FSF3952 Hidden Markov Models 7.5 credits

Dolda Markov-kedjor

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 FSF3952 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Undergraduate courses in probability, in differential and integral calculus and Markov chains.

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 the most important methods of computation and modelling by HMMs and their extensions.

This course focuses primarily on the computational and modeling aspects and will not cover the asymptotic theory (ergodicity e.t.c.) of HMM. Computer-aided project work with datasets forms the essential learning activity.

To pass the course, the student should be able to do the following:

- to recognize a situation, where the basic HMMs can be regarded as promising model candidates.
- to recognize a situation, where the extensions of HMMs can be regarded as promising model candidates.
- be able to implement the basic algorithms with suitable modifications for the data at hand.
- be able to implement algorithms for choice of model family (state space topology) in HMM
- to know the main papers on HMMs
- to place the HMMs in the general picture of statistical learning theory
- to write at technical report that in a concise technical prose describes the work done in analysing, validating and testing an HMM for a problem.

Course contents

Markov chains, Conditional Independence, Bayesian inference, forward-backward algorithm, Baum-Welch algorithm, Viterbi algorithm, extensions: factorial hidden Markov model, hidden semi-Markov models, dynamic Bayesian networks.

Project work (modeling, analysis) on an application of interest for the student.

Course literature

Koski, Timo. Hidden Markov models for bioinformatics. Vol. 2. Kluwer Academic Pub, 2001, selected journal papers.

Examination

- INL1 - Assignments, 4.0 credits, grading scale: P, F
- PRO1 - Project work, 3.5 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.

A project report supervised by and submitted to the examiner.

Other requirements for final grade

Accepted project report.

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.