SF2957 Statistical Machine Learning 7.5 credits

Statistisk maskininlärning

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SF2957 valid from Autumn 2017

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mathematics

Specific prerequisites

Courses in probability and statistics, linear algebra, calculus in one and several variables, numerical methods, modern methods in statistical learning, computer intensive methods.

Passed SF2940 Probability and SF2935 Modern methods in statistical learning.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

This course presents an overview of advanced methods of statistical machine learning. The course addresses both theoretical and practical aspects of advanced statistical learning. Computer-aided project work with a variety of datasets forms an essential learning activity. To pass the course, the student should be able to do the following:

- explain the difference between feed-forward networks and associative memories
- identify similarities between concepts in statistical learning and statistical physics
- know the underlying mathematical relationships within and across statistical learning algorithms
- identify appropriate statistical tools for a data analysis problems in the real world based on reasoned arguments
- develop and implement optimisation methods for training of statistical models
- design decision and optimal control problems to improve performance of statistical learning algo- rithms
- design and implement various statistical machine learning algorithms in real-world applications
- evaluate the performance of various statistical machine learning algorithms
- demonstrate a working knowledge of dimension reduction techniques
- identify and implement advanced computational methods in machine learning
- read current research papers and understand the issues raised by current research

To receive the highest grade, the student should in addition be able to do the following:

- combine several methods and models in order to gain better results

Course contents

This course presents an overview of advanced methods of statistical machine learning. Topics covered include Hopfield networks, Boltzmann machines, Gaussian processes, deep learning, reinforcement learning, dimension reduction techniques as well as computational methods in machine learning.

This course includes both theoretical and practical aspects of statistical learning theory. Computer-aided project work forms an essential learning activity.

Disposition

Lectures, presentations, work with computer-aided data analysis

Course literature

Various books and lecture notes presented on the course web page.

Examination

- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Assignments, 3.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Assignments and final exam.

Other requirements for final grade

Passed assignments and final exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.