Generalized Linear Models 2019/2020
Statistical Science 9055B
Course Outline

Instructor Information

Instructor: Simon Bonner
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Phone: 519 661-2111 ext 88205
Office Hours: Wed 12:30-2:30pm

Course Information

Pre-requisites: You must have completed SS9859A to enroll. 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. You can be deregistered at any time even after writing the final exam. 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.

Lecture Hours: Mon 9:30 AM-11:30 AM WSC 248, Wed 9:30 AM-10:30 WSC 248

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.

Objectives: 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 maximum likelihood inference for the GLM framework.
4. Select an appropriate GLM for analyzing data with a continuous, count, 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.
**Format**  
The course follows a blended format. You will learn material through a combination of readings, lectures, and course activities. Learning activities conducted in class will not be graded.

**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. You should check OWL regularly for news and updates. This is the primary method by which information will be disseminated to 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:


**Methods of Evaluation**  
Your overall course grade will be calculated as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Approximately biweekly</td>
<td>50%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>February 24, in class</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>TBD</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Computing Requirement**  
We will regularly work with the R statistical software package in class, and I expect that you will be able to bring a laptop computer. Please let me know immediately if this is a problem. Note that the classroom does not have plugs at the tables, so you will have to make sure that your computer is charged before class. I expect that you have some experience with R. Experience with LaTeX would also be an asset.
Course Schedule

Section 1: Maximum likelihood inference
- Week 1 (January 6 & 8)
  - Maximum likelihood inference 1: Maximum likelihood estimators and their sampling distributions
- Week 2 (January 13 & 15)
  - Maximum likelihood inference 2: Likelihood based hypothesis tests and confidence intervals

Section 2: Generalized Linear Models
- Week 3 (January 20 & 22)
  - Generalized Linear Models 1: Introduction
- Week 4 (January 27 & 29)
  - Generalized Linear Models 2: Inference
- Week 5 (February 3 & 5)
  - Generalized Linear Models 3: Model Assessment

Section 3: Logistic Regression
- Week 6 (February 10 & 15)
  - Logistic Regression 1: Introduction
- Week 7 (February 26)
  - Logistic Regression 2: Further considerations

Section 4: Poisson Regression
- Week 8 (March 2 & 4)
  - Poisson Regression 1: Introduction
- Week 9 (March 9 & 11)
  - Poisson Regression 2: Overdispersion

Section 5: Multinomial Regression
- Week 10 (March 16 & 18)
  - Multinomial Regression 1: Baseline Category Models
- Week 11 (March 23 & 25)
  - Multinomial Regression 2: Alternative Link Functions and Discrete Choice Models

Section 6: Further topics
- Week 12 (March 30 & April 1)
  - To be determined
Accommodation and Accessibility

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your Dean's office as soon as possible, and contact your instructor immediately. If accommodation is approved by your Dean's office, your instructor will be notified, then it is your responsibility to make alternative arrangements with your instructor. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: http://www.stats.uwo.ca/accommodation_medical.pdf. A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility. The form can be found at: http://www.stats.uwo.ca/medicalform.pdf. Or, request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

Missed Midterm or Test: The policy of the department of Statistical and Actuarial Sciences is that there will be no make-up exams for a missed midterm. For those that do legitimately miss a midterm and provide the required supporting documentation, the standard practice will be that the weight of the midterm will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.

Student Health and Wellness: As part of a successful student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western’s Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page http://www.music.uwo.ca/, and our own McIntosh Gallery http://www.mcintoshgallery.ca. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html.

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.

Accessibility: 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 Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

Support Services: Learning-skills counsellors at the Student Development Centre (SDC) (http://www.sdc.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.
Additional student-run support services are offered by the USC, [http://westernusc.ca/services](http://westernusc.ca/services).
The website for Registrarial Services is [http://www.registrar.uwo.ca](http://www.registrar.uwo.ca).

**Attendance**

Classroom attendance is viewed as an important part of the learning process. Students are advised that excessive absenteeism may result in the student being disbarred from the final exam (see Western Academic Calendar).