Applied Statistical Methods, part I, 5.0 credits

Tillämpade statistiska metoder, del I, 5.0 hp

Third-cycle education course

MAI0137

Department of Mathematics

Valid from: First half-year 2023

Approved by
Head of Department

Approved

Registration number

Entry requirements

Knowledge of probability, calculus and algebra is assumed and some familiarity with matrix algebra.

Learning outcomes

The course is intended to give basic knowledge of the theory and methods of statistical inference, i.e. how to use observed data to draw conclusions about phenomena influenced by random factors. By the end of the course, the student should be able to:

- use an appropriate probability model to describe and analyse observed data and draw conclusions concerning interesting parameters;
- understand the principles of statistical inference;
- explore the nature of the relationships between two or several variables by using different kinds of linear models and discuss the adequacy of the models;
- use nonparametric methods to analyse data of different types and discuss the applicability of the methods;
- find probability models and statistical methods in applications from engineering, economy and science and evaluate the results;
- use suitable software (e.g., R, Matlab) for certain types of statistical analyses.

Contents

- Point estimation, properties of estimators, different methods, e.g., maximum likelihood, method of moments and least squares
- Confidence intervals and tests of hypotheses for one or several samples
- The multivariate normal distribution
- General linear models
- Multiple linear regression
- Single-factor (including random effects model), two-factor and multifactor experiments in theory and practice
- Analysis of variance table (ANOVA)
- Generalized linear models; Logistic regression, Poisson regression
- Variable selection and model building
- Nonparametric methods; sign test, Wilcoxon's tests, Kruskal-Wallis test, Friedmann's test
- Introduction to Bayesian statistical inference
- Analysis of data by using appropriate statistical software, e.g., R, Matlab.

Educational methods

Lectures and Computer example classes.

Examination

Hand-in assignments.

Grading

One-grade scale

Course literature

Two books: 1) “Introduction to the Theory of Statistical Inference” by Hannelore Liero and Silvelyn Zwanzig, and 2) “An Introduction to Generalized Linear Models” by Annette J. Dobson.