Computational Statistics

Single subject and programme course

6 credits

Datorintensiva statistiska metoder

732A72

Valid from: 2018 Spring semester

Determined by
Course and Programme Syllabus Board
at the Faculty of Arts and Sciences

Date determined
2017-10-27

Main field of study

Statistics

Course level

Second cycle

Advancement level

A1N

Entry requirements

- 180 ECTS credits including 90 ECTS credits within one of the following subjects:
    - statistics
    - mathematics
    - applied mathematics
    - computer science
    - engineering
- Passed courses in
    - calculus
    - linear algebra
    - statistics, advanced level
    - programming
    - course including multiple linear regression, advanced level
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6/B)
  (Exemption from Swedish)

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.

   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