Bayesian Learning

Programme course

6 credits

Bayesian Learning

732A46

Valid from:

Determined by
The Quality Board at the Faculty of Arts and Sciences

Date determined
Main field of study

Statistics

Course level

Second cycle

Advancement level

A1X

Entry requirements

A bachelor’s degree in one of the following subjects: statistics, mathematics, applied mathematics, computer science, engineering or a similar degree. Courses in calculus, linear algebra, statistics and programming are also required. Documented knowledge of English equivalent to Engelska B/Engelska 6.

Intended learning outcomes

After completion of the course the student should on an advanced level be able to:
- clearly explain the main differences between Bayesian and frequentist inference
- analyze basic statistical models using a Bayesian approach and correctly interpret the results
- use Bayesian models for prediction and decision making
- implement more advanced statistical models using modern simulation methods
- account for the principles behind Bayesian model inference

Course content

The course aims to give a solid introduction to the Bayesian approach to statistical inference, with a view towards applications in data mining and machine learning. After an introduction to the subjective probability concept that underlies Bayesian inference, the course moves on to the mathematics of the prior-to-posterior updating in basic statistical models, such as the Bernoulli, normal and multinomial models. Linear regression and spline regression are also analyzed using a Bayesian approach. The course subsequently shows how complex models can be analyzed with simulation methods like Markov Chain Monte Carlo (MCMC). Bayesian prediction and marginalization of nuisance parameters is explained, and introductions to Bayesian model selection and Bayesian decision theory are
also given.

Teaching and working methods

The course consists of lectures, exercise sessions, and computer labs. The lectures are devoted to presentations of concepts and methods. Mathematically oriented problems are solved in the exercise sessions. The computer labs are used for practical applications of Bayesian inference. Homework and independent study are a necessary complement to the course.
Language of instruction: English.

Examination

The course is examined by written reports on computer lab assignments and an individual project report. 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