ECON 3640 Syllabus

Probability and Statistical Inference
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This course applies probability theory and statistical methods. Topics include descriptive statistics, basic probability theory and inferential statistics.

Descriptive statistics is a collection of methods for summarizing a large amount of quantitative information so that it is easily understood. This should help you in comprehending the quantitative information that you encounter on a daily basis. It should increase your skills in communication and understanding data.

Uncertainty is all around us. We do not yet know who will win the next Super Bowl. You do not know whether you will have a traffic accident on your way home tonight? The theory of probability is a rigorous way to think about uncertain events.

When reading news reports of the latest scientific findings, do you ever doubt the researcher's conclusion, for example, research about the connection between the coffee drinking and Alzheimer's disease? If you have doubts, can you explain exactly the reason for these doubts? This course will explain the principles involved in judging the quality of such research. This topic is called inferential statistics.

Statistics offers tools important for all sciences. Unfortunately, students are often intimidated by this subject, and often postpone statistics courses as long as possible. This is unfortunate, since statistics is a method that can greatly enhance understanding. Instead of dread, I hope this class will show both the beauty and power of statistical analysis.

Prerequisites

Basic computer skills are presumed, so is college algebra. The Excel spreadsheet program will be used in the lecture videos and for homework assignments. If you are using a Windows version of Excel, then you have all the tools that are needed (although you may need to add them into your program). However, if you are using a Mac version, then some important statistical tools have been removed. In that case I suggest that you switch to the Windows 2013 version that is available in the College of Social and Behavioral Sciences Virtual Lab. Follow the CSBS Virtual Lab installation instructions, then launch the Lab.

Objectives

The broad objective is to show both the beauty and power of statistical methods. The specific objectives are:

- To describe data sets with summary statistics and graphic representations.
- To perform statistical analysis, and to review, criticize and evaluate the statistical analysis of others.
- To apply probability theory to specific situations of uncertainty.
- To make statistical inferences and test hypotheses.
- To overcome negative attitude towards statistics.
- To develop an understanding and appreciation of statistical analysis.

Required Texts(s)

The textbook is *Introduction to the Practice of Statistics*, Eighth Edition, by David Moore, George McCabe and Bruce Craig (MMC).

The course coordinates with a series of video lessons, Against All Odds (AAO videos). These are available online. David Moore, one of the textbook authors, was the consultant to the production of this series. Several additional statistics videos have been produced at the University of Utah (UofU); These are also available online.

Topic Outline

1. Descriptive statistics

   - measuring distributions
   - location and variability
   - box plots and histograms
   - normal distributions

Reading: MMC chapter 1

Videos:

   - AAO 1. What Is Statistics?
   - AAO 2. Stemplots
   - AAO 3. Histograms
   - AAO 4. Measures of center
   - AAO 5. Boxplots
   - AAO 6. Standard deviation
   - AAO 7. Normal Curves
   - AAO 8. Normal Calculations
   - AAO 9. Checking Assumption of Normality
   - UofU Statistics Using Computer Spreadsheets
   - UofU Statistics in Economics History

2. Describing Relationships

   - scatterplots and correlation
   - simple regression
   - correlation and r^2 statistics
   - causation

Reading: MMC chapters 2

Videos:

   - AAO 10 Scatterplots
   - AAO 11. Fitting lines to data
   - AAO 12. Correlation
   - AAO 14. The Question of Causation

3. Probability theory

- probabilities concepts
- random variables
- normal distribution
- binomial distribution
- sampling

Reading: MMC chapters 4 and 5

Videos:

- AAO 19. Probability Models
- AAO 20. Random Variables
- AAO 21. Binomial Distributions
- AAO 22. Sampling Distributions
- UofU Statistics and the Gender Gap

4. Inference

- confidence intervals
- significance tests
- inferences for one mean
- inferences for two means

Reading: MMC chapters 6 and 7

Videos:

- AAO 24. Confidence Intervals
- AAO 25. Tests of Significance
- AAO 26. Small Sample Inference for One Mean
- AAO 27. Comparing Two Means
- UofU Experimental Design and Significance Testing

5. More regression analysis

- inference on regressions
- t-statistics and confidence intervals
- correlation and r^2 statistics
- multiple regression

Reading: MMC chapters 10 and 11

Videos:

- AAO 30. Inference for Regression
- UofU Inferential Statistics and Multiple Regression
- UofU Missing Women The Statistics of Discrimination

6. Review

Grading

The homework assignments are crucial to the course and will be reviewed in class. Late assignments are not accepted; copies and exact duplicates are also unacceptable. You can submit you assignments online. If you seriously attempt these assignments, your chance of doing well on the exams is much improved. Answer keys will be posted. The final exam is comprehensive in coverage. All quizzes and the exam must be taken at the scheduled times.

Grades are based on written discussion boards, assignments, quizzes and the final exam according to the following weights:

- Discussions 10%
- Assignments 15%
- Quizzes 30%
- Final Examination 45%

I will compute final grades by three methods; your grade will be the highest of the three:

- The traditional standard: with 100-93%=A, 92-90%=A-, 87-89%=B+, 83-86%=B, 80-82%=B-, and so on to 59-0%=E,
- The curve: with an overall average grade of B (GPA=3.0),
- The ace-the-final rule: you get an "A" for the course if you score an "A" on the final exam regardless of your point total.

ACADEMIC MISCONDUCT

Academic misconduct includes cheating, plagiarizing, research misconduct, misrepresenting one's work, and inappropriately collaborating. For the assignments, copies and exact duplicates are unacceptable. Definitions can be found in the Student Code. If you are suspected of academic misconduct, the process proceeds according to the rules found in the Student Code, University Policy 6-400(V). If you are found responsible for misconduct, consequences range from failure on the assignment to dismissal from the program, consistent with both University and Department Policy.

STUDENTS WITH DISABILITIES

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and the Center for Disability Services – 581-5020 (Voice or TDD), to make arrangements for accommodations.

WITHDRAWAL POLICY

Students may add or drop any course in a regular 15-week University semester without penalty for a period extending through the second Friday after the first day of the term. Beginning the following day and continuing through Friday of the first full week beyond the midpoint of the term (as determined by the Registrar), students may withdraw from a course or from the University without permission, but a "W" will be recorded on the academic record and applicable tuition and fees will be assessed for each course. The latter date is the final day on which a student may withdraw from a course or from the University.

Students taking regular term courses may appeal the deadline for withdrawal in cases of compelling, nonacademic emergencies by submitting a petition and supporting documentation to the office of the dean of their major college. Undeclared, nonmatriculated, and pre-major students apply to the University College, 450 Student Services Building.

NONDISCRIMINATION POLICY

Discrimination is defined at the University of Utah as less than favorable treatment based on race, color, religion, national origin, sex, sexual orientation, age, disability or status as a disabled veteran or Vietnam Era Veteran. Sexual Harassment is also a form of discrimination. The University of Utah expects members to treat one another with respect. Any behavior that results in sexual abuse, harassment, or intimidation of another person, or any unwanted objectionable sexual attention towards another person is considered to be sexual harassment and will not be tolerated. As a student of the University of Utah, you are entitled to participate in University programs and activities free of sexual harassment and other forms of discrimination.

INCOMPLETE POLICY

The mark "I" (incomplete) shall be given and reported for work incomplete because of circumstances beyond the student's control. I generally do not give an "I" for nonmedical reasons. The grade of "I" should be used only for a student who is passing the course and who needs to complete 20% or less of the course. An "I" should not be used in a way that will permit a student to retake the course without paying tuition. If the student attends the course during a subsequent semester as part of the effort required to complete the course, he/she must be registered (either as a regular student or for audit) in the semester in which he/she attends.

If a student has not finished incomplete work within one calendar year after the "I" was given, the "I" will be changed to an "E" by the Registrar's office. If the student graduates within one calendar year after receiving the "I," but before completing the work, the "I" will remain in the record, but will not contribute to credit toward graduation or the grade point average.

FINAL THOUGHTS

The instructor may change the syllabus at any time. Students will be informed of all syllabus changes.

My hope is that you will become a *practitioner* of statistics. This reflects the importance of the word *Practice* in the textbook title. I hope that you will come to use statistical methods to analyze data that you encounter.

Even if you never compute any of the statistics or tests featured in this course, I hope that you will achieve an understanding of the statistics computed by others. There is a well-known book entitle *How to Lie with Statistics*, written by by Darrell Huff. I hope that you learn how to detect statistical lies, and to avoid making them.

CSBS EMERGENCY ACTION PLAN
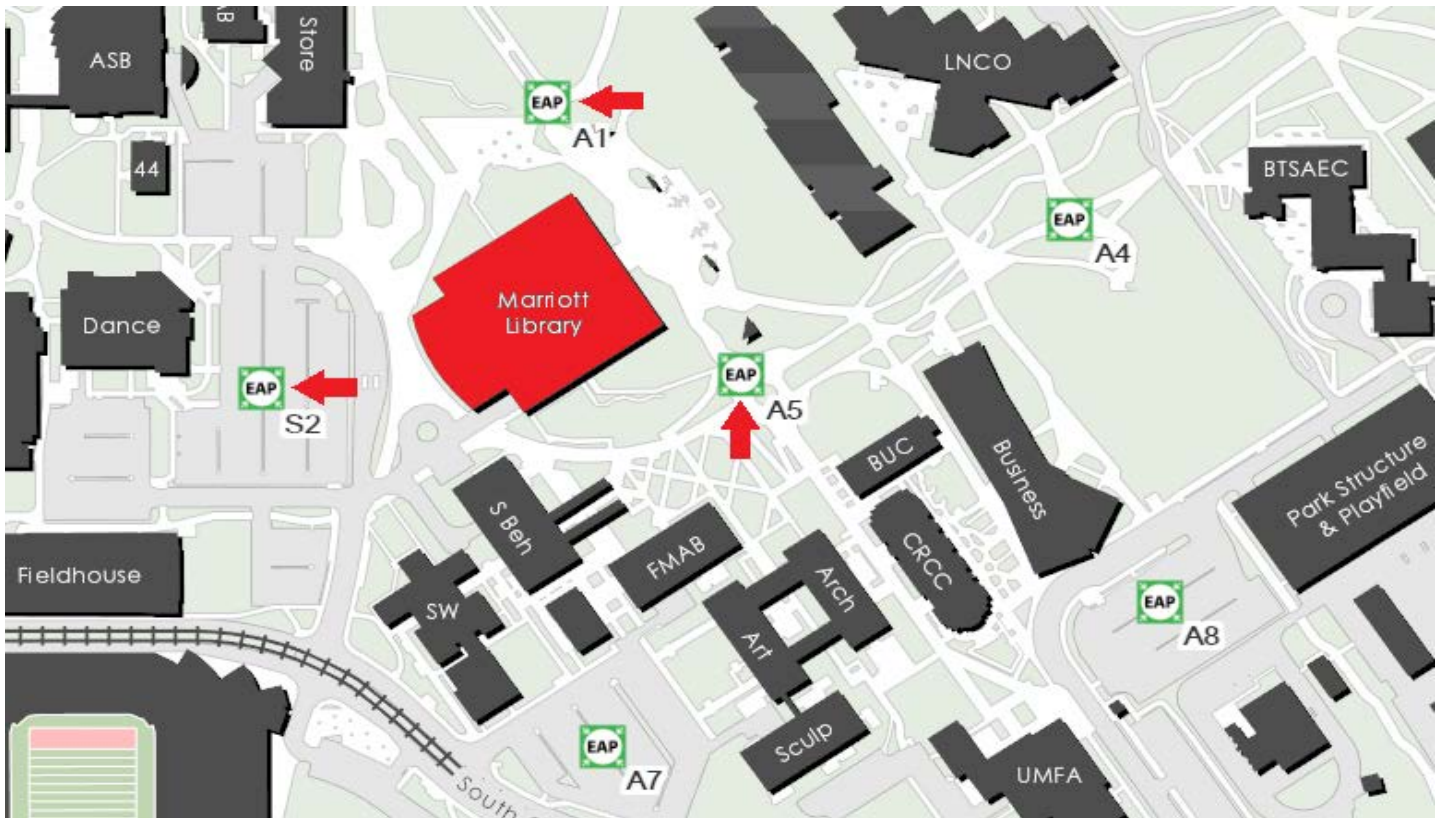
BUILDING EVACUATION

EAP (Emergency Assembly Point) – When you receive a notification to evacuate a building either by campus text alert system or by building fire alarm, please proceed in an orderly fashion to the EAP designated for that building. Once everyone is at the EAP, you will receive further instructions from Emergency Management personnel. You can look up the EAP for any building you may be in on campus at http://emergencymanagement.utah.edu/eap.

CAMPUS RESOURCES

U Heads Up App: There's an app for that. Download the app on your smartphone at alert.utah.edu/headsup to access the following resources:

- **Emergency Response Guide:** Provides instructions on how to handle any type of emergency, such as earthquake, utility failure, fire, active shooter, etc. Flip charts with this information are also available around campus.

- **See Something, Say Something:** Report unsafe or hazardous conditions on campus. If you see a life threatening or emergency situation, please call 911!

Safety Escorts: For students who are on campus at night or past business hours and would like an escort to your car, please call 801-585-2677. You can call 24/7 and a security officer will be sent to walk with you or give you a ride to your desired on-campus location.

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