CM2003 Deep Learning Methods for Medical Image Analysis: a hands-on course 7.5 credits

Djupinlärning för medicinsk bildanalys: en praktisk kurs

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 CM2003 valid from Autumn 2023

Grading scale

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

Education cycle

Second cycle

Main field of study

Medical Engineering

Specific prerequisites

Bachelor's degree in Engineering Physics, Electrical Engineering, Computer Science or equivalent. 6 credits programming.

English B/6

Language of instruction

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

Intended learning outcomes

On successful completion of the course, the student should be able to:

- explain the basic principle of supervised deep learning methods for medical image segmentation and classification
- account for the theoretical background for the methods for deep neural networks used in the context of medical image analysis
- explain the commonly used deep neural network architectures and their functions in medical image analysis
- identify the practical applications in the field of medical image analysis where deep learning can be applied

in order to:

- be able to prepare medical images for deep learning based methods
- be able to implement, analyze and evaluate common deep neural networks for medical image analysis
- use the basic knowledge acquired during the course to learn more about the area and read literature in the area

Course contents

- General introduction of supervised learning and its applications in medical image analysis
- Basic theories of ANN and DNN: Active function, Loss function, gradient descent, layers
- The principle of convolutional neural networks (CNN) and recurrent neural networks (RNN)
- Quick introduction of Python and TensorFlow
- Medical image segmentation using CNN and hands-on section with TensorFlow
- Medical image classification using CNN and hands-on section with TensorFlow
- Medical image analysis using RNN and hands-on section with TensorFlow
- Transferred learning and deep features for medical image analysis
- New progress in methods for deep learning

Examination

- LAB1 - Laboratory work, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- PRO1 - Project work, 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.

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.