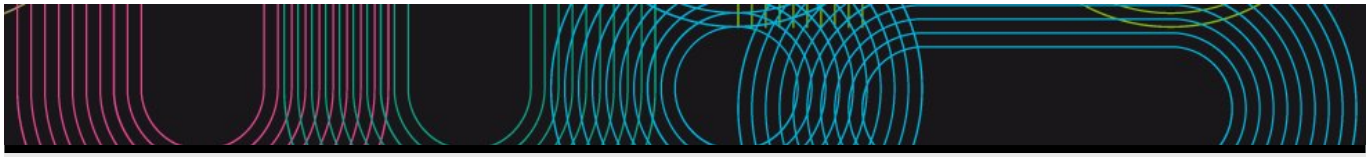

| IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| **Knowledge Engineering** | | | | |
| Subject | Knowledge Engineering | | | |
| Code | O06M132V03103 | | | |
| Study programme | Máster Universitario en Ingeniería Informática | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Mandatory | 1st | 1st |
| Teaching language | Spanish<br>English | | | |
| Department | | | | |
| Coordinator | García Lourenco, Analia María | | | |
| Lecturers | García Lourenco, Analia María | | | |
| E-mail | analia@uvigo.es | | | |
| Web | http://moovi.uvigo.gal | | | |
| General description | Techniques and formalisms of knowledge representation and reasoning in intelligent systems. Methodologies of acquisition of knowledge. Technicians of automatic learning in intelligent systems. Data mining techniques and methodologies.<br><br>A large part of the course's support materials are in English, including those the elaborated by the professor as well as the bibliography and the case studies and datasets analysed. International students may ask the teacher for: a) materials and bibliographical references to follow the subject in English, b) tutoring sessions in English, c) tests and evaluations in English. | | | |

| Training and Learning Results | |
|---|---|
| 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 authonomous. |
| 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 innovative 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 |

| Expected results from this subject | |
|---|---|
| Expected results from this subject | Training and Learning Results |

| | |
|---|---|
| RA1: Know the technicians of acquisition and representation of the knowledge. | A1<br>A5<br>B8<br>C12<br>D7<br>D11<br>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<br>B8<br>B9<br>C12<br>D1<br>D7<br>D12<br>D13 |
| RA3: Know the technicians of automatic learning, handle the technicians of extraction of knowledge from diverse sources of data. | A5<br>B4<br>B8<br>C12<br>D7<br>D11<br>D12<br>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<br>B3<br>B8<br>C12<br>D4<br>D5<br>D6<br>D13 |

## Contents

| Topic | |
|---|---|
| 1. KNOWLEDGE ACQUISITION AND REPRESENTATION | 1.1. Techniques and formalisms of knowledge representation<br>1.2. Methodologies of knowledge acquisition<br>1.3. Reasoning in intelligent systems<br>1.4. Applications in real world |
| 2. MACHINE LEARNING | 2.1. Techniques of knowledge extraction from various data sources<br>2.2. Tasks and methods of machine learning<br>2.3. Model interpretation and comparison |
| 3. IMPLANTATION AND IMPACT OF BUSINESS ANALYTICS PIPELINES | 3.1. Analytical needs and business goals<br>3.2. Implantation of analytical pipelines in the enterprise<br>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 |
| Project | 7 | 68 | 75 |
| Essay | 9 | 12 | 21 |
| Presentation | 3 | 2 | 5 |

*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.<br>CONTINUOUS EVALUATION<br>Mandatory character<br>Facultative attendance<br>GLOBAL EVALUATION<br>Mandatory character |

| | |
|---|---|
| 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.<br><br>CONTINUOUS EVALUATION<br>Mandatory character<br>Mandatory attendance (min. 75% of lab practices)<br>GLOBAL EVALUATION<br>Mandatory character |

**Personalized assistance**

| Methodologies | Description |
|---|---|
| Case studies | Resolution of any issues arising during the analysis of the case studies. |
| **Tests** | **Description** |
| Project | Resolution of any issues arising during the planning and development of the final project. |
| Essay | Resolution of any issues arising during essay preparation. |

**Assessment**

| | Description | Qualification | Training and Learning Results | | | |
|---|---|---|---|---|---|---|
| Project | Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project.<br>Learning results evaluated: RA2, RA4 | 40 | A1 | B3<br>B8<br>B9 | C12 | D1<br>D4<br>D5<br>D6<br>D12<br>D13 |
| Essay | Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated.<br>Learning results evaluated: RA1, RA3 | 30 | A1<br>A5 | B4<br>B8<br>B9 | C12 | D4<br>D7<br>D11<br>D12<br>D13 |
| Presentation | Defense of the solution proposed by the student before the teacher and the rest of the students.<br>Learning results evaluated: RA3, RA4 | 30 | A1<br>A5 | B4<br>B8 | C12 | D1<br>D4<br>D7 |

**Other comments on the Evaluation**

**CONTINUOUS EVALUATION SYSTEM**

**TEST 1:** Essay

**Description:** Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated.

**Methodology(s) applied(s):** Work.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,B9,C12,D4,D7,D11,D12,D13.

**Learning results:** RA1, RA4

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**TEST 2:** Presentation

**Description:** Defense of the solution proposed by the student before the teacher and the rest of the students.

**Methodology(s) applied(s):** Presentation.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of

10).

**Training:** A1,A5,B4,B8,C12,D1,D4,D7

**Learning results:** RA3, RA4

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**TEST 3:** Project

**Description:** Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project.

**Methodology(s) applied:** Project.

**% Qualification:** 40%

**Minimum %:** For passing this part of the subject the student must obtain a grade equal to or greater than 5 points (out of 10)).

**Training:** A1,B3,B8,B9,C12,D1,D4,D5,D6,D12,D13.

**Learning results:** RA2, RA4

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**GLOBAL EVALUATION SYSTEM**

**Procedure for choosing the global assessment modality:** the student body is considered to have opted for the global assessment system if they do not take Test 1 of the continuous evaluation system.

**TEST 1:** Essay

**Description:** Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated.

**Methodology(s) applied(s):** Work.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,B9,C12,D4,D7,D11,D12,D13.

**Learning results:** RA1, RA4

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**TEST 2:** Presentation

**Description:** Defense of the solution proposed by the student before the teacher and the rest of the students.

**Methodology(s) applied(s):** Presentation.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,C12,D1,D4,D7

**Learning results:** RA3, RA4

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**TEST 3:** Project

**Description:** Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project.

**Methodology(s) applied:** Project.

**% Qualification:** 40%

**Minimum %:** For passing this part of the subject the student must obtain a grade equal to or greater than 5 points (out of 10)).

**Training:** A1,B3,B8,B9,C12,D1,D4,D5,D6,D12,D13.

**Learning results:** RA2, RA4

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**EVALUATION CRITERIA FOR EXTRAORDINARY CALL AND FINAL DEGREE**

The continuous and global evaluation systems described above will be used.

**RECORD QUALIFICATION PROCESS**

Regardless of the evaluation system and the call, if any part of the evaluation is not passed, but the overall score is greater than 4 (out of 10), the qualification in the minutes will be 4.

**EVALUATION DATES**

The dates of the tests corresponding to the continuous assessment system will be published in the calendar of activities, available on the ESEI website https://esei.uvigo.es/docencia/horarios/. The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website https://esei.uvigo.es/docencia/exames/.

**USE OF MOBILE DEVICES**

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "Refrain from using or cooperation in fraudulent procedures in the evaluation tests, in the works that are carried out or in official documents of the university."

**CONSULTATION/TUTORING REQUESTS**

Tutoring hours are available at the personal page of the teaching staff, accessible through https://esei.uvigo.es/docencia/profesorado/

**OTHER CONSIDERATIONS**

If plagiarism is detected in any of the works (theoretical or practical), the final grade of the course will be Suspenso (0) and the fact will be communicated to the Center Management so that it can take the appropriate measures. In the event of any contradiction that may arise between the different versions of the guide, due to some translation error, the version that will prevail is the Spanish version.

## Sources of information

### Basic Bibliography


Ian H. Witten, Eibe Frank, Mark A. Hall, **Data Mining: practical machine learning tools and techniques**, 0123748569, 3ª, Morgan Kaufmann, 2011

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


### Complementary Bibliography


Mathew North, **Data Mining for the Masses**, 1727102479, 3ª, Global Text Project Book, 2018

Jiawei Han, Micheline Kamber, **Data Mining: concepts and techniques**, 9780123814791, 3ª, Morgan Kaufmann, 2011

Jason Bell, **Machine Learning: Hands-On for Developers and Technical Professionals**, 1118889061, 1ª, Wiley, 2015

Travis Booth, **Deep learning with Python : a hands-on guide for beginners**, 1070494070, Independently published, 2019


## 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.