FSF3961 Statistical Inference 15.0 credits

Statistisk inferens

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3961 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

A minimal requirement is a basic course in statistics such as SF1901 and an advanced level course in probability (SF2940), but a graduate course in probability (SF3940) and teaching experience in statistics is recommended.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing the course students are expected to

- explain the classical and Bayesian paradigms and contrast the two
- have a good understanding of sufficient statistics and related concepts
- outline the foundations of statistical decision theory, both classical and Bayesian
- explain the notion of point estimation, the Cramér-Rao lower bound and the Rao-Blackwell theorem
- explain the main results and applications of hypothesis testing
- have thorough knowledge of computational methods in statistics, such as the EM-algorithm, the Bootstrap, and Markov Chain Monte Carlo
- be able to solve problems and discuss research related questions, related to the theory

Course contents

The purpose of this course is to cover important topics in the theory of statistics in a thorough and general fashion. The course spans over classical inferential techniques including tests of hypothesis, point estimates, and confidence intervals as well as the Bayesian paradigm where one treats all unknown quantities as random variables and constructs a joint probability distribution for all of them. Fundamental concepts are presented from the classical and Bayesian viewpoints in parallel, for better comparison and understanding. Students will practice by studying applications and solving problems related to the theory.

Disposition

The course will consist of two-week cycles with one theory lecture (45 min) the first week and one homework presentation meeting (90 min) the second week.

Course literature

Recommended literature:

- Statistical Inference 2nd Ed., G. Casella and R. Berger, Duxbury, 2002.
- Theory of Statistics, M. Schervish, Springer, 1995.
- Information Theory, Inference, and Learning Algorithms, D. Mackay, Cambridge University Press, 2003.

Examination

- HEM1 - Home assignments, 7.5 credits, grading scale: P, F
- TENM - Oral exam, 7.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

The examination will be done as a combination of homework and oral exam.

Other requirements for final grade

Homework and oral exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.