

Applied Regression Analysis

STAT 757 – Section 1001

Spring 2019, AB 635 – MoWeFr 10:00 AM - 10:50 AM

Instructor information

Name	Colin James Grudzien	Contact	CGrudzien@UNR.edu / (775) 784-7554
Office	DMSC 218	Hours	We 11:00 - 12:30, Th 15:00 - 16:30, or by appointment

Help & Questions

Students can see the instructor without appointment during office hours. Outside of office hours, the best way to contact the instructor is via email. Emails received before 17:00 will usually get a response the same day. Emails received after 17:00 are not guaranteed a same-day response. Longer questions will not be answered by email and will be directed to appointments or office hours.

Course description

This course covers techniques and applications of regression analysis, including inference and model diagnostics. The main goal is to empower learners to confidently perform and communicate a regression analysis of real data to address research questions in a reproducible framework. This course is primarily intended for non-math graduate students.

Prerequisites

Students will benefit from familiarity with statistical notions such as hypothesis testing and confidence intervals, as well as with calculus and matrix operations. Advanced knowledge in the above subjects is not expected. Students will also benefit from earlier programming experience.

Required text

- *Faraway, Julian J. Linear models with R, Second Edition. Chapman and Hall/CRC, 2016.*
- Book website and resources:
<http://www.maths.bath.ac.uk/~jjf23/LMR/>

Online resources

- **Course web page:** https://cgrudz.github.io/teaching/stat_757_2019
The course web page includes an up-to-date course schedule and approximate due dates of assignments. Homework and quiz solutions will also be posted on the course web page.
- **Web Campus:** <https://wcl.unr.edu>
Students are responsible for checking their email accounts and Web Campus for announcements. Students are assumed to be aware of all information posted to these sources prior to each meeting. **Grades will be posted in Web Campus.**

Student learning outcomes

Upon completion of this course, students will be able to:

1. demonstrate understanding of the concepts that underly modern methods of linear regression, and critically assess the assumption associated with different statistical models.
2. interpret and discuss the results of regression analyses in a broader scientific context and using the terminology of the applied problem.
3. perform essential regression analysis using a professional statistical package, write technical report, and present the results to a professional audience.

Course Topics

This is a tentative outline of the topics for the course. See the course web page for the up-to-date schedule (https://cgrudz.github.io/teaching/stat_757_2019).

1. Introduction to programming in R and review of basic statistical concepts
2. Constructing linear models
3. Inference, hypothesis tests and confidence intervals
4. Prediction and explanation of phenomena with linear models
5. Diagnostics for linear models
6. Remedial measures for linear models
7. Model and variable selection
8. Categorical predictors
9. Logistic regression (if time allows)

Assignments and grading

This will be a programming heavy class and it is expected that every student has access to a computer and the (free) statistical software R installed <https://www.r-project.org>. If possible, each student should bring a personal laptop to class sessions to participate in exercises and group work. Students are not expected to already be proficient in programming; class time and assignments will be used to practice these skills. Students using R are strongly encouraged to use the front-end RStudio <https://www.rstudio.com>. Class time will include lectures, quizzes and group work problem solving and lab-sessions. Students without a computer during class time will be asked to work with others to participate in the lab sessions.

The assignment schedule is tentative, and will be subject to change. The up-to-date schedule will always be updated on the course web page (https://cgrudz.github.io/teaching/stat_757_2019).

- Class attendance is mandatory, and participation is essential for the course. Attendance and participation grades will be evaluated on whether the student arrives to class on time, and if they are actively involved with the in-class exercises and activities. Note, this does not include quizzes which are graded separately. If the student is on time for class and engaged in the class activities, they will receive full credit for the day. If the student is late and/or is not engaged in the class activities, they will receive no credit for the day.

- There will be weekly **homework due each Friday** at the beginning of class. Homework will be assigned each Friday and will be due one week later, with exceptions for spring break and finals week. Students are encouraged to work together on their homework assignments, but every student must turn in their own work and solutions. Solutions to the homework assignment will be posted on the course web page after class on Friday. Part or all of the homework assignment will be graded, but students are responsible to look over the official solutions themselves to make sure they understand the material.
- There will be a weekly **quiz each Monday**, with exceptions for spring break and finals week. Students are allowed one 8.5×11 inch page of handwritten notes for all quizzes, but quizzes must be completed individually. Communication between a student and anyone except the instructor during quiz time will be considered cheating. Quizzes will be entirely graded, and solutions will be posted on the course web page.
- There will be **one take home midterm project**. This will be assigned on 03/15 before spring break and will be **due one week after spring break on Friday 03/29**. This project will be open book, open notes, open computer (including internet resources). Students may work with others on their project, but each student must submit their own work and individual report.
- There will be a **final modeling project** including a written report. This project will be open book, open notes, open computer (including internet resources). Students may work with others on their project, but each student must submit their own work and individual report. The final project report will be due at the time of the **class final, 9:50 - 11:50, Friday 05/10/2019**. All students will make a 5 minute presentation, summarizing their project and results. This presentation will be delivered to the whole class during the scheduled class final.

Final grades

Final grades will be calculated according to the scores from attendance and participation, homework, quizzes, and the projects, each weighted as follows:

Category	Percent of final grade
Attendance and participation	10%
Homework assignments	25%
Weekly quizzes	25%
Midterm project	15%
Final project	25%

The final letter grade will be assigned according to the weighted score as in the following table:

Final letter grade	Weighted score x
A	$90\% \leq x \leq 100\%$
B	$80\% \leq x < 90\%$
C	$70\% \leq x < 80\%$
D	$60\% \leq x < 70\%$
F	$0\% \leq x < 60\%$

Late policy and exceptions

There are no makeups for quizzes, exams or homework except for university recognized activities or exceptional circumstances, as per university policy. If a student needs to miss class due to

participation in official university activities or a religious observance, they must make arrangements with the instructor at least two weeks prior to the date in question. In cases of absences due to extended illness, family emergency, bereavement, or other compelling reason, students should notify the instructor as soon as possible and **within one week of the start of the absence**. The instructor has the right to request formal, written documentation in such cases as they deem appropriate. Please see the full policy statement on absences here: <https://www.unr.edu/administrative-manual/3000-3999-students/3020-class-absence-policy>.

In any other circumstance, there will not be makeups for quizzes, exams or homework. However, the lowest quiz score and lowest homework score will be dropped for each student to accommodate unexpected circumstances.

Diversity statement

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. Students are expected to treat each other and the instructor with respect. No form of harassment, discrimination or bullying will be tolerated. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX Office at (775) 784-1547. Resources and interim measures are available to assist you. For more information, please visit <https://www.unr.edu/equal-opportunity-title-ix>.

Disability services

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Pennington Student Achievement Center, Suite 230) as soon as possible to arrange for appropriate accommodations. Information on the DRC can be found here <https://www.unr.edu/drc>.

Academic conduct

No laptops, cell phones, mp3 players, or other electronics are to be used for personal reasons in class. If you are being disruptive during class you will be asked to leave. Disruptions in this context include inadequate participation. Please visit <https://www.unr.edu/student-conduct> for our official student code of conduct.

Academic success services

A common habit among successful students is to seek help outside of the classroom. Your student fees cover use of the Math Center (784-4433 or <https://www.unr.edu/mathcenter>), Tutoring Center (784-6801 or <https://www.unr.edu/tutoring-center>), and University Writing Center (784-6030 or <https://www.unr.edu/writing-center>). These centers support your classroom learning; it is your responsibility to take advantage of their services.

Statement on Audio and Video Recording

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Academic dishonesty

Cheating, plagiarism, or otherwise obtaining grades under false pretenses constitutes aca-

demic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a students enrollment without a grade or giving an F for the assignment or for the entire course. For more details, see the University of Nevada, Reno general catalog. The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502.

<https://www.unr.edu/administrative-manual/6000-6999-curricula-teaching-research/instruction-research-procedures/6502-academic-standards>