

RES120 Introductory Statistics

3rd and 4th quarters, Freshman

Instructor	MATSUMOTO CHIEKO
Style of Class	Lecture
Number of Credits	2
Day and Period	Tuesday, Period 1

Course Description

Statistics are used widely in many different fields these days. This course involves the integrated study of statistics beyond disciplinary boundaries, including methods of use and points to remember. The use of figures and graphs and the calculation of statistical values are explained using examples from the real world, and students acquire the proper knowledge and understandings required in order to handle statistics.

Course Objectives

Students will:

- (1) Learn methods of use and points to remember in relation to statistics and data
- (2) Learn proper knowledge for handling statistics by reference to examples from the real world
- (3) Learn methods for the production of statistical figures and tables, and methods for calculating statistical values
- (4) Learn precautions to take when producing and using statistical figures/tables and statistical values
- (5) Understand the concepts of probability, probability distribution, parent populations, and sampling necessary in order to learn inferential statistics and Bayesian statistics

Prerequisites

Introduction to Research (J), Introduction to Research (E)

(Students are advised to revise senior high school Mathematics I: Data Analysis and Mathematics A: Permutations and Probability)

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.

Evaluation/Assessment

Mini-tests:

Submit answers to calculation and thought problems set in line with the content of lectures. *15 times

Reports:

Submit reports on the content of lectures, including answers to more difficult calculations than those in the mini-tests. *2 times

Grading

30% Mini-tests 15 x 2% each

30% Reports 10% + 20%

40% Final examination

Course Schedule

Week 1: What is the study of statistics?

Orientation to Class content. Lecture introducing statistics and how they should be used.

Week 2: Thinking about “data” (1)

Required knowledge when analyzing statistics, especially types of data (quantitative and qualitative variables), data scales (ratio scale, interval scale, ordinal scale, nominal scale), and error; revision of statistical research methods

Week 3: Thinking about “data” (2)

Processing required prior to analyzing data gathered through statistical research (processing outliers and missing values, aggregation, coding); ratios

Week 4: Statistical charts

Methods and points to note when creating tables and graphs (statistical charts) in order to organize data and understand their characteristics

Week 5: Frequency distribution tables and histograms

Methods and points to note when creating frequency distribution tables and histograms, which are methods of Classifying and organizing quantitative data

Week 6: Representative values (mean, median, mode)

Various facets in the definition and significance of mean, median, and mode, which are used to represent quantitative data in a single value

Week 7: Data spread (variance, standard deviation)

Various facets in the definition and significance of data spread (variance, standard deviation, etc.), which indicate how quantitative data values are distributed

Week 8: Order statistics and boxplots

Methods other than representative values and spread that are used to represent quantitative data in a single value, their calculation processes, and points to note

Week 9: Correlation coefficients

Definition of correlation coefficients, which are statistical values representing the degree of correlation among quantitative data, their calculation methods, and points to note when using them (spurious correlations, difference between correlations and factors, etc.)

Week 10: Cross-tabulation and association coefficients

Definition of association coefficients, which are statistical values representing the degree of association among qualitative data, their calculation methods (creation of cross-tabulation tables is required), and points to note then using them (prohibition on using correlation coefficients for qualitative data, etc.)

Week 11: Practical exercises

Practical exercises using larger data than those used for calculations in the mini-tests, in order to confirm mastering of the matters studied in Week 1 through 10

Week 12: Probability

Probability theory and conditional probability necessary to study inferential statistics and Bayesian statistics

Week 13: Probability distributions

Definition of probability distributions, which are necessary to study inferential statistics and Bayesian statistics, their types (discrete/continuous) and examples (normal distribution, binomial distribution, Poisson distribution, etc.)

Week 14: Parent populations and samples

Difference between parent populations and samples, which are necessary to understand inferential statistics; law of large numbers and central limit theorem

Week 15: Data analysis and application

Introduction to what kinds of actual data analysis can be conducted and what can be found out using the content covered in previous classes

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).