



STAT*6801 Statistical Learning

Fall 2019

Section(s): C01

Department of Mathematics & Statistics

Credit Weight: 0.50

Version 1.00 - August 23, 2019

1 Course Details

1.1 Calendar Description

Topics include: nonparametric and semiparametric regression; kernel methods; regression splines; local polynomial models; generalized additive models; classification and regression trees; neural networks. This course deals with both the methodology and its application with appropriate software. Areas of application include biology, economics, engineering and medicine.

1.2 Course Description

In this course we will discuss modern regression methods otherwise referred to as statistical learning. We will begin by reviewing classical (unsupervised) learning in the form of the linear model. We will then introduce penalization procedures turning this into a supervised learning problem. Different penalizations lead to different shrinkage methods with the primary ones being ridge regression and LASSO regression, in various forms. This is the basis of modern machine learning methods.

1.3 Timetable

MW 8:30-9:50 am

CRSC 403

1.4 Final Exam

Dec 12, 2019, 7PM-9PM Room TBA

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Peter Kim
Email:	pkim@uoguelph.ca
Telephone:	519-824-4120 x58165
Office:	MACN 515
Office Hours:	MW 2:30-4:00 pm

3 Learning Resources

3.1 Required Resources

Modern Applied Statistics with S, Fourth Edition, W.N. Venables and B.D. Ripley, Springer (Textbook)

Available online through the library.

R package (Software)

<https://cran.r-project.org/package=glmnet>

Documentation is available at:

<https://cran.r-project.org/web/packages/glmnet/glmnet.pdf>

Glmnet documentation (Article)

<https://cran.r-project.org/web/packages/glmnet/glmnet.pdf>

Documentation of glmnet

4 Learning Outcomes

This is a course on advanced data analysis using modern supervised learning.

4.1 Course Learning Outcomes

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

1. Following this course students will have a firm grasp of:

- supervised learning
 - ridge regression
 - LASSO
 - computational aspects of supervised learning
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5 Teaching and Learning Activities

Primary lecture but more in a seminar style.

5.1 Lecture

Week 1

Topics: Linear models

Week 2

Topics: Linear models cont'd

Week 3

Topics: Linear models with L_2 constraint (Ridge regression).

Week 4

Topics: Ridge regression cont'd.

Week 5

Topics: Linear regression with L_1 constraint, LASSO.

Week 6

Topics: LASSO cont'd

Week 7

Topics: LASSO cont'd computations

Week 8

Topics: LASSO cont'd computations.

Week 9

Topics: LASSO cont'd computations and other supervised learning.

Week 9

Topics: Other supervised learning cont'd.

Week 10

Topics: Other supervised learning cont'd and student presentations.

Week 11

Topics: Student presentations

Week 12

Topics: Student presentations.

6 Assessments

6.1 Marking Schemes & Distributions

Assignments: There will be regular assignments that will not be collected for grading but will be discussed in class.

Midterms: There will be two midterms each worth 15%.

Midterm 1 (in class) Oct 7

Midterm 2 (in class) Nov 4

Student Presentations: starting Week 10 worth 20%.

Final Exam: A final exam worth 50%.

7 University Statements

7.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

7.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or

compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

7.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

7.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

7.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

7.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

7.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

7.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
<https://www.uoguelph.ca/academics/calendars>

