Statistical Models and Analysis

IE-68722, Fall 2019

Engineering Building #10, Room 10-515, Mon/Wed 16:30–18:00

Instructor

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Office Hours: 10:30–11:30am (M/W); 18:00–18:30pm (M/W); or by appointment. (No office hours on the first Monday of each month).

Textbook

Applied Linear Regression Models, McGraw-Hill/Irwin; 4th edition, by Michael H Kutner, Christopher J. Nachtsheim, and John Neter.
(ISBN-10: 0073014664 | ISBN-13: 978-0073014661)

Web Page

https://AppliedStat.GitHub.io/teaching

Software

R Language (http://www.r-project.org).
Minitab (http://www.minitab.com).

Prerequisite

The expectation is that you have already been exposed to the basic probability and statistics.

Policy

- Attendance Policy: Class attendance is mandatory. If you miss a class for some reason, it is your responsibility to get notes, *etc.* from someone in the class. I will not repeat lectures during my office hours.
- Tardy Professor Policy: If the instructor has not arrived within 15 minutes of the scheduled class time, you may assume that class has been canceled.
- All drop/add procedures are your responsibility.

Description and Learning Objectives

Upon successful completion of this course, a student will be able to:

- Program statistical softwares (Minitab and R).
- Derive parameter estimates under the simple linear regression model.
- Do basic statistical inference for the simple linear regression model.
- Know how to use matrix algebra in regression models.
- Extend the simple linear regression model to the multiple linear regression model using the matrix algebra.
- Set up polynomial regression models.
- Analyze and infer the multiple linear regression model.
- Understand how to diagnose the problems from regression models.
- Know the general linear F-test.
- Use categorical predictor variables in the regression model setup.
- Use "all possible regression."
- Understand several model selection procedures.
- Build an appropriate model.
- Detect outliers and influential observations.

Grading

The final grade will be curved and calculated as follows:

Homework/Project:	5%
Attendance:	5%
Midterms 1, 2:	60% (30+30)
Final:	30%

The lowest one of your mid-term exam grades will be replaced by the final exam after scaling to 30% if it is better. If a student misses a mid-term exam for any *legitimate* reason, then the final exam will count 60%.

Rough Grading Guide:

- A+: 90 $\sim$ 100 A: 80 $\sim$ 90-
- B+: 70 $\sim$ 80- B: 60 $\sim$ 70-
- C+: 50 $\sim$ 60- C: 40 $\sim$ 50-
- F : below 40.

Exams

Midterm 1:	T.B.A.	In class
Midterm 2:	T.B.A.	In class
Final:	T.B.A.	

- All the exams will be closed-book.
- For the final exam, you are allowed to bring in *one* A4-size formula sheet made up by yourself.
- The final exam will be comprehensive.
- During the exams, a basic calculator will be permitted but cannot be shared with others.
- Calculators in smart phones, tablet PC and laptops are prohibited.
- No early or late exams will be allowed without a written and legitimate excuse.

Project

Instructions for Final Project

1. Ideally you should analyze a data set collected by youself that is important for your own major field of study. If such a set is not available, see if you can borrow a data set from your friends, advisers, web pages, or research papers, etc. (but not from our textbook). If you borrow a data set, you should clearly **specify its origin**. Do not use any data sets used in the class, nor make up your own data set.
2. The data set must have at least 30 observations and at least three predictor variables. If you can have more predictors, it is better.
3. Write a short description of the data and how it is collected. Also write down any background information that may be important for analysis.
4. While analyzing the data, look at all aspects of the model building (or selection) and do hypothesis testing regarding what will make sense for that data set. Approach the problem in a step-by-step way.
5. At every step clearly state what you are going to do and interpret the result properly.
6. Grading will not depend on the final result, but on your approach to the problem. If it turns our that none of the predictors is important for explanation of the response, do not worry. If you have look at the problem carefully, have done all that you are able to do but unable to get good result — you can still get good grades!
7. Submitted final project will not be returned.