Neural Networks and Learning System

Neuronnät och lärande system
6 credits

Programme course

732A55

Valid from: 2023 Spring semester

Determined by	**Main field of study**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Computer Science	
Date determined	**Course level**	**Progressive specialisation**
2017-06-13	Second cycle	A1F
Revised by	**Disciplinary domain**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Technology	
Revision date	**Subject group**	
2022-12-06	Computer Technology	
Offered first time	**Offered for the last time**	
Spring semester 2017		
Department	**Replaced by**	
Institutionen för medicinsk teknik		

Course offered for

- Master's Programme in Statistics and Machine Learning

Entry requirements

- 180 ECTS credits passed including 90 ECTS credits in one of the following subjects:
    - statistics
    - mathematics
    - applied mathematics
    - computer science
    - engineering
- Passed courses in:
    - calculus
    - linear algebra
    - statistics
    - programming
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6)
  Exemption from Swedish
- At least 6 ECTS credits passed from semester 1 Master's Programme in Statistics and Machine Learning, or the equivalent

Intended learning outcomes

After completion of the course the student should on an advanced level be able to:
- design and apply artificial neural networks and similar methods for signal, image and data analysis that learn from previous experience and data
- apply methods to find meaningful relations in multidimensional signals where the degree of complexity makes traditional model-based methods unsuitable or impossible to use
- explain the difference between particular learning paradigms,
implement and use common methods in those paradigms
and select an appropriate method for solving a given problem

Course content

Machine learning, classification, pattern recognition and high-dimensional data analysis. Supervised learning: neural networks, linear discriminants, support vector machines, ensemble learning, boosting. Unsupervised learning: patterns in high-dimensional data, dimensionality reduction, clustering, principal component analysis, independent component analysis. Reinforcement learning: Markov models, Q-learning.

Teaching and working methods

Lectures, lessons, laboratory works. Homework and independent study are a necessary complement to the course.

Examination

Written examination and written reports on laboratory exercises.
Detailed information about the examination can be found in the course's study guide.

If special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it.

If the coordinator has recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner assesses that it is possible, based on consideration of the course objectives.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

Students failing an exam covering either the entire course or part of the course twice are entitled to have a new examiner appointed for the reexamination.

Students who have passed an examination may not retake it in order to improve their grades.

Grades

ECTS, EC