



Teaching Guide				
Identifying Data				2019/20
Subject (*)	Machine Learning	Code	614G01038	
Study programme	Grao en Enxeñaría Informática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da InformaciónComputación			
Coordinador	Rivero Cebrián, Daniel	E-mail	daniel.rivero@udc.es	
Lecturers	Porto Pazos, Ana Belen Rivero Cebrián, Daniel	E-mail	ana.portop@udc.es daniel.rivero@udc.es	
Web				
General description	This course presents an overview of automatic learning. The syllabus explains the different techniques and methods, including supervised, unsupervised and reinforcement learning. In the practical part, a real case will be solved.			

Study programme competences / results	
Code	Study programme competences / results
A45	Capacidade para coñecer e desenvolver técnicas de aprendizaxe computacional e deseñar e implementar aplicacións e sistemas que as utilicen, incluídas as dedicadas á extracción automática de información e coñecemento a partir de grandes volumes de datos.
B1	Capacidade de resolución de problemas
B9	Capacidade para xerar novas ideas (creatividade)
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C7	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes	Study programme competences / results		
	results		
Know the different machine learning techniques and apply them correctly.	A45	B1 B9	C2 C6 C7 C8
To be able to combine the results of different techniques.	A45	B1 B9	
To be able to correctly compare the results obtained with different techniques.	A45	B1	C2
Learn and apply the methodology of using these techniques in the resolution of real problems.	A45	B1 B9	C2 C6 C7 C8

Contents	
Topic	Sub-topic



Unit 1: Introducción	1.1. Introduction to Machine Learning 1.2. Introduction to Inductive Learning
Unit 2: Supervised Learning	2.1. Introduction 2.2. Support-Vector Machines 2.3. Decision Trees and Rules 2.4. Regression. Regression Trees 2.5. Bayesian Learning 2.6. Instant-Based Learning 2.7. Artificial Neural Networks
Unit 3: Unsupervised Learning	3.1. Unsupervised learning: clustering 3.2. Unsupervised neural networks
Unit 4: Reinforcement Learning	4.1. Markov Decision Processes 4.2. Reinforcement Learning
Unit 5: Other concepts	5.1. Deep Learning 5.2. Evaluation and hypotheses contrast 5.3. Metaclassifiers

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A45 C7 C8	21	42	63
Laboratory practice	A45 B1 B9	12	24	36
Supervised projects	A45 C2 C6	7	19	26
Objective test	A45 C8 C7	2	20	22
Personalized attention		3	0	3

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Theoretical teaching of the subject matter of the course
Laboratory practice	Solve a practical problem by using the different techniques that will be explained in the theory classes.
Supervised projects	Writing, under the supervision of the teacher, of the report explaining the resolution of the problem carried out in the laboratory practices and the results obtained. This work must be presented in class.
Objective test	This is a written assessment test in which the student must demonstrate the knowledge acquired from the subject.

Personalized attention	
Methodologies	Description
Supervised projects	Practical work carried out with the advice of the teacher.
Laboratory practice	Writing of the explanatory report under the teacher's supervision.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Objective test	A45 C8 C7	Preguntas de tipo test sobre os contenidos da asignatura, baseada nas distintas técnicas de aprendizaxe computacional e as súas sus aplicacións.	60



Supervised projects	A45 C2 C6	Redacción da memoria relativa á resolución do problema real realizado nas prácticas de laboratorio. A redacción da memoria incluírá a realización dunha revisión bibliográfica dos traballos máis importantes relacionados, escritos na súa inmensa maioría en inglés, documentación sobre o problema a resolver, metodoloxía utilizada, e comparación dos resultados atopados na aplicación das distintas técnicas, así como unha valoración crítica tanto dos resultados obtidos como da información utilizada.	20
Laboratory practice	A45 B1 B9	Resolución dun problema do mundo real utilizando a metodoloxía, para o cal se utilizarán varias técnicas explicadas en teoría, e estimularase ao alumno a xerar novas ideas para a resolución deste problema.	20

### Assessment comments

In order to pass the subject, the student must obtain a minimum score of 5 out of 10 in the result of combining the grades of the objective test, the laboratory practices and the supervised works. In addition, the student must obtain a minimum score of 2.4 out of 6 points in the objective test. If the student does not obtain this minimum grade, the grade of the subject will be that corresponding to the grade of the objective test.

In the second opportunity, the grade obtained in the laboratory practices and supervised works will be maintained, not being able to obtain again a grade since it results from the continuous evaluation of the work during the credits of practice of the subject. The student can retake the examination of the objective test, the criteria for obtaining the total score being those indicated at the beginning of this section.

Part-time students must turn in their papers on the same date as full-time students, and attend the GRTs in which they will be corrected. Similarly, it is recommended that you attend the practice classes.

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- D. Borrajo, J. González, P. Isasi (2006). Aprendizaje automático. Sanz y Torres</li> <li>- T.M. Mitchell (1997). Machine Learning. McGraw Hill</li> <li>- Basilio Sierra Araujo (2006). Aprendizaje automático: conceptos básicos y avanzados. Aspectos prácticos utilizando el software WEKA. Pearson Education</li> <li>- Saso Dzeroski, Nada Lavrac (). Relational Data Mining. Springer</li> <li>- David Aha (). Lazy Learning. Kluwer Academics Publishers</li> <li>- Richard Sutton, Andrew Barto (). Reinforcement Learning. An Introduction. MIT Press</li> <li>- Andrew Webb (2002). Statistical Pattern Recognition. Wiley</li> <li>- Ethem Alpaydın (2004). Introduction to Machine Learning. MIT Press</li> </ul>
<b>Complementary</b>	

### Recommendations

#### Subjects that it is recommended to have taken before

Programming I/614G01001  
 Programming II/614G01006  
 Statistics/614G01008  
 Algorithms/614G01011  
 Intelligent Systems/614G01020

#### Subjects that are recommended to be taken simultaneously

Knowledge Representation and Automatic Reasoning/614G01036

#### Subjects that continue the syllabus

Computer Vision/614G01068  
 Robotics/614G01098

#### Other comments



(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.