STAT 341: Introduction to Probability and Statistics 2

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Class Hours: M/W 11:30-12:20 pm, F: 11:30-1:20 pm

Course Description

STAT 341 is the second course in a three quarter sequence on Probability & Mathematical Statistics. It is an introduction to the mathematics of statistical estimation and hypothesis testing. By the end of this course, students should be able to fit a statistical model using method of moments and perform inference for a single mean.

We will cover the following topics:

1. Joint, marginal and conditional distributions.
2. Independence of random variables
3. Transforming and combining random variables
4. Estimators and sampling distributions
5. Constructing Confidence Intervals
6. Elements of a significance test and the Z test for a mean

Learning Outcomes

By the end of this course, you should be able to

- Define, apply, calculate and use the following probabilistic concepts and definitions: joint distributions, conditional distributions, independence of random variables, distribution of sums, bias, standard error, p-values, errors in testing
- Find method of moments estimators for one-parameter models
- Construct large sample confidence intervals for the mean
- Construct bootstrap confidence intervals
- Be able to explain the elements of a significance test
- Perform the Z test for a mean
- Make conclusions in the context of data

Prerequisites

Students must be extremely comfortable with probability at the level of STAT 340. I will also assume familiarity with topics from calculus, such as, taking limits, continuity of functions, differentiation, integration with 2 variables and more. We will be using the R programming language and familiarity with Rstudio and mathematical typesetting in RMarkdown is expected.

Reference Texts

- Pruim, R. *Foundations and Applications of Statistics: An introduction using R. (second edition)* American Mathematical Society.
- Agresti, A. & Kateri, M. *Foundations of Statistics for data scientists: with R and Python (first edition)* Chapman and Hall
- Larsen, R.& Marx, M. *An Introduction to Mathematical Statistics and its Applications (fifth edition)* Prentice Hall

Course Elements

Instruction format

I am a firm believer that solving problems is the best way to learn and therefore the instructional hours each week will typically be divided into 2 lectures (Wednesday and Friday) and a problem session on Mondays. The lectures will be taught by the instructor while the TA will lead discussions during section.

Please note: Your instructor will be medical leave for the first two weeks of the quarter (through the week of Jan 16). Your TA, Harshil Desai, will be teaching during this time.

Assessments

- There will be a **weekly homework** assignment due by midnight on Wednesday. In order to provide you with a wide breadth of problems, I am also offering two additional low-stakes weekly assessments:
- **Practice Problems** (due before class Wednesday): I will assign a handful of practice problems every week as a CANVAS quiz. You will have unlimited attempts to solve these problems as the goal is to build fluency and confidence.
- **Group work** (every Friday): Our double headers on Friday will provide you with the opportunity to work with your peers on problems that are designed to build conceptual understanding and problem-solving skills. You will review these problems with your TA during section the following Monday.
- In addition to these weekly assignments, you will have one **exam/quiz** at the end of the quarter.

Assessment	When_due
Homework	11:59 PM every Wednesday in Gradescope
Practice problems	11:30 AM every Wednesday in CANVAS
Group work	1:20 PM every Friday in class

Assessment	When_due
Final/quiz	March 8

Grades

I want to work with you to ensure you earn the highest grade of which you are capable. This is why I have set this class up to make it possible for you to do well by demonstrating your learning in multiple ways. Your final course grade will count the assessments using the following proportions:

Assessment	Weight
Homework	50%
Practice problems	15%
Group work	15%
Final	20%

Course grades will be assigned using the following benchmarks: if you earn at least the percentage specified in the left column, you will earn at least the grade on the right. These are *minimum* guarantees. Your grade could be higher than what the table suggests. In other words, it is still possible to get a 3.5 even if your percentage is less than 90%, we just can't make you a guarantee that will happen.

Percent_earned	Course_GPA
98	4.0
90	3.5
85	3.0
80	2.0
75	1.5
68	0.7

Communication

We will mainly use Ed Discussion for communicating with each other. This is the perfect place to post questions asking for clarification on lectures, homework, logistics, scope of work etc. If your question is of a private nature, you may mark it as such.

Regrades on homework should be requested on Gradescope.

Policies

- **Attendance** is strongly encouraged but will not be monitored. However, you must be present in class on Friday to earn points for the group work activity.
- **Late Work**
  - Homework must be submitted in Gradescope by midnight on the due date. Each student receives six late days for the quarter. You may use up to 2 late days on each

homework except the last one, and each late day allows you to submit up to 24 hours late without penalty. For example, if you submit a homework assignment on Friday, that will count as two late days. You do not need to contact the course staff if you want to use a late day. Once a student has used up all their late days, each successive day that an assignment is late will result in a loss of 20% on that assignment. **The deduction will be applied at the end of the quarter. It is your responsibility to track how many late days you have used in the quarter and to not go over the allowed limit**. There is also a small grace period for last-minute submission issues, but you should plan ahead to avoid depending on it.

No assignment may be submitted more than 2 days (48 hours) late. If unusual circumstances[1] truly beyond your control prevent you from submitting an assignment, you should discuss this with the course staff as soon as possible. If you contact us well in advance of the deadline, we may be able to show more flexibility in some cases.

- You cannot use late days on the Practice Problems or group work. However, we will drop your lowest scoring submission for the Practice problems and your lowest two scoring submissions for group work.
- The final exam/quiz may not be missed.
- **Academic Accommodations:** Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.
- **Academic integrity** is essential to this course and to your learning. Violations of the academic integrity policy include but are not limited to: blind copying from a peer, collaborating where it is not allowed, copying from an online resource, using a solutions manual, and using resources from a previous iteration of the course. If you are unsure about whether a particular action would be construed as academic misconduct, please ask. *Anything* found in violation of this policy will be automatically given a score of 0 with no exceptions. If the situation merits, it will also be reported to the Office of Community Standards and Student Conduct for investigation.
- **Religious Accommodations:** Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/)
- **Safety and Health** Take care of yourself. Do your best to maintain a healthy lifestyle this quarter by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us can benefit from support during these times of struggle. You are not alone. Asking for support sooner rather than later is often helpful.

[1] typically, extenuating circumstances include work-school balance, familial responsibilities, health concerns that may negatively impact your performance in the class