FDD3020 Deep Learning Methods for Biomedical Image Analysis 7.5 credits

Djupinlärning för biomedicinsk bildanalys

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 FDD3020 valid from Spring 2020

Grading scale

P, F

Education cycle

Third cycle

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:

- Identify the basic concepts, terminology, theories, models and methods for biomedical image analysis using deep learning
- Characterize the unique challenges associated with various types of biomedical image data modalities
- Describe and implement the commonly used architectures for deep neural networks used for biomedical image analysis.
- Develop and systematically test a number of methods for biomedical image analysis using deep learning
- Choose appropriate evaluation methodologies to evaluate the performance of deep learning models on biomedical image analysis problems
- Identify limitations of the methods covered in the course

in order to:

- Curate biomedical image data for use in deep learning based methods
- Implement, analyze and evaluate biomedical image analysis systems using deep neural networks
- Use the knowledge acquired in the course read and profit by literature in the area

Course contents

- General introduction
- Overview of biological and medical imaging modalities and research/clinical applications
- Quick introduction to PyTorch
- Challenges in biomedical image data handling and curation
- Detection / Segmentation / Image classification for biomedical images
- Transfer learning and generalization
- Evaluation methodology
- Unsupervised learning in biomedical image analysis
- Generative models and Inverse problems
- Other topics (3D models, temporal, registration, graph convolutions)

Course structure

The course consists of regular lectures (mixed video lectures and traditional) and programming laboratory sessions. During programming sessions the students will work on exercises corresponding to each module and a final project at the end of the course.

Course literature

None.

Required equipment

None.

Specific prerequisites

Master's degree in Engineering Physics, Electrical Engineering, Computer Science or equivalent. Python programming knowledge. The student should carry out research on PhD level within computer vision / machine learning or a related field.

Examination

- EXA1 - Written examination, 7.5 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.

LAB1 - Laboratory work, 4.5 credits, grading scale: P/F
EXA1 - Examination, 3.0 credits, grading scale: P/F

Other requirements for final grade

Completion of LAB1, PRO1, and online quizzes.

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.