Department of Statistical and Actuarial Sciences
SS9055B Generalized Linear Models

Course outline for Winter 2021

Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the Digital Student Experience website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: https://www.uwo.ca/health/.

Technical Requirements and Important Dates:

Stable internet connection Laptop or computer

Working microphone Working webcam

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
January 11	February 15 - 19	April 12	April 13	April 14 - 30

* March 15, 2021: Last day to drop a second-term half course or a second-term full course without penalty

1. Course Information

Course information
Lectures: Mon 9:30 AM-11:30 AM, Wed 9:30 AM-10:30 AM[1]

All lectures will be conducted online via Zoom. The link is provided on the OWL site for the course. I do expect you to attend and participate during the sessions that will be scheduled within these periods. Please speak with me immediately if this will be a problem for you.

List of Prerequisite(s)
You must have completed SS9859A or an equivalent course. I also expect you to have a working knowledge of R. If you do not have these pre-requisites and are interested in taking the course then please speak with me immediately.

---

[1] All times are stated in reference to local time in London, Ontario. Please be sure to adjust to these times to your own location.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructor   Simon Bonner
Office   WSC 276
Email   simon.bonner@uwo.ca
Phone 519 661-2111 ext 88205
Office Hours   By appointment

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. [insert other contact policies here]

3. Course Syllabus, Schedule, and Delivery Mode

Course Description

This course concerns both theoretical and applied aspects of generalized linear models (GLM). We will start by discussing inference for GLM including parameter estimation, hypothesis testing, assessing goodness-of-fit, variable selection, and model comparison. We will also consider interpreting and reporting results, and conducting these analyses in the R statistical software package. Our discussion will focus on the most common members of the GLM framework including logistic regression, Poisson log-linear models, and multinomial regression. Additional topics may include quasi-likelihood, semiparametric regression, generalized additive models, and discrete choice models as time allows.

Method of Delivery

The course material will be delivered through a series of course readings, recorded lectures, and "in-class" group activities. I do expect you to attend and participate during the sessions that will be scheduled within these periods. Please speak with me immediately if this will be a problem for you.

Type	Mode	Dates	Time	Frequency
Lecture	Synchronous online	Monday	9:30-10:30am	Weekly
In-class Activities	Synchronous online	Monday	10:30-11:30am	Weekly
Drop-in	Synchronous online	Wednesday	10:30-11:30am	Weekly

Learning Outcomes

By the end of this course you should be able to:

1. Identify and explain the importance of the components of a GLM.
2. Determine if a given model fits within the GLM framework.
3. Explain and implement maximum likelihood inference for the GLM framework.
4. Select an appropriate GLM for analyzing data with a continuous, discrete, or multinomial response variable.
5. Conduct analysis in R including computing parameter estimates and confidence intervals, conducting hypothesis tests, selecting variables, comparing competing models, and assessing goodness of fit.
6. Summarize and report your results for statistical and general audiences.

Course Schedule (Tentative)

Section 1: Review of Linear Regression
- Week 1 (January 11 & 13)
  - Review of point estimation, interval estimation, hypothesis testing, goodness of fit diagnostics, and model selection for linear regression.

Section 2: Maximum likelihood inference
- Week 2 (January 18 & 20)
  - Maximum likelihood inference 1: MLEs and their sampling distributions

- Week 3 (January 25 & 27)
  - Maximum likelihood inference 2: Hypothesis tests and confidence intervals

Section 3: Generalized Linear Models
- Week 4 (February 1 & 3)
  - Generalized Linear Models 1: Introduction and inference

- Week 5 (February 8 & 10)
  - Generalized Linear Models 2: Model Assessment and model selection

Section 4: Logistic Regression
- Week 6 (February 22 & 26)
  - Logistic Regression 1: Introduction

- Week 7 (March 1 & 3)
  - Logistic Regression 2: Separation and other considerations

Section 5: Poisson Regression
- Week 8 (March 8 & 10)
  - Poisson Regression 1: Introduction

- Week 9 (March 15 & 17)
  - Poisson Regression 2: Overdispersion

Section 6: Multinomial Regression
- Week 10 (March 22 & 24)
    - o Multinomial Regression 1: Baseline Category Models

- Week 11 (March 29 & 31)
    - o Multinomial Regression 2: Alternative Link Functions and Discrete Choice Models

Section 7: Further topics
- Week 12 (April 5 & 7)
    - o To be determined

Online Participation and Engagement

Students are expected to participate during the scheduled class sessions and to engage with content as much as possible through the readings, synchronous lectures, and in-class activities.

4. Course Materials

There is no required text for this course. I will be posting materials on OWL (http://owl.uwo.ca) on a regular basis. I will use announcements on OWL as the primary method to communicate with all students in the class, and you are responsible for keeping up to date.

There are many excellent texts that provide a good introduction to the topic of generalized linear modelling. Three that I recommend are as references for this course are:

1. Faraway, JJ (2016) Extending the Linear Model with R: Generalized Linear, Mixed Effects and Nonparametric Regression Models, 2nd Edition. CRC Press.

2. Agresti, A (2012) Categorical Data Analysis, 3rd Edition. Wiley.

3. Dobson, AJ and Barnett, A (2008) An Introduction to Generalized Linear Models, 3rd Edition. CRC Press.

We will regularly work with the R statistical software package in class, and I expect you to have a working knowledge of this software. Experience with LaTeX or Rmarkdown would also be an asset.

Students should check OWL (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

5. Methods of Evaluation

Your overall course grade will be calculated as follows:

In class activities	Approximately weekly	40%
Project #1	Due March 26, 2021	30%
Project #2	Due April 23, 2021	30%

Accommodated Evaluations
- Group assessments that are submitted after the deadline will be assessed a penalty of 10% per day.

- Individual assessments that are submitted after the deadline will be assessed a penalty of 10% per day unless you have spoken with me and I have granted accommodation. If you are granted accommodation then the assessment will be due 24 hours after the end of the accommodation period, after which the 10% per day penalty will apply.

Rounding of Marks Statement
Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

6. Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf
and for the Student Medical Certificate (SMC), see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:
https://multiculturalcalendar.com/ecal/index.php?s=c-univwo

7. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy, http://www.uwo.ca/its/identity/activatenonstudent.html, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Remote learning sessions for this course may be recorded.
The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link:
https://support.zoom.us/hc/en-us

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

Professionalism & Privacy

Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

☒ Students are expected to follow online etiquette expectations provided on OWL

☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared

☒ Recordings are not permitted (audio or video) without explicit permission

☒ Permitted recordings are not to be distributed

☒ Students will be expected to take an academic integrity pledge before some assessments

☒ All recorded sessions will remain within the course site or unlisted if streamed

Copyright Statement

Please be aware that all course materials created by the instructor(s) are copyrighted and cannot be **sold/shared**. Those include materials used in tests/quizzes, midterms, and finals. Any posting/sharing of such materials in part or whole without owner's consent is considered as violation of the Copyright Act and will be considered as a scholastic offence.

In addition, online services such as Chegg are actively monitored. Any questions that are coming out during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, http://westernusc.ca/services.