Bayesian Learning

Single subject and programme course

6 credits

Bayesian Learning

732A46

Valid from:

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

Date determined
2013-04-30

Main field of study
Statistics

Course level
Second cycle

Advancement level
A1X

Entry requirements
For acceptance to the course, the student must have a bachelor's degree with a total of at least 90 ECTS credits (1.5 years of full-time studies) in mathematics, applied mathematics, statistics, and computer science. The undergraduate courses in mathematics should include both calculus and linear algebra. The student should also have passed: - an intermediate course in probability and statistical inference, - a basic course in programming, - a course including multiple linear regression. Documented knowledge of English equivalent to Engelska B/Engelska 6: internationally recognized test, e.g. TOEFL (minimum scores: Paper based 575 + TWE-score 4.5, and internet based 90+TWE-score 20), IELTS, academic (minimum score Overall band 6.5 and no band under 5.5), or equivalent.

Intended learning outcomes
After completion of the course the student should on an adcanced 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.

Department

Institutionen för datavetenskap