Statistical Theory, advanced course

Programme course

6 credits

Statistisk teori, fortsättningskurs

TAMS17

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Mathematics, Applied Mathematics

Course level
Second cycle

Advancement level
A1X

Course offered for
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Mathematics
- Mathematics, Master's programme
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Basic courses in probability theory and statistics. An advanced course in probability theory is helpful, but not required.

Intended learning outcomes

The course gives an introduction to the general theory of statistical inference. After a completed course the student is expected to be able to:

- describe advanced concepts and theorems of theoretical statistics, e.g., sufficiency, completeness, and the Neyman-Pearson lemma, and to prove some of the theorems.
- construct suitable, in some cases optimal, point estimators, hypothesis tests, and confidence sets, in general situations where the data are observations from a parametric family of probability distributions.
- carry out Bayesian inference in general situations where the data are observations from a parametric family of probability distributions.
- derive asymptotic results for point estimators, hypothesis tests, and confidence sets.
- understand and assess statistical inference occurring in other undergraduate courses, research reports, or the media.

Course content

Exponential families. Location and scale families. Sufficient, mimimal sufficient, ancillary, and complete statistics. Methods for point estimation, e.g. maximum likelihood. Evaluation of point estimates using e.g. the Cramer-Rao inequality and the Rao-Blackwell theorem. Likelihood ratio tests. Uniformly most powerful tests and the Neyman-Pearson lemma. The correspondence between tests and confidence sets. Pivotal variables. Optimality for confidence sets.
Bayesian inference and decision theory. Asymptotic theory.

Teaching and working methods

Lectures and tutorials.

Examination

TEN2	Written examination	6 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Matematiska institutionen

Director of Studies or equivalent
Ingegerd Skoglund

Examiner
Torkel Erhardsson

Course website and other links
http://courses.mai.liu.se/GU/TAMS17

Education components
Preliminary scheduled hours: 0 h
Recommended self-study hours: 160 h

Course literature

Additional literature

Books

Casella, G., Berger, R.L, *Statistical Inference* Duxbury Press

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.