Teaching methodology
The teaching methodology will include both theoretical lecture sessions, sessions with practical examples of the concepts and algorithms explained in the course, and also some sessions devoted to support the practical work of the students.

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 45h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>100.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
## Machine Learning: Supervised and Unsupervised ML techniques

### Degree competences to which the content contributes:
**Description:**
Basic principles and classification of Machine Learning techniques

## Important Challenges in Supervised Learning

### Degree competences to which the content contributes:
**Description:**
- Quantity of data
- Quality of data: representativity, imbalanced class distribution
- Overfitting & Underfitting of models
- Bias & Variance of models
- Feature relevance
  - Reminder: Feature Selection vs Feature Weighting, Filters and wrappers
  - Feature weighting techniques

## Supervised Learning techniques

### Degree competences to which the content contributes:
**Description:**
- Rule-based Classifiers
  - Decision Tree Classifiers (ID3, C4.5, CART). Pruning techniques
  - Classification Rules Classifiers (PRISM, RULES, CN2, RISE)
- Probabilistic/Bayesian Classifiers
  - Bayes Optimal Classifier
  - Gibbs algorithm
  - Naïve Bayes Classifier
- Linear Predictors
  - Linear Regression / Multiple Linear Regression
- Statistical Classifiers
  - Linear Discriminant Analysis (LDA)
  - Logistic/Multinomial Regression

## Diversification / Ensemble of classifiers

### Degree competences to which the content contributes:
**Description:**
- Reminder: General scheme
- Random Forests
## Evaluation Techniques

**Degree competences to which the content contributes:**

**Description:**
- a. Classification models
- b. Regression models

## Advanced Classification Challenges

**Degree competences to which the content contributes:**

**Description:**
- a. Multi-label classification
- b. Ordinal classification
- c. Imbalanced Dataset classification
- d. Using noise and diversification for improving classification
- e. Meta-Learning of classifiers
- f. Incremental Learning: Data stream/on-line learning

## Experiential Learning

**Degree competences to which the content contributes:**

**Description:**
1. Reminder: Fundamentals of Case-based Reasoning
   - a. Cognitive Theories
   - b. Basic Cycle of Reasoning

## CBR Academic Demonstrators/Examples

**Degree competences to which the content contributes:**

**Description:**
Some examples will be analysed.

## CBR System Components

**Degree competences to which the content contributes:**
CBR Application on a real domain

Degree competences to which the content contributes:
Description:
A real application will be described and analysed.

CBR Development Problems

Degree competences to which the content contributes:
Description:
a. Competence
b. Space Performance
c. Time Performance

Reflective Reasoning in CBR

Degree competences to which the content contributes:
Description:
a. Case Base Maintenance

CBR Applications and Development Tools [2h]

Degree competences to which the content contributes:
Description:
a. Industrial Applications
b. Software Tools

CBR Systems' Evaluation

Degree competences to which the content contributes:
Evaluation of the knowledge and skills obtained by the students will be assessed through three project works. The first two works (PW1 and PW2) will be on an individual basis and the third one (PW3) will be on a team group basis. The individual works will consist on the implementation, application and evaluation of some supervised machine learning algorithms. The teamgroup work will consist on the design, implementation, application and validation of a Case-Based Reasoning project to solve a synthetical problem. The final grade will be computed as follows:

\[
\text{Final Grade} = 0.25 \times \text{PW1} + 0.25 \times \text{PW2} + 0.5 \times \text{PW3} \times \text{WFstud},
\]

where \(0 \leq \text{WFstud} \leq 1.2\). WFstud is a Working Factor evaluating the work of a particular student within his/her teamwork in PW3. It will be obtained by observing and assessing the load of work and degree of participation of each student throughout the PW3. In normal conditions, the WFstud = 1.

The individual works will be evaluated according to the quality of the software developed (0.6), the evaluation done (0.2) and the documentation delivered (0.2). The Teamgroup work will be evaluated according to:

- The methodology of the work (0.4)
- The quality of the report written (0.2)
- The quality of the oral exposition (both presentation and content assessed, as well as the ability to answer questions) (0.2)
- Planification, coordination and management of the team (0.05)
- The individual valuation of each student, including her/his integration level within the teamgroup (0.15)
270724 - SEL - Supervised and Experiential Learning

Bibliography

Basic:


