



Universitat de Lleida

# DEGREE CURRICULUM **INTELLIGENT SYSTEMS**

Coordination: ANSOTEGUI GIL, CARLOS JOSE

Academic year 2023-24

## Subject's general information

Subject name	INTELLIGENT SYSTEMS			
Code	103054			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Master's Degree in Informatics Engineering	1	COMPULSORY	Attendance-based
Course number of credits (ECTS)	4.5			
Type of activity, credits, and groups	Activity type	PRALAB	TEORIA	
	Number of credits	3	1.5	
	Number of groups	1	1	
Coordination	ANSOTEGUI GIL, CARLOS JOSE			
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN			
Teaching load distribution between lectures and independent student work	2 hours per each hour of physical class.			
Important information on data processing	Consult <a href="#">this link</a> for more information.			
Language	English			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ANSOTEGUI GIL, CARLOS JOSE	carlos.ansotegui@udl.cat	0	
PON FARRENY, JOSEP	josep.pon@udl.cat	4,5	

## Subject's extra information

For questions or related issues, it is recommended to send an email to the teachers of the subject.

## Learning objectives

- Implement and evaluate advanced search algorithms.
- Implement and evaluate reinforcement learning algorithms.
- Apply and evaluate supervised learning algorithms in scikit-learn.
- Apply and evaluate unsupervised learning algorithms in scikit-learn.

## Competences

### General competences

- CG4: Capacity to mathematically model, calculate and simulate in technological companies and engineering centres, particularly with regard to research, development and innovation tasks in all fields related to computer engineering.

### Basic competences

- CB5: Students should possess learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.

### University of Lleida strategic competences

- UDL3: Master Information and Communication Technologies.
- UDL2: Command of a foreign language.

### Degree-specific competences

- CE12: Capacity to apply mathematic, statistical and AI methods to model, design and develop smart and knowledge-based applications, services and systems.

### Degree-transversal competences

- EPS4: Capacity to conceive, design and implement projects and/or contribute to new solutions, using engineering tools. Capacity to draft, design and implement projects and/or give novel solutions, using engineering-related tools

## Subject contents

The topics of the subject are the following:

- T1. Introduction to Intelligent Systems.
- T2. Advanced Search.
- T3. Reinforcement Learning.
- T4. Supervised machine learning with scikit-learn.
- T5. Unsupervised machine learning with scikit-learn.

## Methodology

The theoretical classes incorporate illustrative examples and problems to be solved in the laboratory classes.

In laboratory classes the proposed problems are resolved. The algorithms presented in the lecture are also implemented. In a first phase, the student watches the teacher how to implement an algorithm and how to evaluate its correctness and efficiency. In a second phase the student begins to solve the current laboratory activity. The programming language is Python. Code quality is an important aspect .

## Development plan

Week	Topic	Tasks
1	T1,T2	Introduction to Intelligent Systems. Adversary Search: MiniMax, AlphaBeta, ExpectiMax. Assignment 2 in Pacman Project.
2	T2	Reinforcement Learning. Markov chains, Value Iteration. Assignment 3 in Pacman Project
3	T3	Reinforcement Learning. Q-learning. Assignment 3 in Pacman Project
4	T4	Supervised machine learning algorithms with scikit-learn. Tutorial and proposed problems.
5	T4	Unsupervised machine learning algorithms with scikit-learn. Tutorial and proposed problems.

Topic T5 will be exposed incrementally throughout the course.

In this course, the project will be devoted to the development of a simple videogame. In this subject we will address the artificial intelligence of the project. The graphical part of the game will be addressed in the "Computer graphics and multimedia" subject, while the "Embedded and ubiquitous systems" will focus on aspects related to computer-human interaction by means of special devices. Hence, it is strongly recommended to follow through the three subjects at the same time, although it is not mandatory.

## Evaluation

At the beginning of a topic, the student will be given a guide detailing the work to be done before the beginning of the next topic. This guide will include the objectives to achieve and the evaluation criteria. This work will have to be

handed in and will be evaluated by the professor.

Activity	Weight	Minimum Mark	In group	Mandatory	Recuperable
Work Package 1 PT1	40%	NO	YES	NO	YES
Work Package 2 PT2	20%	NO	YES	NO	YES
Work Package 3 PT3	40%	NO	YES	NO	YES

$$\text{Mark} = 0,4 \cdot \text{PT1} + 0,2 \cdot \text{PT2} + 0,4 \cdot \text{PT3}$$

**Alternative evaluation** (students who waive continuous evaluation):

Students who have the approval to be evaluated by alternative evaluation (see requirements and procedure in the evaluation regulations) will have to do the following activities.

- **Single exam** (100%): It can be improved. Date of the exam: the date of the realization of the 2nd Midterm Exam, defined by the EPS. This exam consists of a written test of the entire subject matter.
- **Improvement of Single exam** (100%): Date of the exam: the date of the realization of the Improvement Exam, defined by the EPS. The realization of the improvement exam does not condition the maximum grade achieved in the subject.

## Bibliography

- Artificial Intelligence: A Modern Approach

Stuart. J. Russell and Peter. Norvig

Prentice Hall, 2009

- Essentials of Artificial Intelligence

Matt Ginsberg

Morgan Kaufmann Pub, 1993

- Hands-on machine learning with Scikit-Learn and TensorFlow : concepts, tools, and techniques to build intelligent systems

[Aurelien Géron](#). *O'Reilly Media, Sebastopol, CA, (2017)*

- Data Mining: Practical Machine Learning Tools and Techniques

Ian H. Witten and Eibe Frank

Morgan Kaufmann, 2005

- SCIKIT-LEARN: <http://scikit-learn.org/stable/>

