RES220 Data Science I
1st and 2nd quarters, Sophomore

Instructor	MATSUMOTO CHIEKO
Style of Class	Lecture
Number of Credits	2
Day and Period	Monday, period 3

Course Description

In recent years, a wide variety of data has become accessible online. It has also become possible to make use of large volumes of data, known as "big data." This course is about how to handle and process data, centering on statistical analysis and especially inferential statistics and strategies for analysis of multivariate data. We use statistical analysis software to conduct actual data processing, as we learn about what kinds of analysis to conduct on what occasions, and how to make use of the results of analysis.

Course Objectives

Students will:

(1)   Learn definitions, calculation methods, and usage methods in inferential statistics

(2)   Learn definitions, calculation methods, and usage methods in regression analysis and variance analysis

(3)   Learn methods of analysis using Excel in inferential statistics and multivariate data analysis (regression analysis, variance analysis)

Prerequisites

Introductory Statistics

Class Materials

Wakui Yoshiyuki and Wakui Sadami, *Zukai 04 tsukaeru tokeigaku* (04 Illustrated Usable Statistics), Kadokawa 2015.

Course Method

Classes will be operated by the instructor in a lecture format. There will also be classes involving practical exercises in analysis using Excel.

Evaluation/Assessment

Mini-tests:

Submit answers to calculation and thought problems set in line with the content of lectures. *12 times

Exercises:

As a way of consolidating lecture material, use Excel and other tools to solve and submit answers to problems including more complex calculations than those in the mini-tests . *3 times

Reports:

Submit reports on the content of lectures, including answers to calculations that are more complex than those in the mini-tests and require thinking through.

Grading

12%   Mini-tests   12 x 1% each
45%   Exercises   3 x 15% each
43%   Reports   10% + 18% +15%

Course Schedule

Week 1: What is inferential statistics?

Orientation to Class content; making paper airplane data for use in subsequent Classes

Week 2: Revision of descriptive statistics

Revision of descriptive statistics using Excel and the data produced in Week 1

Week 3: Revision of parent populations and samples

Revision of parent populations and samples as studied in Introductory Statistics

Week 4: Estimation of means

Estimation of means as a basic element of inferential statistics; actual estimation of means using paper airplane data

Week 5: Testing of means

Testing of means as a basic element of inferential statistics; actual testing of means using paper airplane data.

Week 6: Testing of difference between means

Testing of difference between means as a requirement for comparison of two parent populations; actual testing of difference using paper airplane data

Week 7: Practical exercises 1

Practical exercises using Excel and a variety of data in order to enhance understanding of estimation and testing of means and testing of difference between means

Week 8: Estimation and testing of proportions

Estimation and testing of proportions (percentages) as an application of inferential statistics; maximum likelihood estimators

Week 9: Estimation and testing of variance

Estimation and testing of variance as an application of inferential statistics

Week 10: Testing of independence and correlation

Testing of association coefficients (independence testing) and testing of correlation coefficients as applications of inferential statistics

Week 11: Practical exercises 2

Practical exercises using Excel and a variety of data in order to enhance understanding of estimation and testing of proportions, estimation and testing of variance, testing of independence, and testing of correlation coefficients

Week 12: Regression analysis

Regression analysis as a basic element of multivariate analysis; methods of regression analysis using Excel

Week 13: Variance analysis

Experimental design and variance analysis (one-way and two-way) as basic elements of multivariate analysis; methods of regression analysis using Excel

Week 14: Practical exercises 3

Practical exercises using Excel and a variety of data in order to enhance understanding of regression analysis and variance analysis

Week 15: Bayesian statistics / other forms of multivariate analysis

Introduction to Bayesian statistics and forms of multivariate analysis other than regression analysis and variance analysis

Preparation and Follow-up

- Preparation: Read through the PowerPoint file uploaded to WebClass for each class (approx. 1 hour).
- Follow-up: Read through the sample answers uploaded to WebClass for each mini-test and consolidate what you have learned (approx. 1 hour).