M&IS 24056:Fundamentals of Business Statistics

Fall 2013

Murali Shanker
E-mail: mshanker@kent.edu
Phone: (330) 672-1165
Office Hours: By appointment
Office Location A401 BSA
Class Times Web Based
http://learn.kent.edu. Contains all course materials

Course Description

This course is an introduction to concepts in statistical methods and their applications to real-world problems. This course will examine both the theoretical and practical side of the different methods. Students will be given ample opportunities to apply the techniques to different problems. The goal of the course is for students to understand fundamental statistical concepts and methods, and their applications.

Course Requirements

Last day to withdraw from a course: Sunday, 3 November 2013

Prerequisites: Math 11011 (Algebra). Students attending the course who do not have the proper prerequisite risk being deregistered from the class.

Enrollment: Students have responsibility to ensure they are properly enrolled in classes. You are advised to review your official class schedule (using Student Tools on FlashLine) during the first two weeks of the semester to ensure you are properly enrolled in this class and section. Should you find an error in your class schedule, you have until Sunday, 8 September 2013 to correct the error. If registration errors are not corrected by this date and you continue to attend and participate in classes for which you are not officially enrolled, you are advised now that you **will not** receive a grade at the conclusion of the semester for any class in which you are not properly registered.

Students With Disabilities: University policy 3342-3-01.3 requires that students with disabilities be provided reasonable accommodations to ensure their equal access to course content. If you have a documented disability and require accommodations, please contact the instructor at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through Student Accessibility Services (contact 330-672-3391 or visit http://www.kent.edu/sas/index.cfm for more information on registration procedures).

Academic Honesty: Cheating means to misrepresent the source, nature, or other conditions of your academic work (e.g., tests, papers, projects, assignments) so as to get undeserved credit. In addition, it is considered cheating when one cooperates with someone else in any such misrepresentation. The use of the intellectual property of others without giving them appropriate credit is a serious academic offense. It is the University's policy that cheating or plagiarism result in receiving a failing grade for the work or course. Repeat offenses result in dismissal from the University.

Unless noted, all assessments are open-book, open notes, but please remember that academic dishonesty will result in a failing grade, and may result in dismissal from the University. As part of the instructor tools, I can observe the progress of each student, and also of the class. As such, it is within my right to ask any student suspected of cheating to establish the validity of their work. Failure to do so will result in failing grade.

Learning Outcomes

1. Examine distributions.

   a. Summarize and describe the distribution of a categorical variable in context.
   b. Generate and interpret several different graphical displays of the distribution of a quantitative variable (histogram, stemplot, boxplot).
   c. Summarize and describe the distribution of a quantitative variable in context: a) describe the overall pattern, b) describe striking deviations from the pattern.
   d. Relate measures of center and spread to the shape of the distribution, and choose the appropriate measures in different contexts.
   e. Compare and contrast distributions (of quantitative data) from two or more groups, and produce a brief summary, interpreting your findings in context.
   f. Apply the standard deviation rule to the special case of distributions having the "normal" shape.
2. Explore relationships between variables using graphical and numerical measures.
   a. Classify a data analysis situation (involving two variables) according to the "role-type classification," and state the appropriate display and/or numerical measures that should be used in order to summarize the data.
   b. Compare and contrast distributions (of quantitative data) from two or more groups, and produce a brief summary, interpreting your findings in context.
   c. Graphically display the relationship between two quantitative variables and describe: a) the overall pattern, and b) striking deviations from the pattern.
   d. Interpret the value of the correlation coefficient, and be aware of its limitations as a numerical measure of the association between two quantitative variables.
   e. In the special case of linear relationship, use the least squares regression line as a summary of the overall pattern, and use it to make predictions.
   f. Recognize the distinction between association and causation, and identify potential lurking variables for explaining an observed relationship.
   g. Recognize and explain the phenomenon of Simpson's Paradox as it relates to interpreting the relationship between two variables.
3. Sampling. Examine methods of drawing samples from populations
   a. Identify the sampling method used in a study and discuss its implications and potential limitations.
4. Designing Studies. Distinguish between multiple studies, and learn details about each study design.
   a. Identify the design of a study (controlled experiment vs. observational study) and other features of the study design (randomized, blind etc.).
   b. Explain how the study design impacts the types of conclusions that can be drawn.
   c. Determine how the features of a survey impact the collected data and the accuracy of the data.
5. Probability: Concepts and properties
6. Random Variables: Discrete and continuous. Using distributions of random variables to compute probabilities.
7. Sampling distributions of the sample mean
   a. Identify and distinguish between a parameter and a statistic.
   b. Explain the concepts of sampling variability and sampling distribution.
   c. Apply the sampling distribution of the sample mean as summarized by the Central Limit Theorem (when appropriate). In particular, be able to identify unusual samples from a given population.
8. Estimation: Determine point and interval estimates for the population mean
   a. Determine point estimates in simple cases, and make the connection between the sampling distribution of a statistic, and its properties as a point estimator.
   b. Explain what a confidence interval represents and determine how changes in sample size and confidence level affect the precision of the confidence interval.
   c. Find confidence intervals for the population mean, and perform sample size calculations.
9. Hypothesis Testing: Logic and process. Conduct tests for the population mean. Understand relationship between hypothesis testing and estimation.
   a. Explain the logic behind and the process of hypotheses testing. In particular, explain what the p-value is and how it is used to draw conclusions.
   b. In a given context, specify the null and alternative hypotheses for the population mean.

c. Carry out hypothesis testing for the population mean (when appropriate), and draw conclusions in context.
d. Apply the concepts of: sample size, statistical significance vs. practical importance, and the relationship between hypothesis testing and confidence intervals.
e. Determine the likelihood of making type I and type II errors, and explain how to reduce them, in context.

Course Structure

All class materials are available through Blackboard Learn (http://learn.kent.edu). You can access Learn either directly, or by logging in through Flashline. The course contains the following sections:

Syllabus: Links to this document

Lesson Plans: This contains the online lectures, and powerpoint slides. Start learning the materials in this section. There are three subsections, *Looking at Data*, *Probability and Inference,* and *Topics in Inference*, and each subsection is further divided into chapters. For each chapter, you will find links to multimedia lectures, and slides.

Assessments: This section contains links to your Examinations, Quizzes, and Surveys.

Downloads: Links to Normal and t distribution tables, and to the data from the textbook

Tutorials: We will use JMP statistical software in this class. This section provides links to tutorials on using JMP.

Textbook Information: Here, you will find a link to our textbook. The publisher allows free access, regardless of whether you bought the textbook or not, to practice quizzes and other materials.

Class Time

There are no class times. This class is completely web based, and students can access the materials anytime during the course offerings. Remember to complete ALL requirements for the course by **13 December 2013.**

Course Content

1. Looking at Data
   a. Looking at Data - Distributions
   b. Looking at Data - Relationships
   c. Producing Data
2. Probability and Inference
   a. Probability
   b. Sampling Distribution of a Sample Mean
   c. Introduction to Inference
   d. Inference for Distributions
3. Topics in Inference
   a. Linear Regression
   b. Multiple Linear Regression

Class Materials

Statistical Software: This course makes extensive use of statistical software. I use and recommend ***JMP*** statistical software. JMP is free to all Kent State Students and has been developed for statistical analysis and data exploration.

To get a copy of JMP, please go to http://www.kent.edu/is/helpdesk/sas.cfm. University licensing provides this software at no cost to you. Please access the extensive help menu system in JMP to learn how to use it. Also, the multimedia lectures show you how to use JMP for various topics. A complimentary webcast on learning JMP is being offered. Click here to register.

Book. There is a recommended, but no required book. For my audio lectures, I use "Introduction to the Practice of Statistics," by David Moore and George McCabe, 6th edition. Version 5, or Version 7 (latest version), are equally suitable. There is no required book, and students have done well in my classes without a book. But, if you do want to get a book, there are several cost-effective solutions available online like www.chegg.com, or Amazon used books. Look for the 6th or 5th Edition.

Lectures: I have recorded multimedia lectures from classes that I have taught in previous semesters. These lectures capture what I did in class, and you will find them under **Lesson Plans** in Blackboard Learn. You will also find the corresponding Powerpoint Slides for these lectures at the same location. It is best if you proceed in order, and start with *Looking with Data* section under Lesson Plans.

Assessments

There will be **six** quizzes and **three** examinations. All quizzes and examinations will be taken online, and are best taken using a standards-compliant web browser like Mozilla Firefox. Examinations and quizzes will consist of multiple choice, true or false, fill-in-the blanks, short-answer, matching, and calculation type questions. All online testing material can be found at the course web site on Blackboard Learn (https://learn.kent.edu). All tests are open-book, open notes, but cheating in any form will result in a failing grade for the course. As such, while you are allowed to use books and notes for the tests, it is cheating if you ask other students to help you while taking the tests.

Quizzes: There are 6 quizzes for this class. Each quiz is worth 10 points. The amount of time allotted for each quiz may vary, but will typically be around 25 minutes. You will have two attempts to take each quiz. The average result of the two attempts will be your score for that quiz. If you are happy with your first attempt, there is no need to take the second attempt. Results for the quizzes will be known immediately. Thus, the maximum points from quizzes is 60. You can take quizzes from anywhere you have internet access. Quizzes are not proctored, but once a quiz has been started, you need to complete it in one sitting.

Examinations: There will be 3 examinations. Each examination is worth 25 points. Each exam (including the final) will take approximately 75 minutes. All examinations are cumulative. You will have only one attempt to take each examination. Thus, the maximum score from examinations is 75. All examinations will be proctored through ProctorU.

ProctorU is a service that provides online proctoring. This service is available for free for all students in this class, but you should schedule your examinations in **advance**. Please note the following conditions for using ProctorU.

- All examinations will be available from 9 AM on the day they open, and will close at 9 PM on the last available day for the examination. As such, all examinations close by 9 PM on **13 December 2013**.
- Schedule your examination at least three days in advance. Otherwise, you will be charged a fee. Please see the FAQ at http://www.proctoru.com/faq.php for detailed information. Note that it is not possible to schedule an examination between 12:45 AM EST until 8 AM EST each day, regardless of whether the examination is available during that period.
- Examinations can be taken on any computer that meets ProctorU's technical specifications. Please go to http://www.proctoru.com/kent/techspecs.htm.
- There is no restriction on the physical location from where you can access the online examinations, as long as your computer meets the technical specifications given above.

In addition, there are some additional restrictions:

- While taking the examination, you should only access the websites for Blackboard Learn http://learn.kent.edu.
- You can access statistical software like JMP or Excel.
- All examinations are open book, open notes, so you can refer to them.
- Once you start the examination, you have to finish it in one sitting.
- Academic dishonesty in any form will lead to a failing grade for the class.

Please go to http://www.proctoru.com/portal/kent/index.php to start.

Assessment Schedule

The following table gives the topics covered for each assessment. Note that all examinations are cummulative. All assessments will be available starting 9 a.m. EST on September 6, 2013, and will end at 9 p.m. EST on December 13, 2013.

Assessment	Topics Covered	Points
Quiz 1	Looking at Data - Distributions	10

Quiz 2	Looking at Data - Relationships	10
Exam 1	Looking at Data - Distributions, Looking at Data - Relationships, Producing Data, Probability	25
Quiz 3	Probability, Sampling Distribution of a Sample Mean	10
Quiz 4	Introduction to Inference	10
Quiz 5	Inference for Distributions	10
Exam 2	All topics covered in Exam 1 and Quizzes 1 through 5.	25
Quiz 6	Linear Regression	10
Exam 3	All topics for the course, including Multiple Linear Regression	25

Grades

The maximum score for this class 135 (60 from quizzes, and 75 from examinations). Your final grade will depend on the grading scale given below.

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum Score Required	127	122	117	113	108	104	100	95	90	86

- Scores below 86 results in an "F".
- None of the assessments can be made up. Missed assessments will receive a score of zero.
- Please print and keep a copy of your assessments. That will be the proof I will require if there are any disputes about scores.
- You will have **one week** after receiving the score for each assessment to request any corrections.

Extra Credit

Statistical literacy, reasoning, and thinking are important aspects of this course. By statistical literacy we refer to the basic understanding of the language and tools of statistics. Statistical reasoning refers to the way students understand and make sense of statistical information, and finally, statistical thinking refers to why and how statistical investigations are carried out. By taking this course, I am hoping that your statistical literacy, reasoning, and thinking will improve. To determine this, you will have the opportunity to take two surveys. Details are given below, but please note the following:

- While these surveys are scored, the score **does not** affect your grade for the course.
- You will be given 8 extra credit points for taking each survey. To ensure accuracy of credit, please do the following on the survey:
    - When requested to enter your name on the survey, enter your Kent UserID for both your First and Last names. For example, a person named *Snares Gentoo*, with Kent UserID sgentoo2, will enter *sgentoo2*, rather than Snares Gentoo. So, please put your **username** on the survey **exactly** as you have on your Kent account.
    - Each survey takes between 30 and 40 minutes.

Pretest Survey: Please take this survey before you start work on your course. This is a pretest survey, that is, it measures your knowledge before you learn the concepts in this course. To access this survey:

- Go to https://apps3.cehd.umn.edu/artist/user/scale_select.html
- Enter GSA8523QFH for Access Code.

This survey is available only between 01:00 on 08-29-2013 and 23:55 on 09-13-2013 (EASTERN).

Posttest Survey: Please take this survey after you have completed all assessments. This is a posttest survey. To access this survey:

1. Go to https://apps3.cehd.umn.edu/artist/user/scale_select.html
2. Enter IKG7386MGI for Access Code

This survey is available only between 01:00 on 12-01-2013 and 23:55 on 12-13-2013 (EASTERN).

Please Do The Following Immediately

- Install *JMP* statistical software
- Take the pretest survey at https://apps3.cehd.umn.edu/artist/user/scale_select.html, with access code GSA8523QFH