UCLouvain

linfo2262

2025

Machine Learning :classification and evaluation

The version you're consulting is not final. This course description may change. The final version will be published on 1st June.

6.00 credits	30.0 h + 30.0 h	Q2

Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	• Learning as search, inductive bias • Combinations of decisions • Loss function minimization, gradient descent • Performance assessment • Instance-based learning • Probabilistic learning • Unsupervised classification
Learning outcomes	**At the end of this learning unit, the student is able to :** Given the learning outcomes of the "Master in Computer Science and Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • INFO1.1-3 • INFO2.3-4 • INFO5.3-5 • INFO6.1, INFO6.4 Given the learning outcomes of the "Master [120] in Computer Science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • SINF1.M4 • SINF2.3-4 • SINF5.3-5 • SINF6.1, SINF6.4 Students completing successfully this course will be able to: • understand and apply standard techniques to build computer programs that automatically improve with experience, especially for classification problems • assess the quality of a learned model for a given task • assess the relative performance of several learning algorithms • justify the use of a particular learning algorithm given the nature of the data, the learning problem and a relevant performance measure • use, adapt and extend learning software Students will have developed skills and operational methodology. In particular, they have developed their ability to: • use the technical documentation to make efficient use of existing packages, • communicate test results in a short report using graphics.

1

Evaluation methods	**Computation of the global grade for the course** For the **first session**, the global grade for the course is solely based on the grades of the computing projects, submitted and evaluated during the semester. This global grade is computed, right after the grading of the final project, as a weighted average of the project grades according to the following weighting scheme: • project 1 = 10% • project 2 = 15% • project 3 = 10% • project 4 = 15% • project 5 = 50% The projects are **not** evaluated again for the **second session** and may not be resubmitted. The grades for projects 1 to 4 are kept as such, while project 5 is replaced by a closed book written exam. This written exam is by default on paper or, when appropriate, on a computer. The global grade is computed according to the same weighting scheme used for the first session, with the written exam representing 50% of this global grade (and replacing the project 5 grade). **Rules for student collaboration and use of external resources** Collaborative studying among students is encouraged through an exchange forum on Moodle. Each student is however expected to submit a personal solution to each project. The use of public resources (e.g. stackoverflow.com), including generative AIs (e.g. chatGPT) is permitted, as long as each (fragment of) code submitted by the student mentions all the resources used. The distribution or exchange between students of (fragments of) code is not authorized by any means (GitHub, Facebook, Discord, etc.), even after the project deadlines. Failure to comply with these rules will be considered as plagiarism and/or cheating and will be sanctioned according to the Academic Regulations and Procedures. These rules are explained in detail during the first class (see course Moodle site).
Teaching methods	• Lectures • Computing projects including theoretical questions and practical applications. These projects are implemented in python. They are submitted and evaluated on the *Inginious* platform.
Content	• Decision Tree Learning: ID3, C4.5, CART, Random Forests • Linear Discriminants: Perceptrons, Gradient-Descent and Least-Square Procedures • Maximal Margin Hyperplanes and Support Vector Machines • Deep Learning • Probability and Statistics in Machine Learning • Performance Assessment: Hypothesis testing, Comparing Learning Algorithms, ROC analysis • Gaussian Classifiers, Fisher Linear Discriminants • Bayesian Learning: ML, MAP, Optimal Classifier, Naive Bayes • Instance-based learning: k-NN, LVQ
Inline resources	moodle.uclouvain.be/course/view.php?id=1836
Bibliography	Des ouvrages complémentaires sont recommandés sur le site Moodle du cours. Additional textbooks are recommended on the Moodle site for this course.
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	6		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Statistics: Biostatistics	BSTA2M	6		
Master [120] in Linguistics	LING2M	6		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Statistics: General	STAT2M	6		
Master [120] in Computer Science and Engineering	INFO2M	6		
Master [120] in Computer Science	SINF2M	6		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [60] in Computer Science	SINF2M1	6		
Master [120] in Data Science Engineering	DATE2M	5		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	6		
Master [120] in Data Science: Information Technology	DATI2M	5		
Master [120] in Energy Engineering	NRGY2M	5		