STAT 9055 B Course Outline

1. Course Information

Course Information
Lectures:
      Mon 9:30 AM-11:30 AM WSC 248
      Wed 9:30 AM-10:30 AM WSC 248 or HSB 13 (TBD)

List of Prerequisites
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.

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

Instructors	Email	Office	Phone	Office Hours
Dr. Simon Bonner	sbonner6@uwo.ca	WSC 276	519-661-2111 x 88205	TBD

Please use the Forums on the OWL site to post questions about course material. This helps other students who may have the same question, and I encourage you to help each other if you can. Note that you can use LaTeX to insert mathematical equations into your forum posts.

Please send me an e-mail if you need to discuss personal matters (e.g., a missed assignment). I recommended that you use your Western (@uwo.ca) email address.

3. Course Syllabus, Schedule, Delivery Mode

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.

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

A tentative schedule for the course is provided on the final page of this outline.

Contingency plan for an in-person class pivoting to 100% online learning
In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

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.

Technical Requirements
You must access to a computer with R version $>= 4.1.0$. You are welcome to use any operating system (Windows, MacOS, Linux, or BSD). However, you must have access to install packages in R and further

software required during the semester. I will work in RStudio during the lectures and expect most of you will do the same. However, you are welcome to use any IDE.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:
Group activities (approximately weekly)   40%
Midterm Exam   30%
Final Project   30%

Group Activities
You will divide yourselves into groups of three to four students at the start of each semester. Each week starting January 16, I will post an activity for you to complete in your groups. Activities will be based on the material covered in the readings and lectures from the previous week (e.g., the activity in Week 2 will be based on the reading posted in the first week). You will have time during the scheduled lectures to work on these activities, but you are also expected to meet outside of lecture.

Midterm Exam
The midterm exam will be held in class on Monday February 27 and will cover the material presented in Sections 1, 2, and 3 of the course.

Final Project
The final project will require you to analyse a data set and report on your results. Details will be provided later in the semester.

6. Student Absences

Please send me an e-mail as soon as possible if you are unable to meet a course requirement due to illness or other serious circumstances. Group assessments that are submitted after the deadline will be assessed a penalty of 10% per day. Individual assessments submitted after the deadline will be assessed a penalty of 10% per day unless you have been granted an extension. Any assessment submitted more than 5 days after the deadline will receive a grade of zero. If you are granted an extension longer than 5 days then the assessment will be waived and the weight of the assessment will be moved to another component of the course.

6. Accommodation and Accessibility

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

   https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

7. Academic Policies

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

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

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 their official university address is attended to in a timely manner.

8. Support Services

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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 Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Course Schedule (Tentative)

Section 1: Review of Linear Regression
- Week 1 (January 9 & 11)
  - o 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 16 & 18)
  - o Maximum likelihood inference 1: MLEs and their sampling distributions

- Week 3 (January 23 & 25)
  - o Maximum likelihood inference 2: Hypothesis tests and confidence intervals

Section 3: Generalized Linear Models
- Week 4 (January 30 & February 1)
  - o Generalized Linear Models 1: Introduction and inference

- Week 5 (February 6 & 8)
  - o Generalized Linear Models 2: Model Assessment and model selection

Section 4: Logistic Regression
- Week 6 (February 13 & 15)
  - o Logistic Regression 1: Introduction

- Week 7 (February 27 & March 1)
  - o Midterm Exam

- Week 8 (March 6 & 8)
  - o Logistic Regression 2: Separation and other considerations

Section 5: Poisson Regression
- Week 9 (March 13 & 15)
  - o Poisson Regression 1: Introduction

- Week 10 (March 20 & 22)
  - o Poisson Regression 2: Overdispersion

Section 6: Multinomial Regression
- Week 11 (March 27 & 29)
  - o Multinomial Regression 1: Baseline Category Models

- Week 12 (April 3 & 5)
  - o Multinomial Regression 2: Alternative Link Functions and Discrete Choice Models