Universitat de Lleida

DEGREE CURRICULUM
INTELLIGENT SYSTEMS

Coordination: ANSOTEGUI GIL, CARLOS JOSE

Academic year 2016-17

Subject's general information

Subject name	INTELLIGENT SYSTEMS
Code	103054
Semester	1st Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Typology	Modality
	Master's Degree in Computer Engineering	1	COMPULSORY	Attendance-based
	Master's Degree in Informatics Engineering	1	COMPULSORY	Attendance-based

ECTS credits	4,5
Groups	1GG
Theoretical credits	2.5
Practical credits	2
Coordination	ANSOTEGUI GIL, CARLOS JOSE
Department	INFORMATICA I ENGINYERIA INDUSTRIAL
Teaching load distribution between lectures and independent student work	2 hours per each hour of physical class.
Important information on data processing	Consult this link for more information.
Language	English
Office and hour of attention	Contact me to arrange a mutually suitable time

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ANSOTEGUI GIL, CARLOS JOSE	carlos@diei.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

University of Lleida strategic competences

- Apply and evaluate solvers for optimization problems.
- Apply and evaluate tools for data mining.
- Demonstrate knowledge and skill in designing a slide presentation on an intelligent system in English language.
- Prepare documentation on the architecture, design and implementation of intelligent systems in English language.

Degree-specific competences

- Design, implement and evaluate advanced search algorithms as subsystems describing the space and time complexities.
- Select suitable heuristics and implement evaluation functions.
- Model decision and optimization problems through Minizinc language.
- Apply and evaluate solvers for combinatorial optimization problems.
- Evaluate and implement supervised and non supervised learning algorithms.
- Select the most suitable learning technique depending on the problem domain.

Degree-transversal competences

- Integrate heuristic search, optimization and machine learning techniques as part of an intelligent system.

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. Combinatorial Optimization problems (through Minizinc).

- T4. Advanced machine learning (through scikit-learn).

- T5. Architecture and implementation of Intelligent Systems.

Methodology

The theoretical classes incorporate illustrative examples and problems to be solvd 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 Intellligent Systems. Adversary Search: MiniMax, AlphaBeta, ExpectiMax. Assignment 2 in Pacman Project.
2	T2	Reinforcement Learning. Assignment 3 in Pacman Project
3	T3	Combinatorial optimization problems with minizinc. Tutorial and proposed problems.
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 ubicuos 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

Mark = 0,4*PT2 + 0,2*PT2 + 0,4*PT3

Bibliography

- Artificial Intelligence: A Modern Approach

  S. J. Russell and P. Norvig

  Prentice Hall, 2009

- Essentials of Artificial Intelligence

  Ginsberg

  Morgan Kaufmann Pub, 1993

- Handbook of Satisfiability

  Biere, Armin and Heule, Marijn J. H. and van Maaren, Hans and Walsh, Toby

  IOS Press, 2009

- Data Mining: Practical Machine Learning Tools and Techniques

  Ian H. Witten and Eibe Frank

 Morgan Kaufmann, 2005

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

- MINIZINC: http://www.minizinc.org/