Advanced Machine Learning

Single subject and programme course

6 credits

Advanced Machine Learning

732A96

Valid from: 2017 Autumn semester

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

Course offered for
- Master´s Programme in Statistics and Data Mining

Entry requirements
A bachelor's degree in one of the following subjects: statistics, mathematics, applied mathematics, computer science, engineering, or equivalent. Completed courses in calculus, linear algebra, statistics and programming are required.
The student should also have passed:
- a course in Bayesian Learning covering at least 6 ECTS credits;
- a course in Computational Statistics covering at least 6 ECTS credits, or similar courses.
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:
- account for the principles of machine learning used in the Bayesian tradition of machine learning,
- construct a suitable probabilistic model describing the data structure and the prior,
- compare between models in order to select the best one,
- implement machine learning models in a programming language and also use standard machine learning libraries in order to perform the model inference, make predictions based on these models and estimate the uncertainty of these predictions.

Course content

The course covers some advanced methods in machine learning that allow for modelling complex phenomena and predicting the outcomes of these phenomena. The following topics are included in the course:
- Introduction to Bayesian Learning: likelihood, prior, posterior, marginal likelihood, posterior predictive distribution. Generative and discriminative models,
- Gaussian process,
- State-space models,
- Kalman filtering and smoothing,
- particle methods,
- Markov models and hidden Markov models,
- graphical models, such as Bayesian networks and Markov random fields.

Teaching and working methods

The teaching comprises lectures, seminars, and computer exercises complemented by self-studies. Lectures are devoted to presentations of theories, concepts and methods. Computer exercises provide practical experience of data analysis in some machine learning software. The seminars comprise student presentations and discussions of computer assignments.
Language of instruction: English.

Examination

Written reports on the computer assignments. Active participation in the seminars. One final written examination. Detailed information about the examination can be found in the course's study guide.

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

Department

Institutionen för datavetenskap