

Teacher(s)	Lee John ;Lee John (compensates Verleysen Michel) ;Verleysen Michel ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	Linear and nonlinear data analysis methods, in particular for regression and dimensionality reduction, including visualization.
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <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"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA3.1, AA3.2, AA3.3</li> <li>• AA4.1, AA4.2, AA4.4</li> <li>• AA5.1, AA5.2, AA5.3, AA5.5</li> <li>• AA6.3</li> </ul> <p>1</p> <p>At the end of the course, students will be able to :</p> <ul style="list-style-type: none"> <li>- Understand and apply machine learning techniques for data and signal analysis, in particular for regression and prediction tasks.</li> <li>- Understand and apply linear and nonlinear data visualization techniques.</li> <li>- Evaluate the performances of these methods with appropriate techniques.</li> <li>- Choose between existing methods on the basis of the nature of data and signals to be analyzed.</li> </ul>
Evaluation methods	<p>The assessment consists of two parts.</p> <p>1) An assignment (course project) to be completed during the semester, and handed in as a report including answers to the questions that come with the assignment wording;</p> <p>2) An oral or written examination on the course and practical sessions.</p> <p>Part 1) counts for 50% of the final assessment points, part 2) for 50%.</p> <p>Students who have taken the examination in the January session may, on request, retain their points from part 1) for a possible examination in the August session.</p>
Teaching methods	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.
Content	<ul style="list-style-type: none"> <li>• Linear regression</li> <li>• Nonlinear regression with multi-layer perceptrons (MLP)</li> <li>• Deep learning (convolutional CNN and adversarial GAN)</li> <li>• Clustering and vector quantization</li> <li>• Nonlinear regression with radial-basis function networks (RBFN)</li> <li>• Model selection</li> <li>• Feature selection</li> <li>• Principal Component Analysis (PCA)</li> <li>• Nonlinear dimensionality reduction and data visualization</li> <li>• Independent Component Analysis (ICA)</li> <li>• Kernel methods (SVM)</li> </ul>
Inline resources	Cours : <a href="https://uclouvain.be/lelec2870">LELEC2870 - Machine learning : regression, deep networks and dimensionality reduction (uclouvain.be)</a>
Bibliography	Divers livres de références (mais non obligatoires) mentionnés sur le site du cours
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Forests and Natural Areas Engineering	BIRF2M	5		
Master [120] in Linguistics	LING2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Computer Science	SINF2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Data Science Engineering	DATE2M	5		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		
Master [120] in Energy Engineering	NRGY2M	5		