

# Linear Regression

MSDS 601

Fall 2024

Lecture: TR 10a-12p or 1p-3p in SFH 154-156  
Instructor: Cody Carroll  
Email: [cjcarroll@usfca.edu](mailto:cjcarroll@usfca.edu)  
Office Hours: Tues 3:30p-4:30p and Wed 11a-12p on Zoom (Link: <https://usfca.zoom.us/my/cody.carroll>)  
(subject to change during quiz/exam/pitch weeks - watch the course slack!)  
Office: SFH 608

## **Textbook**

*Applied Linear Statistical Models - Fifth Edition*, Kutner, Nachtsheim, Neter, Li.

## **Material Covered**

We will cover the following topics, time permitting:

- Simple Linear Regression
- Inference in Regression and Correlation Analysis
- Multiple Regression and Matrix Notation
- ANOVA and dummy variables
- Model Selection, Model Validation, Diagnostics, and Remedial Measures
- Logistic Regression

## **Course Tenets**

When in doubt, rely on the following:

- Put the work in & ask for help when stuck.
- Ask questions before spiraling.
- When confused, work with a partner & zoom into details.
- When you understand, teach others & zoom out to debrief.
- Use common sense whenever possible.

## **Course Learning Outcomes**

By the end of this course, students will be able to:

- Understand the structural forms of classical simple and multiple linear and logistic regression models, as well as the assumptions underlying these models;
- Be familiar with the principles underlying, and results related to, parameter estimation for these classes of models;
- Formulate and test hypotheses using these basic models, as well as use them for both prediction and interpretation;
- Be able to use Python to load and clean data, fit regression models, and generate various outputs like ANOVA tables, confidence intervals for parameters, diagnostic assessments, etc.;
- Be able to check or to test whether or not diagnostics conform to the assumptions that underlie classical regression;
- Rigorously identify and manage outliers and influential observations and understanding the potential implications of leaving them uncensored;

- Be able to modify regression models to encourage fitted residuals to more closely conform to the assumptions that underlying classical regression, i.e., handle multicollinearity, heteroscedasticity, autocorrelation, a non-normal error term, and specification errors;
- Understand how to use dichotomous dependent variables, indicator (or dummy) independent variables, and interaction terms;
- Communicate the results of complete and well-reasoned regression analysis as an data analyst; and
- Critically evaluate and apply theoretical and applied concepts in statistical inference, honing your ability to engage with advanced statistical research and methodology.

## Attendance and Professionalism

Attendance is expected in all live lectures. Valid excuses for absence with permission will be accepted with documentation, but students are required to watch the lecture videos and submit class exercises and activities on Canvas if any. Students who miss the live lectures with a valid excuse are required to submit the exercises within 24 hours of class time (3pm PST/PDT next day).

Professional behavior is expected both during classtime and outside of class when working with your fellow students. Issues with unprofessional behavior will result in deductions in your professionalism score.

## Homework

- You will be assigned computational and theoretical homework assignments to be completed and turned in on Canvas every Monday before midnight at 11:59p Pacific time.
- Students are encouraged to work together on the assignments, but each student must turn in their own original work. ***If there is evidence that the work turned in is not original work, which includes copying another student's homework or using any solutions found online, all credit for that homework set will be forfeited.***
- No late homework will be accepted.

## Quizzes, Projects, and Final

- There will be 2 quizzes. These quizzes may be cumulative They are tentatively scheduled for Week 4 and Week 7.
- The final project will be a computational group case study that brings together the techniques learned throughout the semester. The project outlines and groups will be published on Canvas. A final report of the project and peer review is due by the end of the module.
- The final exam will be a comprehensive written exam covering the main components of the course.
- No make-up quizzes, exams or early finals will be given. Missing an exam without proper documentation will result in a score of zero for that exam. Any documentation must be submitted to the instructor **before** the exam in question and at the student's earliest convenience.

## Course Website

The class will be using Canvas to distribute all resources. Exams will be uploaded to Gradescope (<https://gradescope.com/>), and the graded exams will be released on this website. You will receive an email from the site allowing you to register after the first exam. Please do not try to register on your own.

## Grading Scheme\*\*

Attendance and Participation	5%
Homework	25%
Quizzes	30%
Final Project	10%
Final Exam	30%

- **Regrade Policy:** You have **5 days** after a graded assignment is returned (exams, homeworks) to contest a grade. After this time, the item may not be considered. If the 5 day period extends beyond the final exam date, the grade must be contested before the final exam.

#### Course Grade Cutoffs\*\*\*:

A+	97 - 100
A	93 - 97
A-	90 - 93
B+	87 - 90
B	83 - 87
B-	80 - 83
C+	77 - 80
C	73 - 77
C-	70 - 73
D+	67 - 70
D	63 - 67
D-	60 - 63
F	0 - 60

### Final Grade Guidelines

\*\* Grading scheme is approximate. Instructor reserves the right to adjust grading scheme.

\*\*\* Cutoffs are approximate. Instructor reserves the right to alter any grade cutoffs. Final decisions will not be made until all assignments have been turned in and graded.

### Academic Integrity

As a Jesuit institution committed to *cura personalis* - the care and education of the whole person - USF has an obligation to embody and foster the values of honesty and integrity. USF upholds the standards of honesty and integrity from all members of the academic community. All students are expected to know and adhere to the University's Honor Code. You can find the full text of the code online at [www.usfca.edu/academic integrity](http://www.usfca.edu/academic%20integrity). The policy covers: – Plagiarism: intentionally or unintentionally representing the words or ideas of another person as your own; failure to properly cite references; manufacturing references. – Working with another person when independent work is required. – Submission of the same paper in more than one course without the specific permission of each instructor. – Submitting a paper written by another person or obtained from the internet. – The penalties for violation of the policy may include a failing grade on the assignment, a failing grade in the course, and/or a referral to the Academic Integrity Committee.

### Students with Disabilities

If you are a student with a disability or disabling condition, or if you think you may have a disability, please contact USF Student Disability Services (SDS) at 415 422-2613 within the first week of class, or immediately upon onset of disability, to speak with a disability specialist. If you are determined eligible for reasonable accommodations, please meet with your disability specialist so they can arrange to have your accommodation letter sent to me, and we will discuss your needs for this course. For more information, please visit: <http://www.usfca.edu/sds> or call (415) 422-2613.

### Behavioral Expectations

All students are expected to behave in accordance with the Student Conduct Code and other University policies (see <http://www.usfca.edu/fogcutter/>). Open discussion and disagreement is encouraged when done respectfully and in the spirit of academic discourse. There are also a variety of behaviors that, while not against a specific University policy, may create disruption in this course. Students whose behavior is disruptive or who fail to comply with the instructor may be dismissed from the class for the remainder of the class period and may need to meet with the instructor or Dean prior to returning to the next class period. If necessary, referrals may also be made to the Student Conduct process for violations of the Student Conduct Code.

You must complete the work for this course entirely on your own. You may not use any online sites (e.g., Course Hero or Chegg), technologies (e.g., ChatGPT, language translators), tools, or sources that are prohibited. You should work independently on assignments and exams unless specified by the instructor. If your instructor permits the use of ideas, images, or word phrases created by another person or by generative technology on an assignment, you must identify their source. You may not share any information about, or from, this course's assignments and assessments with others. If you have questions about these instructions, you should discuss them with your instructor before you begin.

### Learning & Writing Center

The Learning & Writing Center provides assistance to all USF students in pursuit of academic success. Peer tutors provide regular review and practice of course materials in the subjects of Math, Science, Business, Economics, Nursing and Languages.

<https://tutortrac.usfca.edu>. Students may also take advantage of writing support provided by Rhetoric and Language Department instructors and academic study skills support provided by Learning Center professional staff. For more information about these services contact the Learning & Writing Center at (415) 422- 6713, email: [lwc@usfca.edu](mailto:lwc@usfca.edu) or stop by our office in Cowell 215. Information can also be found on our website at [www.usfca.edu/lwc](http://www.usfca.edu/lwc). Counseling and Psychological Services Our diverse staff offers brief individual, couple, and group counseling to student members of our community. CAPS services are confidential and free of charge. Call 415-422-6352 for an initial consultation appointment. Having a crisis at 3 AM? We are still here for you. Telephone consultation through CAPS After Hours is available between the hours of 5:00 PM to 8:30 AM; call the above number and press 2.

### **Confidentiality, Mandatory Reporting, and Sexual Assault**

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a faculty member. I am required to share information regarding sexual misconduct or information about a crime that may have occurred on USF's campus with the University. Here are other resources:

- To report any sexual misconduct, students may visit Anna Bartkowski (UC 5th floor) or see many other options by visiting our website: [www.usfca.edu/student-life/safer](http://www.usfca.edu/student-life/safer).
- Students may speak to someone confidentially, or report a sexual assault confidentially by contacting Counseling and Psychological Services at 415-422-6352.
- To find out more about reporting a sexual assault at USF, visit USF's Callisto website at: [www.usfca.callistocampus.org](http://www.usfca.callistocampus.org).
- For an off-campus resource, contact San Francisco Women Against Rape (SFWAR) (415)647-7273 ([www.sfwar.org](http://www.sfwar.org)).

### **Student Accounts - Last day to withdraw with tuition reversal**

Students who wish to have the tuition charges reversed on their student account should withdraw from the course(s) by the end of the business day on the last day to withdraw with tuition credit (census date) for the applicable course(s) in which the student is enrolled. Please note that the last day to withdraw with tuition credit may vary by course. The last day to withdraw with tuition credit (census date) listed in the Academic Calendar is applicable only to courses which meet for the standard 15-week semester. To find what the last day to withdraw with tuition credit is for a specific course, please visit the Online Class Schedule at [www.usfca.edu/schedules](http://www.usfca.edu/schedules).

### **Ability to Change Syllabus**

I will do my best as an instructor to stick to the guidelines established in this syllabus throughout the year. I do, however, have the right to change components of this syllabus at my own discretion if I deem such changes as necessary.