UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				**2020/21**
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	Hybrid			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da InformaciónComputación			
Coordinador	Rivero Cebrián, Daniel		**E-mail**	daniel.rivero@udc.es
Lecturers	Porto Pazos, Ana Belen		**E-mail**	ana.portop@udc.es
	Rivero Cebrián, Daniel			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.			

Contingency plan	1. Modifications to the contents
	
	  No changes are made.
	
	2. Methodologies
	
	  Methodologies are maintained.
	  The written assessment test is changed to a non-attendance assessment test. This final test is necessary to make an individual evaluation of each student, since the practices and works are made in groups.
	
	3. Mechanisms for personalized attention to students
	
	  Use of Moodle to provide material to students.
	  Use of the Moodle forum to communicate all those events of the subject (modifications, deliveries of practices, etc.)
	  Synchronous teaching in class time and asynchronous teaching through Teams.
	  Tutoring through the Teams chat on a continuous basis.
	  Tutorials through email on a continuous basis.
	
	4. Modifications in the evaluation
	
	  The evaluation mechanisms are maintained, with the above-mentioned change of the written test to a non-attendance test.
	
	*Evaluation observations:
	
	  The need to obtain a minimum score in the theory exam is eliminated. The rest of the evaluation observations are maintained.
	
	5. Modifications to the bibliography or webgraphy
	
	  No changes are made.			

Study programme competences				

Code	Study programme competences
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	
Know the different machine learning techniques and apply them correctly.	A45 B9	B1 C2 C6 C7 C8
To be able to combine the results of different techniques.	A45 B9	B1
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 B9	B1 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	Ordinary class hours	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 C7 C8	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 Laboratory practice	Practical work carried out with the advice of the teacher. Writing of the explanatory report under the teacher's supervision.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Objective test	A45 C7 C8	Test questions about the contents of the course, based on the different computer learning techniques and their applications.	50
Supervised projects	A45 C2 C6	Writing of the report on the resolution of the real problem carried out in the laboratory practices. The writing of the report will include a bibliographic review of the most important works related, written in English for the most part, documentation on the problem to be solved, methodology used, and comparison of the results found in the application of the different techniques, as well as a critical evaluation of both the results obtained and the information used.	25
Laboratory practice	A45 B1 B9	Resolution of a real world problem using the methodology, for which several techniques explained in theory will be used, and the student will be stimulated to generate new ideas for the resolution of this problem.	25

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 out of 5 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 deliver in their reports on the same dates as full-time students, and attend the RGTs in which they will be corrected. Similarly, it is recommended that they attend the practice classes.

Sources of information

Basic	- D. Borrajo, J. González, P. Isasi (2006). Aprendizaje automático. Sanz y Torres
	- T.M. Mitchell (1997). Machine Learning. McGraw Hill
	- Basilio Sierra Araujo (2006). Aprendizaje automático: conceptos básicos y avanzados. Aspectos prácticos utilizando el software WEKA. Pearson Education
	- Saso Dzeroski, Nada Lavrac (). Relational Data Mining. Springer
	- David Aha (). Lazy Learning. Kluwer Academics Publishers
	- Richard Sutton, Andrew Barto (). Reinforcement Learning. An Introduction. MIT Press
	- Andrew Webb (2002). Statistical Pattern Recognition. Wiley
	- Ethem Alpaydin (2004). Introduction to Machine Learning. MIT Press
Complementary	

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.