Data Compression

Programme course

6 credits

Datakompression

TSBK08

Valid from: 2020 Spring semester

Determined by
Board of Studies for Electrical Engineering,
Physics and Mathematics

Date determined
2019-09-23

Main field of study

Electrical Engineering, Media Technology and Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Master's Programme in Communication Systems
- Computer Science and Engineering, M Sc in Engineering
- Industrial Engineering and Management - International, M Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Information Technology, M Sc in Engineering
- Computer Science and Software Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical 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

Intended learning outcomes

After having taken this course, the student is expected to be able to

- Obtain a random model for a source, given data from the source.
- Analyze random sources and calculate theoretical limits for coding performance.

- Understand and explain the concept of codes.
- Understand and explain how the following coding methods work
    - Huffman coding
    - Golomb coding
    - Arithmetic coding
    - Lempel-Ziv coding
    - Burrows-Wheeler's block transform
- Understand and explain how adaptive Huffman coding and adaptiv arithmetic coding works.
- Design different types of coders and calculate their coding performance, given random source models.
- Know where the coding methods are used in different standards.
- Implement different coding methods, test these on real data and report the results in writing.

Course content

The course deals with coding and data compression from an information theoretic perspective. Subjects:

- Random models for sources
- Source coding theory
- Entropy
- Huffman coding
- Arithmetic coding
- Lempel-Ziv coding
- Burrows-Wheeler's block transform
- Adaptive coding methods
- Coding standards
- Fax coding
- Lossless image coding

Teaching and working methods

The course consists of lectures, lessons and laboratory work.

Examination

LAB2	Small computer project	U, G	2 credits
TEN1	A written exam	U, 3, 4, 5	4 credits

During the project, the students implement a couple of the coding methods that are taught in the course and test them on several kinds of real data. The students can choose to

work alone or in groups of two.

Grades

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

Other information

Supplementary courses: Image and Audio Coding

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is Swedish, the course as a whole or in large parts, is taught in Swedish. Please note that although teaching language is Swedish, parts of the course could be given in English. Examination language is Swedish.
- If teaching language is Swedish/English, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English (depending on teaching language).
- If teaching language is English, the course as a whole is taught in English. Examination language is English.

Other

The course is conducted in a manner where both men's and women's experience and knowledge are made visible and developed.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

Department

Institutionen för systemteknik

Director of Studies or equivalent

Lasse Alfredsson

Examiner

Harald Nautsch

Course website and other links

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Course literature

Kursen har inte någon hårt specificerad kurslitteratur. För den som även tänker läsa TSBK02/06 Bild- och ljudkodning rekommenderas den kursens huvudlitteratur: Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Publishers, ISBN 978-0-12-415796-5