Neural Networks and Learning Systems

Programme course

6 credits

Neuronnät och lärande system

TBMI26

Valid from: 2017 Spring semester

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

Date determined
2017-01-25

Main field of study

Information Technology, Computer Science and Engineering, Computer Science, Electrical Engineering, Biomedical Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- 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
- Chemical Biology
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- Engineering Biology, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Biomedical Engineering, Master's programme
- Computer Science, Master's programme
- Mathematics, Master's programme
- Information Technology, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Computer Science and Software 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

Requisite: Linear algebra, multivariable calculus, mathematical statistics.
Recommended: Signal theory, programming (Matlab).

Intended learning outcomes

The aim is that students after passing the course will 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. Students will also be able to apply such methods to find meaningful relations in multidimensional signals where the degree of complexity makes traditional model-based methods unsuitable or impossible to use.

Specifically, students should be able to:

- Explain the difference between particular learning paradigms
- Implement and use common methods in those paradigms
- 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, assignments with mandatory written reports

Examination

TEN1	Written Examination	U, 3, 4, 5	4 credits
LAB1	Laboratory Work	U, G	2 credits

Grades

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

Department

Institutionen för medicinsk teknik

Director of Studies or equivalent

Linda Rattfält

Examiner

Magnus Borga

Course website and other links

http://www.imt.liu.se/edu/courses/TBMI26/

Education components

Preliminary scheduled hours: 54 h
Recommended self-study hours: 106 h

Course literature

Additional literature

Books

Stephen Marsland, *Machine Learning: An Algorithmic Perspective*

Other

Compendium: examples, supplementary material, lab manual

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.