DD2420 Probabilistic Graphical Models 7.5 credits

Probabilistiska grafiska modeller

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

On 2020-10-13, the Head of School of EECS has decided to establish this official course syllabus to apply from the spring semester 2021 (registration number J-2020-2220).

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

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

- explain and discuss how different graphs represent both factorization and independent relations
- explain and discuss exact inference in graphical models
- use message passing algorithms for inference
- explain and discuss methods for learning uncertainties in a model's parameters
- explain and discuss approximate inference methods such as sampling, ”loopy belief” propagation and variational methods.

Students can obtain higher grades by explaining how the methods above can be used to solve specific problems. Highest grade can be obtained by explaining complex real research with these methods.

Course contents

The main contents of the course are:

Graph representations: discriminative and generative models, Bayesian nets (DAG), undirected graphical models (MRF/factor graphs), exponential distributions, D-separation, Markov blanket.

Exact inference: messsage passing, variable elimination, Factor graphs from DAG, clique graphs/trees, inferences with evidence, junction tree algorithm etc

Approximate inference: ”Loopy belief” - propagation, the Monte Carlo principen, (Markov Chain Monte Carlo (MCMC), variational methods, MAP-inference etc

Learning: parameter estimation, the maximum likelihood method, conjugate prior, Gaussian, Beta and Dirichlet distributions, partially observed data, the gradient ascent method, Expectation Maximization (EM) etc

Specific prerequisites

Completed courses in all of the following fields:

- Programming equivalent DD1310/DD1311/DD1312/DD1314/DD1315/DD1316/DD1318/DD1331/DD1337/DD100N/ID1018.
- Algebra and Geometry equivalent SF1624.
- The equivalent SF1626 of multivariable analysis.
- Probability and Statistics equivalent SF1901.
- Basic machine learning equivalent DD2421.

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.

Examination

- OVN1 - Exercises, 2.5 credits, grading scale: P, F
- OVN2 - Exercises, 2.5 credits, grading scale: P, F
- TENT - Written exam, 2.5 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.

Transitional regulations

The earlier test parts PRO1, PRO2 and TEN1 have been replaced by OVN1, OVN2 and TENT respectively.

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.