SYLLABUS

Machine Learning and Pattern recognition 7.5 credits D0033E

Maskininlärning och mönsterigenkänning

Course syllabus admitted: Spring 2022 Sp 3 - Autumn 2024 Sp 2

DECISION DATE
2022-04-08

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Machine Learning and Pattern recognition 7.5 credits D0033E

Maskininlärning och mönsterigenkänning

First cycle, D0033E

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	U G VG	Datalogi	Computer Technology

Main field of study

Computer Science and Engineering

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and Knowledge in logic, set theory and graph theory, for example M0009M Discrete Mathematics. Basic knowledge in programming, for example D0009E Introduction to Programming or D0028E Programming and Digitalisation.

Knowledge in English equivalent to English 6.

Selection

The selection is based on 1-165 credits.

Course Aim

Upon course completion, the student should have the ability to:

- In-depth understanding of the basic methods and theories of this field
- Select appropriate methods for given problems in this field
- Apply the learned methods on new use cases
- Demonstrate the ability to critically evaluate and compare different AI models and learning algorithms for different problem setups and quality characteristics

Contents

This course goes deeper into the theory and mathematical methodology of sub-symbolic AI methods, mainly in machine learning and pattern recognition. It will overview the foundations and details of standard machine learning and pattern recognition methods, such as K-NN and variants, Support Vector Machines, decision trees and random forests, Naïve Bayes and Bayesian Networks, Expectation Maximization, evolutionary methods, instance-based learning, reinforcement learning, methods for evaluating learning outcomes. Furthermore, this course introduces concepts and methods required to design, train, and validate neural networks. It will also give an overview of methods for improving machine learning and pattern recognition methods, such as multiple classifier combination, ensemble methods, bagging, boosting, and extended methods.

Finally, unsupervised learning techniques, such as clustering (k-means, hierarchical, DBSCAN), PCA, LDA, and other pattern analysis techniques will be covered.

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Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.

Lectures will be given in the form of short videos 6-10 minutes covering a specific concept related to the module, a short reflection questions will be asked after the video to confirm the success of delivering the knowledge. Weekly live sessions will be conducted where students can ask the instructors and sort out their concerns if they are exists. Project related to the covered topics should be delivered at the end of the module as the major contribution from the students, project will be split into different tasks, and each task will be assigned to the students at the end of the relevant module.

Participants are recommended to:

- Have internet connection (minimum 0,5 Mbps), microphone, Web cam
- Use their personal computers during the course.
- The participants need to guarantee they have all administration rights on their machines to install and use the necessary tools during the course.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Assessment of written reflection quizzes. Project work with oral examination

Overlap

The course D0033E is equal to D0038E

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0003	Project work with oral examination	U G VG	4.5	Mandatory	S22	
0004	Reflective quizzes	U G VG	3	Mandatory	S22	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

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Last revised

by Jonny Johansson 2022-04-08

Syllabus established

by Jonny Johansson, HUL SRT 2021-02-17

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