










Teacher(s)	Dupont Pierre ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Learning as search, inductive bias • Combinations of decisions • Loss function minimization, gradient descent • Performance assessment • Instance-based learning • Probabilistic learning • Unsupervised classification
Aims	<p>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:</p> <ul style="list-style-type: none"> • INFO1.1-3 • INFO2.3-4 • INFO5.3-5 • INFO6.1, INFO6.4 <p>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:</p> <ul style="list-style-type: none"> • SIN1.M4 • SIN2.3-4 • SIN5.3-5 • SIN6.1, SIN6.4 <p>1</p> <p>Students completing successfully this course will be able to:</p> <ul style="list-style-type: none"> • 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 <p>Students will have developed skills and operational methodology. In particular, they have developed their ability to:</p> <ul style="list-style-type: none"> • use the technical documentation to make efficient use of existing packages, • communicate test results in a short report using graphics. <p>-----</p> <p><i>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".</i></p>
Evaluation methods	<p>The 4 mini-projects worth 30 % of the final grade, 70 % for the exam (closed-book) .</p> <p>The mini-projects can NOT be remade in second session</p> <p>30 % are already set at the end of Q2 and included as such in the final score in the second session.</p>
Teaching methods	<ul style="list-style-type: none"> • Lectures • Written assignment and/or Miniproject (2 students/group, from 1 to 3 weeks) • Assignment feedback
Content	<ul style="list-style-type: none"> • 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 • 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

	<ul style="list-style-type: none"> • Clustering Techniques
Inline resources	http://moodleucl.uclouvain.be/course/view.php?id=8900
Bibliography	Slides obligatoires, disponibles sur : http://moodleucl.uclouvain.be/course/view.php?id=8900 et plus généralement tous les documents (énoncés des mini-projets) disponibles sur le même site.
Other infos	Background: - LSINF1121 Algorithmics and data structures https://uclouvain.be/en-cours-lsinf1121.html - LBIR1304 Probability and statistics II https://uclouvain.be/en-cours-lbir1304.html OR LFSAB1105 Probability and statistics: https://uclouvain.be/en-cours-LFSAB1105.html
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Statistics: Biostatistics	BSTA2M	5		
Master [120] in Computer Science	SINF2M	5		
Master [120] in data Science: Statistic	DATS2M	5		
Master [120] in data Science: Information technology	DATI2M	5		