

The University of Manitoba, Department of Statistics  
STAT 3550: Nonlinear Regression Models (Winter Term 2021)

**Time** Tuesdays & Thursdays 11:30 a.m. – 12:45 p.m.  
**Location** Online via Zoom  
**Instructor** Dr. Liqun Wang, email: liqun.wang@umanitoba.ca  
**Office Hours** Tuesdays and Thursdays from 11:00 a.m. – 11:30 a.m., or by appointment

**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.

**Textbook**

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

**Assignments/Tests/Final Exam**

There will be four assignments. Assignments will include theoretical and computing problems. The computing problems involving data analysis are to be done using R(Studio). All assignments will be made available in UMLearn. No late assignments will be accepted.

There will be two midterm tests to be done in class, tentatively scheduled on February 23 and March 23, 2021. 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 tests and exam will be open-book. All questions will be made available in UMLearn before the scheduled time. The answers are to be submitted electronically through UMLearn before the due date/time. Late submissions will not be accepted. Detailed instructions will be provided in the class.

**Course Evaluation and Grading Scheme**

The final grade for the course will be calculated according to the following scheme:

Assignments (4): 40% (10% each); Midterm Tests: 30% (15% each); Final Exam: 30%

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

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

**Objectives**

This course is meant to be the follow-up to STAT 3450, focusing on nonlinear regression models, including the important families of generalized linear models and other useful generalizations of linear

models. Optional topics include introductions to nonparametric techniques, issues related to censored/truncated data and estimation in sparse models. This course is part of the informal stream of *applied* courses. Courses in the applied stream are meant to expose students to generalizations of the concepts seen in previous courses (linear models) and to the use of these ideas for real data analysis, which should imply the use of statistical software to perform analyses.

### **Course Contents**

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 19: First lecture - course overview

January 29: Last date to drop Winter Term

February 23: Midterm Test #1

February 16 – 19: Winter Term break (no classes)

March 23: Midterm Test #2

March 31: Voluntary withdrawal (VW) deadline

April 15: Last lecture

April 19 – May 1: Final exam period

### **Respectful Behaviour in Online Classroom**

All live components of this course will be conducted over Zoom. It is expected that you conduct yourself professionally and do not distract your fellow students with unnecessary or inappropriate chat messages, sounds, or images if you are ever on web camera. If you appear on web camera it is expected that you will be dressed appropriately for a classroom environment.

### **Academic Dishonesty**

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration, examination impersonation and typical penalties) can be found at: [http://www.umanitoba.ca/student/resource/student\\_advocacy/academicintegrity/students/a-to-i-what-is-academic-integrity.html#cheating-on-exams](http://www.umanitoba.ca/student/resource/student_advocacy/academicintegrity/students/a-to-i-what-is-academic-integrity.html#cheating-on-exams); and [http://www.umanitoba.ca/student/resource/student\\_advocacy/academicintegrity/students/student-academic-misconduct-faq.html](http://www.umanitoba.ca/student/resource/student_advocacy/academicintegrity/students/student-academic-misconduct-faq.html); and <https://www.sci.umanitoba.ca/students/undergraduate-students/academic-resources/academic-integrity-2/>

This is a remote learning course. I expect students to hold themselves to the highest standards of academic integrity. I expect you to be honest, conduct yourself with integrity, actively encourage your peers to conduct themselves with integrity, and uphold the value of what a degree from the University of Manitoba means.

### **Copyrighted Material**

Please respect copyright. We may use copyrighted content in this course and ensure that the contents are appropriately acknowledged according to copyright laws and university guidelines. The course notes, assignments, tests and exams are the intellectual property of your instructor or the Department of Statistics. Reproduction or distribution of these materials is strictly forbidden without their consent. You do not have permission to upload any course notes, tests, assignments, or handouts to any note sharing websites. Please see the following site: [https://umanitoba.ca/admin/vp\\_admin/ofp/copyright/media/Note\\_sharing\\_Web\\_sites.pdf](https://umanitoba.ca/admin/vp_admin/ofp/copyright/media/Note_sharing_Web_sites.pdf). For more information, see the university's copyright office website at <http://umanitoba.ca/copyright>.

### **Course Technology**

You will require the following minimum technological requirements for this course:

A computing device where one can create and edit documents. An internet connection capable of streaming videos and downloading software. Access to a webcam and microphone.

### **Recording of Class Lectures**

Your instructor and the University of Manitoba hold 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, openly or surreptitiously, in whole or in part without permission from your instructor.

### **Use of Electronics in the Classroom**

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. A student may use technology in the classroom setting only for educational purposes approved by the instructor and/or the University of Manitoba Accessibility Services. Students should not engage in electronic messaging/posting activities (e-mail, texting, video or voice chat, social networking (e.g. Facebook) or electronic gaming during scheduled class time.

### **Class Communication**

The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. For more information, please see: [http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](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.

### **Student Accessibility Services**

If you are a student with a disability, please contact Student Accessibility Services (SAS) for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

### **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.