Statistics 6214

Applied Linear Models

Spring 2015

6:10-8:40 W 2020 K 25

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COURSE OBJECTIVE

Data arising from both experimental and observational studies and in a range of applications e.g. biomedical, pharmaceutical, social sciences, business, reliability etc. can be typically analyzed using linear models. Linear regression analysis is the most widely used of all statistical techniques: it is the study of linear, additive relationships between variables, with the ultimate goal of creating a model to predict a future value for some dependent variable. Applied Linear Models is an applied course that provides the methodological background and computational tools for data analysis, linear modeling and interpretation.

LEARNING OUTCOMES

Students will learn how and when to apply linear regression to analyze data and how to critically evaluate the performance of the regression models. At the completion of this course students should be able to (i) apply linear regression methods to build predictive models, (ii) assess model assumptions and fit, (iii) select best regression models, and (iv) use the R software for regression and data analysis.

COURSE OUTLINE

- Introduction to Linear Models: Simple Linear Regression Examples, Assumptions for Linear Models, Ordinary Least Squares (OLS) estimators,
- Inference: inference for the slope and the intercept, interpretation of results, prediction, F-tests
- Regression Diagnostics: outliers, influential points, graphical diagnostics, remedies, weighted least squares
• Multiple regression: estimation, prediction, diagnostics, nested models, multi-collinearity, ridge regression, qualitative predictors, mixture of continuous and categorical variables, model building, variable selection and model validation
• ANOVA
• Regression models with binary response, simple and multiple logistic regression
• Regression with correlated errors (time series)—if time allows

TEXTBOOK
The required text for the course is *Introduction to Linear Regression Analysis*, 5th Edition by Montgomery, Peck and Vining.

PREREQUISITES
Basic probability and statistics at the level of Stat 157-158 or Stat 201; Basic linear algebra at the level of Math 124.

GRADING
The course grade will be based on homework, a midterm exam and a final as follows:

Homework 45%, Midterm 20%, Final 35%

• **HOMEWORK:** There will be approximately 5-6 homework assignments. Late assignments will not be accepted for any reason, medical or otherwise. Homework assignments that are collected and graded should be treated as individual and not collective efforts.
• **MIDTERM EXAM:** The midterm exam is tentatively scheduled for February 25. The exam will be given during class time.
• **FINAL EXAM:** The final exam will be a comprehensive exam. This 2-hour exam is tentatively scheduled for April 22 (last class).

COMPUTING
The statistical software we will be using is R. You can download the R software and get related information from the R home page. Alternatively, RStudio offers a GUI R platform. A tutorial in R is housed at Clarkson University Department of Mathematics and a more detailed one at http://www.maths.anu.edu.au/~johnm/r-book/3edn/xtras/daagur-ohp.pdf
Here is a short reference card.

BLACKBOARD REGISTRATION
All students are required to register for the course in Blackboard, the GWU web-based instructional resource. Course information and materials, including notes, grades, and details about course assignments and exams will be posted there periodically. It is the student’s responsibility to check the Stat 214 Blackboard website frequently for up-to-date information about assignments. Once enrolled in the course, you should automatically be registered on Blackboard. Log into the course website at: https://blackboard.gwu.edu/webapps/portal/frameset.jsp
ACADEMIC INTEGRITY
I personally support the GW Code of Academic Integrity. It states: “Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information.” For the remainder of the code, see: http://www.gwu.edu/~ntegrity/code.html

SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM
DISABILITY SUPPORT SERVICES (DSS)
Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC)  202-994-5300
The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: - crisis and emergency mental health consultations - confidential assessment, counseling services (individual and small group), and referrals http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

SECURITY
In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.