

MATH 314

Probability and Statistics for Science and Technology

Section 01 Holt 257, MoWeFr 2:00PM - 2:50PM and Holt 173, Th 2:00PM - 2:50PM
Section 02 Holt 257, MoWeFr 3:00PM - 3:50PM and Holt 173, Th 2:00PM - 2:50PM

Edward A. Roualdes eroualdes@csuchico.edu
Office Hours: Holt 204 We 1-1:50, CommunityCoding in THMA 116 TuTh 2-3:50 (MATH 290-02 #5854), or by appointment

Textbook

No textbook is required.

- Most material will come from my (work in progress) [lecture notes](#).
- *M. A. Nielsen. [Neural networks and deep learning](#), volume 25. Determination press San Francisco, CA, USA:, 2015.*
- This is an excellent, free, online book that covers some good introductory data science material.
Wickham, H. and Golemund, G. [R for Data Science: Import, Tidy, Transform, Visualize, and Model Data](#). " O'Reilly Media, Inc.", 2016.
- And this free, PDF book is a good resource for much of our vocabulary.
D. M. Diez, C. D. Barr, and M. Cetinkaya-Rundel. [OpenIntro statistics](#), 3rd Edition. CreateSpace, 2015.
- And this is a cool paper.
Taylor, S. J., and Letham, B. [Forecasting at Scale](#)

Additional Requirements

- Access to a computer will be essential to master the material of this course.
- We will learn to code in [R](#) using the program [RStudio](#).

Course Grading

Your final grade for this course will be given according to the +/− grading system, based on the following percentages and scale: 90 – 100, A; 80– < 90, B; 70– < 80, C; 60– < 70, D; < 60, F.

Labs, Worksheets, Participation, and Quizzes	15%
Homework	15%
Exam 01	20%
Exam 02	20%
Final	30%

Homework

All homework assignments are to be created using [R Markdown](#). Homework will be assigned as I see fit. Submit your homework to me directly or to my office (slide under door if I'm not there) no later than 5:00pm on the date the assignment is due. Working with other students on homework is allowed, subject to the Academic Integrity Policy below. After the due date, you are allowed to turn in homework before the next exam for up to 50% credit. After this exam you will not be allowed to turn in late homework.

On all homework, minus five million points for printing not-summarized data.

Tests

There will be 3 tests including the final. Make-up tests are subject to the Make-Up Policy below. All exams are comprehensive and will not be given earlier than the scheduled date for your class.

Make-Up Policy

Course work can only be made-up in the case of a documented absence. To receive credit you must notify me in advance, or in the case of emergency, as soon as possible (within roughly 24 hours). All undocumented absences will result in a zero.

Getting Help

- Me – though I reserve the right to refuse to provide help within 24 hours of an exam.
- You can visit the Math Tutor Lab on the fourth floor of Meriam Library. You should also visit your instructor during his/her office hours.
- Help specific to R:
 - MATH 130 (#4426) aka [Math130](#)
 - Chico R Users Group - [RUG](#)
 - Online, Free Introduction to R – [Data Camp](#)

Diversity Policy

Respect: Students in this class are encouraged to speak up and participate during class meetings. Because the class will represent a diversity of individual beliefs, backgrounds, and experiences, every member of this class must show respect for every other member of this class.

Academic Integrity Policy

Students are permitted and encouraged to collaborate on all assignments other than examinations. However, each student must turn in their own work. Further, it is the expressed expectation of this instructor that all students demonstrate integrity and individual responsibility in all actions related to this course. Unethical behavior of any kind is unacceptable and will be prosecuted vigorously. Any sign of cheating in any way on any course exams or assignments will be addressed directly, according to university standards. If you do not understand what plagiarism is, or what cheating entails, you must seek information regarding this matter from the current University Catalog and from me. The consequences of plagiarism begin with a failing grade on the work, and possibly a failing grade in the course, depending upon university action. More information is found at <http://catalog.csuchico.edu/viewer/15/STUDJUDAFFAIRS.html>

Disability Support

If you have any disability related needs in terms of taking exams or other accommodations, please contact Disability Support Service (Colusa Hall 898-5959 or campus information 898-INFO for directions) on campus to obtain the appropriate documentation. Afterwards, come by my office and identify your needs within the first two weeks of class so that any necessary arrangements can be made.

Course Outline

- Discrete Uniform Distribution
 - Probability
 - Random Variables
- Estimating Proportions
 - goal of statistics
 - data basics
- The Bernoulli Distribution

- estimating proportions
- Likelihood
 - optimization – by hand and on a computer
 - other random variables so as to practice the likelihood
 - variables, data structures, common functions, defining functions, and manipulating data
- Random Variables
 - random variables (discrete/continuous), probability distribution functions, parameters of distributions, expectation, variance, and standard deviation
- Conditional probability
 - independence, sampling with/without replacement
 - dplyr – group_by, summarise, filter, mutate
- Sampling Distribution
 - sampling distribution, central limit theorem, confidence intervals
- Bootstrap
 - basic idea, standard error of mean
- Modeling
 - mean
 - means by group
 - hypothesis tests: paired, two sample t-tests, ANOVA
 - linear regression
 - logistic regression
- Prediction Error
 - quantifying prediction error
 - training/testing prediction error
- Regularization
 - improving out of sample prediction error
 - k-fold cross validation