UNIVERSITY OF BORÅS

Applied Machine Learning
Tillämpad maskininlärning
7.5 credits

Ladok Code: C1TMIB
Version: 1.0
Established by: Committee for Education in Librarianship, Information, and IT 2023-11-07
Valid from: Autumn 2024

Education Cycle: First cycle
Main Field of Study (Progressive Specialisation): Informatics (G1F), Computer Science (G1F)
Disciplinary Domain: Natural sciences
Prerequisites: General entry requirements for university studies.
Completed courses of at least 15 credits in programming and data structures.
Subject Area: Informatics/Computer and Systems Sciences
Grading Scale: Seven-degree grading scale (A-F)

Content
This course provides an introduction to machine learning with a focus on the subfield of supervised learning and the use of pre-implemented algorithms for prediction. The Python programming language is introduced and used for applied machine learning through the Scikit-Learn and Keras frameworks. The course covers several predictive algorithms and techniques for classification and regression, such as linear, multiple and logistic regression, decision trees, k-Nearest Neighbor (kNN), ensembles, and artificial neural networks. It also covers methods for pre-processing data and evaluating predictive models. The course also covers the standard process for data mining in different industries (CRISP-DM).

Learning Outcomes
After completing the course, the student will be able to:

Knowledge and understanding
1.1 describe the programming terms and concepts of the Python programming language,
1.2 describe the properties of classification and regression problems and algorithms,
1.3 describe the purposes, strengths, and weaknesses of different classification and regression algorithms,
1.4 describe pre-processing methods for classification and regression problems,
1.5 describe evaluation criteria for classification and regression algorithms,
1.6 describe evaluation methods for classification and regression algorithms
1.7 describe a standardised approach to data analysis projects (CRISP-DM), and
1.8 describe the design and implementation of a machine learning pipeline for machine learning problems.

Competence and skills
2.1 implement simple programs in the Python programming language for applied machine learning,
2.2 use established software libraries for data processing and machine learning,
2.3 use standard data pre-processing techniques,
2.4 conduct empirical evaluation of trained classification and regression models, and
2.5 carry out design and the implementation of a machine learning pipeline for machine learning.

Judgement and approach
3.1 choose and apply a machine learning algorithm given problems and data for classification or regression, and
3.2 select and apply pre-processing and evaluation methods for different machine learning algorithms

Forms of Teaching
The course consists of:
- lectures

- supervision in the form of workshops
- supervision of laboratory sessions
- seminars

The language of instruction is English.

Forms of Examination

The course will be examined through the following examination elements:

Individual written examination
Learning outcomes: 1.1–1.8, 2.1–2.2
Credits: 3.5
Gradingscale: Seven-degree grading scale (A-F)

Lab 1: regression and classification with kNN, decision trees and ensembles (group task)
Learning outcomes: 2.1–2.5, 3.1–3.2
Credits: 1.5
Gradingscale: Fail (U) or Pass (G)

Seminar 1: presentation of regression and classification with kNN, decision trees and ensembles.
Learning outcomes: 2.1–2.5, 3.1–3.2
Credits: 0.5
Gradingscale: Fail (U) or Pass (G)

Lab 2: regression and classification with artificial neural networks (group task)
Learning outcomes: 2.1–2.5, 3.1–3.2
Credits: 1.5
Gradingscale: Fail (U) or Pass (G)

Seminar 2: presentation of regression and classification with artificial neural networks
Learning outcomes: 2.1–2.5, 3.1–3.2
Credits: 0.5
Gradingscale: Fail (U) or Pass (G)

For a passing grade (A-E) on the entire course, the grade E at a minimum is required on the *Individual written examintation* and Pass (G) on the other examination components. A higher grade on the entire course is then determined by the grade on *Individual written examination.*

If the student has received a decision/recommendation regarding special pedagogical support from the University of Borås due to disability or special needs, the examiner has the right to make accommodations when it comes to examination. The examiner must, based on the objectives of the course syllabus, determine whether the examination can be adapted in accordance with the decision/recommendation.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Materials

The course literature is in English.

Chan, J. (2017). Learn Python in One Day and Learn It Well. LCF Publishing.

Geron, A. (2019), Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow. OReilly.

Scientific articles and other material may be added according to the teacher's instructions.

Student Influence and Evaluation

The course is evaluated in accordance with current guidelines for course evaluations at the University of Borås in which students' views are to be gathered. The course evaluation report is published and returned to participating and prospective students in accordance with the above-mentioned guidelines, and will be taken into consideration in the future development of courses and education programmes. Course coordinators are responsible for ensuring that the evaluations are conducted as described above.

Miscellaneous

The course is given as a freestanding course.

This syllabus is a translation from the Swedish original.