



IDENTIFYING DATA

Knowledge Engineering

Subject	Knowledge Engineering			
Code	O06M132V03103			
Study programme	(*)Máster Universitario en Enxeñaría Informática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	García Lourenco, Analia María			
Lecturers	García Lourenco, Analia María			
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General description	Techniques and formalisms of knowledge representation and reasoning in intelligent systems. Methodologies of acquisition of knowledge. Techniques of automatic learning in intelligent systems. Data mining techniques and methodologies.			

A large part of the course's support materials are in English, including those elaborated by the professor as well as the bibliography and the case studies and datasets analysed.

Competencies

Code	
A1	(CB6) Have and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A5	(CB10) That the students possess the skills of learning that allow them continue studying of a way that must greatly be self-directed or autonomous.
B3	Ability to direct, schedule and supervise multidisciplinary teams
B4	Ability for mathematical modeling, calculation and simulation in technology and business engineering centers, particularly in research, development and innovation tasks in all areas related to Computer Engineering
B8	Ability to apply the acquired knowledge and solve problems in new or little-known environments within broader and multidisciplinary contexts, being able to integrate this knowledge
B9	Ability to understand and apply ethical responsibility, legislation and professional ethics of the activity of the profession of Computer Engineer
C12	
D1	Develop an espíritu innovativo and emprendedor
D4	Capacity to communicate knowledge and conclusions to públicos especializados and no especializados, of oral way and written
D5	Capacity of work in team
D6	Skills of relations interpersonales
D7	Capacity of reasoning crítico and creativity
D11	Capacity of learning autónomo
D12	Capacity to resolve problems in new surroundings or little known inside contexts más wide or multidisciplinares
D13	Capacity to integrate knowledges and enfrentarse to the complexity to formulate trials from an información incomplete

Learning outcomes

Expected results from this subject	Training and Learning Results
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RA1: Know the technicians of acquisition and representation of the knowledge.	A1 A5 B8 C12 D7 D11 D12
RA2: Be able to design an intelligent system, selecting the architecture and the mechanisms of representation more felicitous and applying methodologies and technical of the Engineering of the Knowledge.	A1 B8 B9 C12 D1 D7 D12 D13
RA3: Know the technicians of automatic learning, handle the technicians of extraction of knowledge from diverse sources of data.	A5 B4 B8 C12 D7 D11 D12 D13
RA4: Be able to schedule and develop a project of Minería of Data by means of the integration of distinct technical and algorithms.	A1 B3 B8 C12 D4 D5 D6 D13

Contents

Topic	
1. KNOWLEDGE ACQUISITION AND REPRESENTATION	1.1. Techniques and formalisms of knowledge representation 1.2. Methodologies of knowledge acquisition 1.3. Reasoning in intelligent systems 1.4. Applications in real world
2. MACHINE LEARNING	2.1. Techniques of knowledge extraction from various data sources 2.2. Tasks and methods of machine learning 2.3. Model interpretation and comparison
3. IMPLANTATION AND IMPACT OF DATA MINING	3.1. Analytical needs and aims of businesses 3.2. Implantation of a data mining program in a business 3.3. New challenges of Knowledge Engineering

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20.5	0	20.5
Case studies	8.5	17.8	26.3
Mentored work	2.2	0	2.2
Project	10	70	80
Essay	9	12	21

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

Methodologies

	Description
Lecturing	To present fundamental concepts and to carry out group activities, promoting active student participation, that allow to apply the exposed concepts in practical problem solving. The goal is to promote knowledge acquisition and the ability/sensibility to apply the concepts and techniques to Computer Science industrial and research application domains. If teaching needs to switch to online mode, these lectures will be conducted by means of Remote Campus and will use the E-learning platform Fatic as support, without prejudice to other measures that can be adopted to guarantee the accessibility of the students to the educational contents.

Case studies	Practical activities, sessions of laboratory guided, seminars of resolution of problems, etc., under the direction of the professor. Previous activities may be integrated to achieve the proposed aims. These activities aim to consolidate the acquisition of knowledge and develop the capacity to solve problems in new real-world contexts.
	If teaching needs to switch to online mode, these activities will be conducted by means of Remote Campus and will use the E-learning platform Faitic as support, without prejudice to other measures that can be adopted to guarantee the accessibility of the students to the educational contents.
Mentored work	Sessions of tutoring and follow-up that will be conducted face-to-face form or online (e.g. email, video-conference, forums of FAITIC, ...) by appointment.

Personalized assistance

Methodologies	Description
Case studies	Resolution of any issues arising during the programmed activities. If teaching needs to switch to online mode, these sessions will be conducted by means of the UVigo's Remote Campus and will use the E-learning platform Faitic as support, without prejudice to other measures that may be adopted to guarantee the accessibility of the students to the educational contents.
Mentored work	Resolution of any issues concerning the proposed assignments. If teaching needs to switch to online mode, these sessions will be conducted by means of the UVigo's Remote Campus and will use the E-learning platform Faitic as support, without prejudice to other measures that may be adopted to guarantee the accessibility of the students to the educational contents.
Tests	Description
Project	Resolution of any issues arising during the planning and development of the final project. If teaching needs to switch to online mode, these sessions will be conducted by means of the UVigo's Remote Campus and will use the E-learning platform Faitic as support, without prejudice to other measures that may be adopted to guarantee the accessibility of the students to the educational contents.

Assessment

Description	Qualification	Training and Learning Results			
Project This is a practical work that aims to consolidate the capacity of the student to to apply the acquired knowledge to real-world scenarios. The student will have to work a problem of the real world. The volumes and type of data must be as real as possible. The models of reasoning can be of diverse nature, but their application should be dully justified. Whenever possible, the application of distinct methodologies is desirable. Also, it is important to describe the implantation of the new system in a real-world scenario. At the end, the student must submit a detailed report of the project and make an oral presentation. Results of learning evaluated: RA2, RA4	70	A1	B3	C12	D1 D4 D5 D6 D12 D13
Essay Preparation of three theoretical essays that aim to boost autonomous learning. At the end, the student will submit the three essays and make an oral presentation. Results of learning evaluated: *RA1, *RA3	30	A1 A5	B4 B8 B9	C12	D4 D7 D11 D12 D13

Other comments on the Evaluation

FIRST EVALUATION AND SECOND CALLS [Assisting and Non-assisting students]

Final grade = 0,30 * essays + 0,70 * project

There will be three essays, which will have the same weight in the calculation of the corresponding component of the final grade. These works will be presented in dully established dates.

Likewise, students will work on a practical project that will be presented in the date of the exam.

All students must submit a detailed report for each of the works under evaluation (3 essays + 1 project). Moreover, the oral presentation of all the works is mandatory.

FINAL GRADES -> ("PROCESO DE CALIFICACIÓN DE ACTA")

To pass the course in any of the evaluation calls, the final grade must be equal or greater than 5 values (from a total of 10), obtaining a minimum of 5 values (from a total of 10) in each of the works under evaluation (i.e. 3 essays + 1 project).

SCHEDULING

The official exams calendar is published by la Xunta de Centro de la ESEI in the School's web page <https://esei.uvigo.es/docencia/exames/>.

OTHER CONSIDERATIONS

If plagiarism is detected in any of the works (essays or project), the final grade will be "Suspenso" (0) and the situation will be notified to the School's Board to take the appropriate disciplinary actions. In the case of any contradiction between the various versions of this guide, due to translation issues, the Spanish will be the prevailing version.

Sources of information

Basic Bibliography

Ian H. Witten, Eibe Frank, Mark A. Hall, **Data Mining: practical machine learning tools and techniques**, 978-0-12-374856-0, 3ª, Morgan Kaufmann, 2011

Complementary Bibliography

Mathew North, **Data Mining for the Masses**, 978-0615684376, 1ª, Global Text Project Book, 2012

Jiawei Han, Micheline Kamber, **Data Mining: concepts and techniques**, 978-9380931913, 3ª, Morgan Kaufmann, 2011

Jason Bell, **Machine Learning: Hands-On for Developers and Technical Professionals**, 978-1-118-88906-0, 1ª, Wiley, 2015

Booth, Travis, **Deep learning with Python : a hands-on guide for beginners**, 9781070494074, Independently published, 2019

Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems**, 1492032646, O'Reilly Media, 2019

Emmanuel Ameisen, **Building Machine Learning Powered Applications: Going from Idea to Product**, 149204511X, O'Reilly Media, 2020

Recommendations

Other comments

The student should demonstrate good aptitudes for research.

The student should show some degree of autonomy, i.e. look for contents in the Internet (in general search engines like Google or more specialised engines like CiteSeer), explore the literature and contents related with the presented contents, and have a critical opinion on the topics discussed throughout the course.

Good English understanding is desirable.

Contingency plan

Description

Because of the exceptional situation, in the advent of not being able to conduct face-to-face classes and tutoring, interaction with the students will be conducted via the UVigo's Remote Campus and the E-learning platform Fatic as support, without prejudice to other measures that may be adopted to guarantee the accessibility of the students to the educational contents.