

Computational Statistics

Single subject and programme course

6 credits

Datorintensiva statistiska metoder

732A90

Valid from: 2017 Spring semester

Determined by

The Quality Board at the Faculty of Arts
and Sciences

Date determined

2016-04-13

Main field of study

Statistics

Course level

Second cycle

Advancement level

A1X

Course offered for

- Master's Programme in Statistics and Data Mining

Entry requirements

A bachelor's degree in one of the following subjects: statistics, mathematics, applied mathematics, computer science, engineering, or equivalent. Completed courses in calculus, linear algebra and programming are required.

The student should also have passed the following courses at advanced level:

- a course in Statistics;
- a course including multiple linear regression.

Documented knowledge of English equivalent to Engelska B/Engelska 6.

Intended learning outcomes

After completion of the course the student should be able to:

- account for how computer arithmetics affects statistical computations,
- use powerful techniques for simulation from complex distributions,
- carry out computer experiments involving Monte-Carlo techniques, i.e. the use of random number generation to simulate stochastic phenomena and perform the inference,
- use optimization techniques to fit statistical models.

Course content

The course comprises to enable insightful selection of computational tools and algorithms in statistics. The course lays the foundation for professional work and research in which advanced computation and computer experiments involving simulation are employed to make inference about models and the performance of statistical methods.

The following topics are included in the course:

- effect of computer arithmetics on statistical computations,
- basic methods for random number generation, including inverse CDF method and acceptance/rejection method,
- Monte Carlo methods for simulation and inference, including bootstrap and jackknife,
- Markov Chain Monte Carlo (MCMC) simulation, including Metropolis-Hastings and Gibbs samplers,
- introduction to unconstrained optimization and stochastic optimization..

Teaching and working methods

The teaching comprises lectures, computer exercises and seminars complemented by self-studies. The lectures are devoted to presentations of theories, concepts, and methods. Computer exercises provide practical experience of statistical analysis. Seminars are devoted to discussions of the computer exercises and student presentations.

Language of instruction: English.

Examination

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

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.

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Department
Institutionen för datavetenskap