

Multivariate Statistical Methods

Multivariata statistiska metoder

6 credits

Single subject and programme course

732A97

Valid from: 2023 Spring semester

Determined by	Main field of study	
The Quality Board at the Faculty of Arts and Sciences	Statistics	
Date determined	Course level	Progressive specialisation
2016-04-13	Second cycle	A1F
Revised by	Disciplinary domain	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Technology	
Revision date	Subject group	
2017-10-31; 2022-06-15	Statistics	
Offered first time	Offered for the last time	
Autumn semester 2017	Spring semester 2024	
Department	Replaced by	
Institutionen för datavetenskap	732A88	

Course offered for

- Master's Programme in Statistics and Machine Learning

Entry requirements

- 180 ECTS credits passed including 90 ECTS credits in one of the following subjects:
 - statistics
 - mathematics
 - applied mathematics
 - computer science
 - engineering
- Passed courses in:
 - calculus
 - linear algebra
 - statistics
 - programming
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6)
Exemption from Swedish
- At least 6 ECTS credits passed from semester 1 Master's Programme in Statistics and Machine Learning, or the equivalent

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 special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

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 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.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

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 conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.