STAT*3240 Applied Regression Analysis

Fall 2019
Section(s): C01

Department of Mathematics & Statistics
Credit Weight: 0.50
Version 1.00 - September 04, 2019

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1 Course Details

1.1 Calendar Description

This course reviews simple linear regression and introduces multiple regression with emphasis on theory of least squares estimation, residual analysis, and model interpretation. Within the multiple regression context, transformations of variables, interactions, model selection techniques, ANOVA, influence diagnostics and multicollinearity will be discussed. Topics may also include Box-Cox transformations, weighted regression, and logistic and Poisson regression. This course is supplemented with computer labs involving interactive data analysis using statistical software.

Pre-Requisites: (1 of IPS*1510, MATH*1210, MATH*2080), (1 of MATH*1160, MATH*2150, MATH*2160), STAT*2050

1.2 Timetable

Lectures: Tuesday, Thursday 10:00 - 11:20 ALEX 218

Labs: Thursday 4:30 - 5:20 SSC 1305 (if there is overflow we will also use 1303).

1.3 Final Exam

December 6, 2:30 - 4:30.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Jeremy Balka
Email: jbalka@uoguelph.ca
Telephone: +1-519-824-4120 x54481

Office:	MACN 550
Office Hours:	Monday 1:00 - 3:00
	Tuesday 3:00 - 4:00
	I am also available at many other times, and depending on my schedule can accommodate drop-ins.

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3 Learning Resources

3.1 Required Resources

Courselink (Website)
http://courselink.uoguelph.ca

Notes, announcements, assignments, etc. will be posted here.

3.2 Recommended Resources

(Optional) Introduction to Linear Regression Analysis by Montgomery, Peck, and Vining. 5th edition. Wiley, 2012. (Textbook)
A copy of this textbook will be available on reserve at the library.

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Select, implement and interpret appropriate regression models to explain real-world phenomena.
2. Demonstrate an understanding of the limitations and uncertainties associated with regression models.
3. State the assumptions of regression models, and investigate these assumptions using appropriate plots and statistics.
4. Demonstrate a command of the mathematical foundations of regression models.
5. Demonstrate competence in using statistical software to implement regression procedures.
6. Effectively communicate a proper interpretation of the results of a regression analysis.

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5 Teaching and Learning Activities

5.1 Lecture

When	Topic
Weeks 1 - 3	Simple Linear Regression. (The simple linear regression model, least squares, properties of the least squares estimators, model assumptions, interpretation of model parameters, inference on the slope and intercept, prediction, maximum likelihood estimation, the coefficient of determination, ANOVA for regression.)
Weeks 3 - 5	Introduction to Multiple Linear Regression. (The multiple linear regression model, matrix notation, properties of the least squares estimators, inference on model parameters, estimation and prediction, interpretation of output, standardized regression coefficients, multicollinearity.)
Week 6	Model Assumptions and Checking Model Adequacy. (Residual analysis, standardized and studentized residuals, residual plots, partial regression and partial residual plots, outliers, lack of fit tests.)
Week 7	Polynomial Regression Models, Indicator Variables. (Including higher order terms in the linear regression model, the use of indicator variables to represent categorical explanatory variables, one-way ANOVA as a regression.)
Week 8	Transformations and Weighting. (Variance stabilizing transformations, intrinsically linear models, the Box-Cox transformation, weighted least squares.)
Week 9	Leverage and Influence. (Leverage, influence, measures of leverage and influence, treatment of influential observations.)

When	Topic
Week 10	Model Building. (Model building techniques, forward selection, backward selection, stepwise selection, Mallow's Cp.)
Week 11	Nonlinear Regression. (A brief introduction to nonlinear regression models.)
Week 12	Generalized Linear Models. (Brief introduction to generalized linear models, logistic regression, interpretation of parameters, Poisson regression.)

5.2 Lab

Topic
COMPUTING LABS: The computing labs are held in SSC 1305. These labs will provide an introduction to SAS (a commonly used statistical software which you will need to use for the assignments).

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Assignments	25
Midterm exam	30
Final Exam	45
Total	100

6.2 Assessment Details

Assignments (25%)

There will be 5 assignments, but only your best 4 will count towards your final grade.

Due dates:

A1: Friday September 20.

A2: Friday October 4.

A3: Friday October 18.

A4: Friday November 15.

A5: Friday November 29.

Midterm exam (30%)
Date: Thursday October 24 (during lecture time), in the lecture room

Final Exam (45%)
Date: December 6, 2:30 - 4:30, see Webadvisor for the location.

6.3 Assignment and Exam Policies

- Any assignment not submitted by the deadline will not be marked and will receive a grade of 0.
- While you are encouraged discuss approaches to assignment questions with other students, your submitted assignment must be your own work. Copying any part of another student's work is considered academic misconduct. (Please read the section on academic misconduct at the end of this document and in the undergraduate calendar.)
- In calculating your overall mark, I will throw out your worst assignment grade. This is not done to be nice, but to account for possible illnesses, computer problems, car accidents, house fires, etc. If you have extremely serious issues that cause you to miss more than one assignment, see me in person.
- For the midterm examination, you may bring in one 8.5×11 (letter size) piece of paper, with whatever you would like written on both sides. For the final examination you may bring in two sheets of this size.

POLICY FOR A MISSED MIDTERM EXAM: If you miss the midterm exam due to medical illness or another valid (and documented) reason, your final exam will be reweighted to make up for the missed exam.

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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
