

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).

5 credits	30.0 h + 30.0 h	Q1
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Teacher(s)	Lee John ;Verleysen Michel ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Linear and nonlinear data analysis methods, in particular for regression and dimensionality reduction, including visualization.
Aims	<p>With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the development, mastery and assessment of the following skills :</p> <ul style="list-style-type: none"> • AA1.1, AA1.2, AA1.3 • AA3.1, AA3.2, AA3.3 • AA4.1, AA4.2, AA4.4 • AA5.1, AA5.2, AA5.3, AA5.5 • AA6.3 <p>1</p> <p>At the end of the course, students will be able to :</p> <ul style="list-style-type: none"> - Understand and apply machine learning techniques for data and signal analysis, in particular for regression and prediction tasks. - Understand and apply linear and nonlinear data visualization techniques. - Evaluate the performances of these methods with appropriate techniques. - Choose between existing methods on the basis of the nature of data and signals to be analyzed. <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>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Closed book hybrid written-oral exam. The project is part of the evaluation. Examination modalities may be adapted according to sanitary conditions and to the number of registered students.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Ex-cathedra course organized physically if sanitary conditions permit, and broadcasted or recorded if required by sanitary rules. Practical sessions on computers, and project to be carried out individually or by groups of 2 students.</p>
Content	<ul style="list-style-type: none"> • Linear regression • Nonlinear regression with multi-layer perceptrons (MLP) • Deep learning (convolutional CNN and adversarial GAN) • Clustering and vector quantization • Nonlinear regression with radial-basis function networks (RBFN) • Model selection • Feature selection • Principal Component Analysis (PCA) • Nonlinear dimensionality reduction and data visualization • Independent Component Analysis (ICA) • Kernel methods (SVM)
Inline resources	http://moodleucl.uclouvain.be/course/view.php?id=84
Bibliography	Divers livres de références (mais non obligatoires) mentionnés sur le site du cours

Faculty or entity in charge	ELEC
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Force majeure

Teaching methods	Ex-cathedra course broadcasted or recorded. Practical sessions on computers, and project to be carried out individually or by groups of 2 students.
Evaluation methods	Exam organized during the January session, physically in Louvain-la-Neuve unless the sanitary situation does not allow on-site exams anymore: open book written exam. In the situation of postponed exam or enrollment to another session, the exam may be transformed into an oral exam, depending on the number of registered students. The project is evaluated, and the written or oral exam may include part of the project.

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science : Statistic	DATS2M	5		
Master [120] in Linguistics	LING2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Computer Science	SINF2M	5		
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 Agricultural Bioengineering	BIRA2M	5		
Master [120] in Forests and Natural Areas Engineering	BIRF2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		
Master [120] in Statistic: General	STAT2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		