Bayesian Learning

Bayesianska metoder
6 credits

Programme course

732A91

Valid from: 2023 Spring semester

Determined by	**Main field of study**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Statistics	
Date determined	**Course level**	**Progressive specialisation**
2016-04-13	Second cycle	A1F
Revised by	**Disciplinary domain**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Technology	
Revision date	**Subject group**	
2022-06-15	Statistics	
Offered first time	**Offered for the last time**	
Spring semester 2017		
Department	**Replaced by**	
Institutionen för datavetenskap		

Course offered for

- Master's Programme in Statistics and Machine Learning

Entry requirements

- 180 ECTS credits passed including 90 ECTS credits in one of the following subjects:
    - statistics
    - mathematics
    - applied mathematics
    - computer science
    - engineering
- Passed courses in:
    - calculus
    - linear algebra
    - statistics
    - programming
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6)
  Exemption from Swedish
- At least 6 ECTS credits passed from semester 1 Master's Programme in Statistics and Machine Learning, or the equivalent

Intended learning outcomes

After completion of the course the student should at an advanced level be able to:
- account for 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,
- perform Bayesian model inference

Course content

The course covers the following topics:
Likelihood, Subjective probability, Bayes theorem, Prior and posterior distribution, Bayesian analysis of the following models: Bernoulli, Normal, Multinomial, Multivariate normal; Linear and nonlinear regression, Binary regression, Mixture models; Regularization priors, Classification, Naïve Bayes, Marginalization, Posterior approximation, Prediction, Decision theory, Markov Chain Monte Carlo, Gibbs sampling, Bayesian variable selection, Model selection, Model averaging.

Teaching and working methods

The teaching comprises 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

Written reports on computer lab assignments, and a computer exam. Detailed information about the examination can be found in the course's study guide.

If special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

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 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.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

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 conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.