

STAT 4130J: Applied Regression Analysis

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Course Description

Regression studies mathematical patterns among variables, with the purpose of understanding trends, identifying significant predictors, and forecasting. The course covers two parts: linear regression and modern regression methods.

Linear regression consists of simple and multiple regression. We will cover the method of least squares, analysis of variance, model building, regression diagnostics, and prediction. You will learn how to estimate and test significance of regression slopes, evaluate the goodness of fit, build optimal models, verify regression assumptions, suggest remedies, and apply regression methods to real datasets using statistical software.

Modern regression methods contains a high-level tour of statistical methods for regression and classification.

Prerequisites

- Probability and Statistics (ECE 4010J)
- Linear Algebra
- Coding experience

Grading Policy

The typical JI grading scale will be used. I reserve the right to curve the scale if there are less than 30% of students with grades $\geq A$. The grade will count the assessments using the following proportions:

- 25% Homework
- 25% Bi-weekly quiz

While attendance is not required for this course, we will have bi-weekly quizzes scheduled on Tuesdays for odd weeks. The quiz will be distributed on Canvas (You need to bring your laptop). The quiz is open-book, open-note, and takes 15-20 min. If you are working on the quiz in the classroom, you can turn in your work on paper. If you are taking the quiz online, please turn in your work in a pdf. (Note: we don't give you extra time for scanning and uploading, therefore please schedule the time accordingly)

Unable to submit the quiz on time will lead to a point deduction. No make-up quiz will be given unless you have a reasonable excuse and notify us beforehand.

- **30%** Midterm

The exam will be scheduled around week 8, after the long holiday, and it will be closed-book and closed-note.

- **20%** Final Project

At the end of the semester, there will be a project where groups of 2-3 students find a real-world problem to analyze and summarize. We will use the last week for group presentation. Furthermore, each group will write a final report that will be due a week before the end of the class. During the last week of class each class member will receive a report from another group, and evaluate the analysis and conclusions of the project.

Your final grade for the project will be based on your presentation (graded by TA and instructor), and peer-reviewed report (graded by peers and instructor).

- **2%*** Extra credit

1 pt for Course evaluation and 1 pt for Piazza participation

Course Agenda and Timeline

The agenda is tentative and subject to change. The bullet points are key concepts you should grasp, and also as a study guide before exams.

- Simple linear regression
- Linear algebra
- Multiple linear regression
- Analysis of variance (ANOVA)
- Model building and selection
- Colinearity
- Mixed effects models
- Ridge and lasso regression
- Logistic and poisson regressions