Office website, [Withdraw from a Course](#), includes more information on the different ways in which you can withdraw from a course and important dates and deadlines to do so.

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](#) 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 Integrity

Academic integrity is taking responsibility for and being honest with your work and respecting the work of others. Since you are a member of the university community, we want you to learn what that responsibility and honesty entails and how we respect the work of others.

The Faculty of Science continues to uphold high standards of academic integrity. We know that you, our students, support us in this and we count on every one of you to do your part. We expect all students to strictly adhere to instructions from their professors regarding what resources can and cannot be used for assessments, to follow other rules the professors wish to set, and to adhere to the academic conduct standards of the University and Faculty.

To aid professors in assuring that all forms of assessments have been administered fairly, the University can electronically monitor all tests, quizzes and examinations, included, but not limited to overseeing chatrooms, relevant predatory websites and, in so doing, we will analyze scholastic evidence of individual exams.

Students who transgress academic integrity rules will be investigated and disciplined (if justified) according to the [Student Discipline By-Law](#) and [Student Academic Misconduct Procedure](#).

The list of suggested minimum penalties assessed by the Faculty of Science for acts of academic misconduct is available on the [Faculty of Science website](#).

Artificial Intelligence

Many of us have heard of, and perhaps even used, artificial intelligence tools like ChatGPT. Course instructors can decide whether artificial intelligence tools can be used in their courses. Artificial intelligence tools are not limited to artificial intelligence chatbots (e.g., ChatGPT) or image generators (e.g., DALL-E) but also writing and paraphrasing tools (e.g., Quillbot and Grammarly). Please refer to the syllabus or ask the instructor for clarity.

Copyright

All students are required to respect copyright as per Canada's *Copyright Act*. Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the UM community.

Please respect copyright. We will use copyrighted content in this course. No audio or video recording of the lectures is allowed in any format, openly or surreptitiously, in whole or in part without permission from the instructor. University guidelines state that copyrighted works, including those created by the course instructor, are made available for private study and research, and must not be distributed in any format without permission. Since it is illegal, do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the Copyright Act applies or written permission has been confirmed.

For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright>.

Your Rights And Responsibilities

As a student of the UM 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](#) 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** regulation. 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. Policies governing behavior include the: [Respectful Work and Learning Environment](#), [Student Discipline](#) and, [Violent or Threatening Behaviour](#)
- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The **Sexual Violence** policy may be found at: <https://umanitoba.ca/governance/governing-documents/governing-documents-university-community#sexual-violence>. More information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>

For information about rights and responsibilities regarding **Intellectual Property** view the policy: https://umanitoba.ca/admin/governance/governing_documents/community/235.html

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 <http://umanitoba.ca/academic-advisors/>

Student Advocacy

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