Statistics 6214

Applied Linear Models

Fall 2022

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Most likely, I will NOT be able to provide recorded videos. Therefore, it will be difficult to learn this course remotely. Please plan your new semester accordingly.

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Office hours: 3:00pm to 5:00pm on Tuesday

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. Applied Linear Models is an applied course aiming to provide the methodological background and computational tools for data analysis.

Course outline

- Introduction to linear models: simple linear regression examples, assumptions for linear models, ordinary least squares (OLS) estimators, R^2, residuals.
- Inference in linear regression: inference for the slope and the intercept, interpretation of results, prediction, F-tests.
- Regression Diagnostics: outliers, influential points, graphical diagnostics, remedies, weighted least squares.
- Regression in matrix notation, multiple regression, estimation, prediction, diagnostics.
- Analysis of variance.

Textbook

The required text for the course: *Linear Models with R* by Julian Faraway. CRC Press. Second Edition. ISBN: 978-1-4398-8733-2

https://www.crcpress.com/Linear-Models-with-R/Faraway/p/book/9781439887332

Prerequisites

Stat 4157-4158 or Stat 6201; Math 4124.

Learning Outcomes

1.   Demonstrate basic knowledge of linear and matrix algebra;

2.   Demonstrate basic knowledge of distribution theory;

3.   Apply knowledge of linear and matrix algebra to manipulate linear models;

4.   Perform simple and multiple linear regressions;

5.   Use R software to conduct data analysis;

6.   Conduct regression analysis;

7.   Conduct analysis of variance.

Plan

Session 1: Introduction and R software; Session 2: Vector Algebra; Session 3: Matrix Algebra; Session 4: Distribution Theory; Session 5: Ordinary Least Squares Estimators; Session 6: Weighted Least Squares Estimators; Session 7: Interval Estimators; Session 8: Testing; Session 9: Prediction and Explanation ; Session 10: Transformation; Session 11: One-way ANOVA; Session 12: Two-way ANOVA; Session 1: Final Example。

Grading: Your final letter grade will be based on weighted average: 35% Homework, 35% Midterm Exam, and 30% Final Exam.

No incomplete grades will be assigned for marginal or failing grades at the end of the semester. There will be no extra work available to improve your final grade. Your grade will be determined as outlined above. **There will be no exceptions**.

Class Attendance

Class discussions will extend the materials covered in the textbook. Therefore, it is important that you attend the class. You are responsible for any materials covered or any announcements made in class, even if you are not present.

Amount of Time on Direct and Independent Learning: It is expected that students spend 150 minutes in classroom on lecture plus 300 minutes of independent learning per week.

Homework: Late homework will not be accepted.

Computing

Statistical Packages: You will need to use a statistical package in order to perform most of the statistical analyses covered in this course. R is a freeware that we will use extensively in this course. Please google "download R" to download R 4.0.1 and install it to your computer. Please read the Appendix of the textbook for more information about downloading R.

University policies:

University policy on observance of religious holidays
In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: students.gwu.edu/accommodations-religious-holidays.

Academic integrity code

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 details and complete code, see: studentconduct.gwu.edu/code-academic-integrity

Safety and 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.

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 Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: disabilitysupport.gwu.edu/

Mental Health Services 202-994-5300

The University's Mental Health Services 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. For additional information see: counselingcenter.gwu.edu/

Please note:

1. Please go to blackboard to find various course components.
2. You need to meet minimum technology requirements for participation in the course.
3. Please visit the following website to get support (e.g., technical requirements and support, student services, obtaining a GWorld card, and state contact information) at online.gwu.edu/student-support

Copy-Right and Privacy:

Students are prohibited from recording/distributing any Class Activity without permission from the instructor, except as necessary as part of approved accommodations

for students with disabilities. Any approved recordings may only be used for the student's own private use.