FEO3250 Information Theory and Source Coding 12.0 credits

Informationsteori och källkodning

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 FEO3250 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

EQ1220 Signal Theory or equivalent

Language of instruction

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

Intended learning outcomes

After the course, the student should be able to:

- describe the general principles of rate distortion theory
- assess given source coding schemes in the light of these principles
- devise coding schemes for given sources
- apply these principles to accomplish a project task
- contribute to the research frontier in the area

Course contents

Information theory of discrete and continuous variables: Entropy, Kraft inequality, relative entropy, entropy rate, redundancy rate, mutual information, asymptotic equipartition.

Lossless coding: nonadaptive codes: Shannon, Huffmann, arithmetic codes. Universal and adaptive codes. Ziv-Lempel codes.

Rate-distortion theory: the rate-distortion function, Shannon lower bound, rate distribution over independent variables, reverse waterfilling, Blahut algorithm.

High-rate quantization: resolution-constrained and entropy-constrained quantization. Scalar and vector quantization.

Low-rate quantization: Lloyd training algorithm for resolution-constrained and entropy-constrained cases.

Transform coding: Orthonormal transforms, transform coding gain, Karhunen-Loeve transform, Energy concentration.

Predictive coding: MSE-optimal linear prediction, linear prediction gain, coding of prediction error, closed-loop prediction.

Examination

- EXA1 - Examination, 12.0 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.

- Homework problems: pass/fail
- Written examination: pass/fail
- Project: pass/fail

Other requirements for final grade

Homework, examination, and project

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.