Linnæus University

Jnr: 2019/1456-3.1.2.2

Course syllabus

Faculty of Technology
Department of Computer Science and Media Technology

4DV661 Djup maskininlärning, 5 högskolepoäng
Deep Machine Learning, 5 credits

Main field of study
Computer Science

Subject Group
Informatics/Computer and Systems Sciences

Level of classification
Second Level

Progression
A1F

Date of Ratification
Approved by Faculty of Technology 2019-04-24
The course syllabus is valid from spring semester 2020

Prerequisites
Courses at advanced level within the main field of computer science comprising at least 10 credits.

Objectives
After completing the course the student shall be able to:

- Describe the foundation and applications of deep learning,
- explain methods for reinforcement learning, planning, and control in sequential decision-making processes,
- explain the limitations of a model in a given context,
- implement deep learning models in a state of the art framework, such as Tensorflow or Keras,
- apply concepts from deep learning to solve tasks such as image recognition,
- represent data in ways to facilitate learning,
- recognize the effects of bad initialization, parameters, and hyperparameters, and suggest ways to change these to improve the results, and
- critically reflect on the value of a scientific result, as well as summarize, present, and discuss findings from scientific articles, as well as the effect these research results have on society.

Content
The course covers concepts and methods from neural networks and deep learning.
The following topics are covered:

- Neural networks and convolutional neural networks.

- Optimization in training deep learning models.
- Regularization for deep learning.
- Hyperparameter tuning.
- Recurrent networks.
- Long-short term memory.
- Reinforcement learning.

Type of Instruction

The instruction consists of lectures, teacher-supervised laboratory sessions, seminars, where pairs of students present a scientific article and acts as opponents on another student presentation.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.
The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as a fail (i.e. received the grade F). Assessment of student performance is made through theoretical assignments, programming assignments, and a written exam. Students who do not pass the regular examination will be offered retrials close to the regular examination.
To pass the course, grade G is required on the presentation and grade E or higher is required for all other parts. The final grade is decided from: programming assignments (50%) and written exam (50%).

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.
If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

Course Evaluation

During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

Other

Grade criteria for the A-F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

The course is conducted in such a way that the course participants' experiences and knowledge are made visible and developed. This means, for example, that we have an inclusive approach and strive for no one to feel excluded. This can be expressed in different ways in a course, for example by using the gender-neutral example.

Required Reading and Additional Study Material

Required reading:

- Goodfellow, Ian, Bengio, Yoshua, and Courville, Aaron, *Deep learning*, MIT Press, 2016, ISBN: 0262035618. Pages: 465 of 710.
- Compendium of scientific articles. Approximately 100 pages.