AMS 315 (3 credits, Spring 2024) Data Analysis

Instructor	Changsoon(C.S.) Park Research Professor, Department of Applied Mathematics & Statistics, SUNY Korea
Class	Mon, Wed 10:30PM-11:50PM
Office	A611
Office Hour	Mon, Wed 09:00 AM-10:00 AM
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Cell Phone	010-8904-6351
Text	Statistics: The art and science of learning from data, 3rd Edition, Pearson Agresti & Franklin ISBN 978-0-321-80574-4
Room	B313
Grading	ABCDF grading

Course Description:

Introduction to basic statistical procedures. Survey of elementary statistical procedures such as the t-test and chi-square test. Procedures to verify that assumptions are satisfied. Extensions of simple procedures to more complex situations and introduction to one-way analysis of variance. Basic exploratory data analysis procedures (stem and leaf plots, straightening regression lines, and techniques to establish equal variance.

Learning Outcomes:

1) Master the sampling distributions of statistics especially:

* Sampling from the normal populations;
* Sampling from the Bernoulli populations;
* Large sample distribution of sample mean;
* Distribution of order statistics.

2) Master the basic concepts of statistical inference:

* Point estimators;
* Pivotal quantity;
* Maximum likelihood based methods;
* Confidence intervals;
* Hypothesis testing.

3) Demonstrate skills for inference with one population mean (including derivation of the formulas using the pivotal quantity method):

* Inference on one population mean when the population is normal and the population variance is known;

* Inference on one population mean when the population is normal and the population variance is unknown;

* Inference on one population mean when the population distribution is unknown but the sample size is large;

* Normality test using the normal probability plot and the Shapiro-Wilk test.

4) Demonstrate skills for inference with one population variance when the population is normal (including derivation of the formulas using the pivotal quantity method).

5) Demonstrate skills for inference with two population means (including derivation of the formulas using the pivotal quantity method):

* Inference on two population means with paired samples – how to reduce that to inference on one population mean with the paired differences;

* Inference on two population means, two independent samples, when both populations are normal and the population variances are known;

* Inference on two population means, two independent samples, when both populations are normal and the population variances are unknown but equal;

* Inference on two population means, two independent samples, when at least one population distribution is not normal but both sample sizes are large.

6) Demonstrate skills for inference with two population variances when both populations are normal (including derivation of the formulas using the pivotal quantity method) – especially the F-test for the equality of two population variances.

7) Master the basic inference with proportions and count data (including derivation of the formulas using the pivotal quantity method for the inference on one-population proportion and two-population proportions):

* Inference on one population proportion – exact test and large sample inference;

* Inference on two population proportions, independent samples – exact test and large sample inference;

* Inference on two population proportions, paired samples – exact test;

* Inference with one-way contingency table, including the Chi-square goodness-of-fit test;

* Inference with two-way contingency table, test for homogeneity and test for independence.

8) Master the basic inference with simple linear regression and correlation:

* Least squares method;

* Error in variable regression;

* Bivariate normal distribution;

* Pearson correlation;

* Spearman rank correlation.

9) Demonstrate skills with inference on several population means, independent samples – One-Way ANOVA:

* Understanding of the assumptions, derivation, interpretation of results from statistical analysis;

* Post-hoc (pairwise) comparison of the population means.

10) Master the related R procedures for all materials covered in lectures.

Grades:

Class attendance – 10%
Homework – 10%
Midterm 1,2 – 20% each (April 3, May 1)
Final – 40%

Homework will be assigned after 3 chapters, and is due one week from the day it is assigned on. Each student must turn in the homework before the lecture on the due date. Late homework will not be accepted. Solutions will be posted on the webpage after the due date. The first page of the homework should contain the following information on the top:

AMS 315
Homework #
(Your name)

-All exams are closed-book tests. You may bring a calculator.

-Final grade will be given according to curve evaluation.
-Use your official name (no nickname or else) the same as in WS (first name first; last name last)

Lectures:

-Lecture notes will be available to be downloaded from the course webpage. It would be a good idea to print the notes and bring them to the class.
-No reference is needed, and examples and problems only in the textbook will be explained.
-Bring the textbook to the class.
-Send me your Kakao Talk id or telephone number (if you agree) to my kakao talk (010 8904 6351)

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

School Policy on Attendance:

1. If a student has over 20% unexcused absences, the student's final course grade will be an F.
2. Students should report the reason of absence to the professor in advance, or immediately after the absence.
3. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the professor.
4. The professor of the course reserves the right to excuse absences.
5. The professor may excuse the absence if the submitted documentation fulfills the following conditions: extreme emergences, severe medical reasons with doctor's note, very important events.

Tentative Course Schedule

Week	Dates	Chapter	Topic
1	2/26, 2/28	Chapter1	Introduction
2	3/4,	Chapter 2	Exploring data with graphs and numerical summaries
	3/6	Chapter 3	Association: Contingency, Correlation, and Regression
3	3/11, 3/13	Chapter 4	Gathering data
4	3/18, 3/20	Chapter 5	Probability in our daily lives
5	3/25, 3/27	Chapter 6	Probability distributions
6	4/1	Review	

	4/3	Midterm #1	
7	4/8 4/10	Chapter 7 No Class	Sampling distribution
8	4/15, 4/17	Chapter 8	Statistical inference: Confidence intervals
9	4/22, 4/24	Chapter 9	Statistical inference: Significance tests about hypotheses
10	4/29 5/1	Review Midterm #2	
11	5/6 5/8	No Class Chapter 10	Comparing two groups
12	5/13, 5/14(Tues) 5/15	Chapter 11 No Class	Analyzing the association between Categorical variables
13	5/20, 5/22	Chapter 12	Analyzing the association between quantitative variables: Regression analysis
14	5/27, 5/29	Chapter 13	Multiple regression
15	6/3 6/5	Chapter 14 Review	Comparing groups: analysis of variance methods