Advanced Machine Learning

Programme course

6 credits

Avancerad maskininlärning

TDDE15

Valid from: 2018 Spring semester

Determined by
Board of Studies for Computer Science
and Media Technology

Date determined

Main field of study
Computer Science and Engineering, Computer Science

Course level
Second cycle

Advancement level
A1X

Course offered for
- Computer Science and Engineering, M Sc in Engineering
- Information Technology, M Sc in Engineering
- Computer Science and Software Engineering, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Probability theory and Statistics; Bayesian Learning; Machine Learning; Mathematical analysis; Linear Algebra; Basic programming.

Intended learning outcomes
The course presents the analysis of several large classes of models widely used in advanced machine learning, such as state-space models, gaussian processes, hidden Markov models, Bayesian networks, and Markov random fields. Students will learn about the structure and learning of these models, when they are applicable, how to use them in practical machine learning applications, and how to correctly interpret the results. The models are mainly analyzed from a Bayesian perspective.
After completing the course, the student should be able to:

- use the introduced model classes to accurately formulate and solve practical problems.
- learn the parameters and perform predictions in the presented models.
- evaluate and choose among the models within each class.
- implement the models and learning methods in a programming language.

Course content

Bayesian learning summary, Gaussian processes, State-space models, Kalman filtering and smoothing, Particle methods, Graphical models, Bayesian networks, Markov models, Hidden Markov models, Markov random fields.

Teaching and working methods

The course consists of lectures, seminars and computer laboratory work. The lectures introduce concepts and theories that students then use in problem solving at the computer labs. Seminars comprise student presentations and discussion of computer lab reports.

Examination

UPG1	Computer-based laboratory exercises	3 credits	U, G
DAT1	Computer examination	3 credits	U, 3, 4, 5

DAT1 is an exam in a computer hall that tests students' theoretical knowledge and problem-solving skills in machine learning.
UPG1 consists of computer exercises that tests the students' ability to translate theoretical knowledge into practical problem solving in machine learning.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses:
Text Mining, Visual Object Recognition and Detection

Department

Institutionen för datavetenskap

Director of Studies or equivalent

Ann-Charlotte Hallberg

Examiner

Jose M Pena

Education components

Preliminary scheduled hours: 52 h
Recommended self-study hours: 108 h

Course literature

Bishop, C. M., Pattern Recognition and Machine Learning, Springer, 2006.