Multivariate Statistical Methods

Single subject and programme course

6 credits

Multivariata statistiska metoder

732A97

Valid from: 2017 Autumn semester

Determined by
The Quality Board at the Faculty of Arts and Sciences

Date determined
2016-04-13

Revision date
2017-10-31

Main field of study
Statistics

Course level
Second cycle

Advancement level
A1N

Course offered for
- Master's Programme in Statistics and Machine Learning

Entry requirements
- Bachelor's degree of 180 ECTS credits including 90 ECTS credits in any of the following subjects:
  - Statistic
  - Mathematics Applied
  - Mathematics Computer Science
  - Technique or the equivalent degree
- Passed courses in:
  - Calculation
  - Linear algebra
  - Statistics
  - Programming
- Passed basic course in probability theory and inference
- Passed course that includes multiple linear regression
- English 6 / B

  (Exception for Swedish)

Intended learning outcomes
After completion of the course, the student should be able to:
- analyze multivariate data by using appropriate multivariate models,
- account for mathematical models related to various multivariate methods and derive theoretical results from these models,
- apply hypothesis testing and large sample theory to assess the credibility of the results obtained by multivariate models,
- use computer simulations to solve multivariate statistical problems,
- account for different types of covariance structures and their impact on interpretation,
- apply multivariate methods for dimension reduction.

Course content

The course comprises the mathematical theory for the multivariate normal distribution and its related distributions, as well as the practical application of this theory to a range of multivariate statistical model and inference problems in statistics, machine learning and engineering.

The course includes:

- matrix algebra, random vectors and matrices
- multivariate normal distribution, mathematical properties of sampling distributions and large sample theory.
- inference of mean vectors, related hypothesis testing models and confidence regions
- principal component analysis and large sample inference
- factor analysis,
- canonical correlation analysis and large sample inference,
- MANOVA models.

Teaching and working methods

The teaching comprises lectures, seminars, and computer exercises complemented by self-studies. Lectures are devoted to presentations of theories, concepts and methods. Computer exercises provide practical experience of analyzing multivariate data. The seminars comprise student presentations and discussions of computer assignments.
Language of instruction: English.

Examination

Written reports on computer assignments. Active participation at the seminars. A final oral or written examination. Detailed information about the examination can be found in the course's study guide.

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it. If the coordinator has instead recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner assesses that it is possible, based on consideration of the course objectives.

Students failing an exam covering either the entire course or part of the course twice are entitled to have a new examiner appointed for the reexamination.

Students who have passed an examination may not retake it in order to improve their grades.

Grades

ECTS, EC

Other information

Planning and implementation of a course must take its starting point in the wording of the syllabus. The course evaluation included in each course must therefore take up the question how well the course agrees with the syllabus.

The course is carried out in such a way that both men´s and women´s experience and knowledge is made visible and developed.

Department

Institutionen för datavetenskap