DD1420 Foundations of Machine Learning 7.5 credits

Maskininlärningens grunder

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

Establishment

On 10/13/2020, the Head of the EECS School has decided to establish this official course syllabus to apply from autumn semester 2021, registration number J-2020-1818.

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed courses in all of the following fields:

- Linear Algebra (SF1624, SF1672, SF1684 or the equivalent)
- Multivariable analysis (SF1626, SF1674 or the equivalent)
- Probability and Statistics (SF1912, SF1914-SF1924 or the equivalent)
- Programming (DD1310, DD1331, DD1337 or the equivalent)

- Algorithms and Data Structures (DD1320, DD1321, DD1325, DD1327, DD1338, ID1020, ID1021 or the equivalent)

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.

Registering for a course is counted as active participation. The term 'final examination' encompasses both the regular examination and the first re-examination.

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

- use basic concepts, language and notation that supports machine learning
- explain the mathematical and statistical mechanisms in common machine learning methods.
- derive and prove selected important theoretical results
- formulate and implement appropriate machine learning models to solve empirical problems
- interpret the adaptation of the model to data
- give an account of strengths and weaknesses of machine learning models/- technologies and justify made choices based on the data
- identify relevant scientific literature including current trends and make critical assessments of this literature
- demonstrate critical thinking around ethical and social aspects of machine learning and show awareness of current progress in these fields

in order to

- be able to define problems in data analysis clearly
- formulate a suitable solution with machine learning and strengthen this solution through critical and quantitative evaluation
- be well prepared to read advanced courses in machine learning.

Course contents

Important subjects in the course include:
- What is machine learning?
- Decision making in an uncertain world
- Optimisation
- Generalisation
- Probabilistic methods in machine learning

- Information theory in machine learning
- Geometry in machine learning
- Kernel methods
- Neural networks and deep learning
- Machine learning for data synthesis
- Interactive machine learning
- Ensemble methods
- Learning theory
- Machine learning and the surrounding world

Examination

- INL1 - Assignment, 3.0 credits, grading scale: A, B, C, D, E, FX, F

- PRO1 - Project work, 1.5 credits, grading scale: P, F

- TES1 - Quizzes, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

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

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.