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MATH20812

Practical Statistics

Unit code:	MATH20812
Credit Rating:	10
Unit level:	Level 2
Teaching period(s):	Semester 2
Offered by	School of Mathematics
Available as a free choice unit?:	N

Requisites

Co-Requisite

- [MATH20802 - Statistical Methods](#) (Compulsory)

Additional Requirements

MATH20812 co-requisites

Aims

This course unit aims to introduce essential statistical concepts and techniques and to provide the students with experience in the use of the statistical system R.

Overview

In this course statistical methods and concepts are put in the context of their practical application with emphasis on model selection and diagnostics. Students do a series of small projects in class and as homework. Some projects are complete data analysis exercises centred around some statistical topic

Assessment Further Information

100% coursework consisting of in-class tests and homework projects.

Learning outcomes

On completion of this unit successful students will:

- be familiar with essential ideas and techniques in statistics;
- be able to choose appropriate methods to tackle a variety of data analysis problems;
- have a working knowledge of the statistical system R;
- have gained experience in the writing of statistical reports;
- be able to set up simple simulation experiments.

Syllabus

Exploratory data analysis (3 lectures)

- Data collection and presentation. [2]
- Organisation of data analysis in R: transformations, scripts and functions. [1]

Correlation (3 lectures)

- Sample correlation coefficient: numerical properties and interpretation. [1]
- Estimation of population correlation and test for zero correlation. [1]
- Rank correlation. [1]

Linear regression (4 lectures)

- Simple linear regression. [3]
- Transformations of predictor and response variables. [1]

Writing projects (1 lecture)

Goodness of fit tests (5 lectures)

- Testing for a single distribution (K-S test). [1]
- Testing for a family of distributions. [2]
- Analysis of residuals. [1]
- Chi-square test for discrete distributions. [1]

Tests for bivariate data (3 lectures)

- Wilcoxon rank sum test. Binomial test. [1]
- Two-way contingency tables: chi-square test of independence, testing homogeneity, inference about the odds ratio. [2]
- **Introduction to Monte Carlo methods (3 lectures)**
- Estimating standard errors of estimators. [1]
- Evaluation of integrals by simple Monte Carlo. [1]
- Estimating distributions of estimators. [1]

Recommended reading

This course unit is not based on a single book, some suggestions are given below. More details are available from the web page of the course.

- A reference text for probability and statistical concepts studied in the first 3 semesters is a necessity, for example: Miller, Irwin; Miller, Marylees(2004) John E. Freund's mathematical statistics with applications. 7th ed. Upper Saddle River, N.J. : Pearson Prentice Hall.
- Conover, W.J. (1999) Practical nonparametric statistics, 3rd edition (mainly Chapter 3 and Chapter 6).
- Dalgaard, Peter (2002) Introductory statistics with R, New York : Springer.
- Devore, Jay; Peck, Roxy Introductory statistics, 2nd edition, 1994 (Chapters 11 and 12 cover simple linear regression and correlation.). There are more recent books by these authors with slightly different names.
- Joaquim P. Marques de Sá (2007) Applied Statistics Using SPSS, STATISTICA, MATLAB and R. Springer Berlin Heidelberg New York.

Feedback methods

Tutorials will provide an opportunity for students' work to be discussed and to provide feedback on their understanding.

Study hours

- Lectures - 22 hours
- Tutorials - 11 hours
- Independent study hours - 67 hours

Teaching staff

Georgi Boshnakov - Unit coordinator