UCLouvain

lingi2262

2020

Machine Learning :classification and evaluation

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

6 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Dupont Pierre ;
Language :	English
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
Aims	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 1 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. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The projects are worth 40 % of the final grade, 60 % for the final exam (closed-book). The mini-projects **cannot** be implemented again in second session. The projects grades are fixed at the end of the semester and included as such in the global score for the second session. The final exam is, by default, a written exam (on paper or, when appropriate, on a computer) These evaluation rules are subject to possible updates due to the sanitary situation. In particular, the relative weights between the projects and the final exam could be adapted. Such possible updates would be notified to the students by a general announcement posted on the Moodle site of this course.

Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Lectures • Several projects including some theoretical questions and mostly practical applications. By default, *lectures* can be followed **face to face** in the auditorium announced in the official schedule. Depending on the number of registered students and the evolution of the sanitary situation, students will be able to follow the lectures as well **remotely** on *Teams*. Practical projects are submitted **on line** 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	http://moodleucl.uclouvain.be/course/view.php?id=8900
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

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Teaching methods	Lectures are given **online** and can be followed **remotely**. Computing projects are submitted **online** on the Inginious platform.
Evaluation methods	The gobal grade for the course is only based on the projects (no final exam). The relative weights of the projects in the global grade is adapted as follows: • project 1 = 15% • project 2 = 15% • project 3 = 10% • project 4 = 15% • project 5 = 45% In case of a second session, a new version of project 5 is implemented and re-evaluated. The grades of the other projects are fixed, after a feedback has been given, and cannot be re-implemented.

Programmes containing this learning unit (UE)

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