Universitat de Lleida

DEGREE CURRICULUM

AUTOMATIC REASONING AND LEARNING

Academic year 2014-15

AUTOMATIC LEARNING AND REASONING 2014-15

Subject's general information

Subject name	AUTOMATIC REASONING AND LEARNING
Code	102040
Semester	2n Q Avaluació Continuada
Typology	Obligatòria
ECTS credits	6
Groups	1
Theoretical credits	0
Practical credits	0
Office and hour of attention	A concretar con el profesor
Department	Informàtica i Enginyeria Industrial
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Lectures at the classrom in Spanish, but learning material is provided always in English.
Degree	Degree in Computer Enginneering
Distribution of credits	Ramon Bejar Torres 6
Office and hour of attention	A concretar con el profesor
E-mail addresses	ramon@diei.udl.cat

AUTOMATIC LEARNING AND REASONING 2014-15

Ramón Béjar Torres

Learning objectives

Expected learning outcomes linked to UdL strategic and cross-disciplinary competences :

- Knows how to prepare technical documents with different presentation tools for digital documents (CT3).
- Knows how to work with technical and scientific documents written in English (CT2).
- Understands the main problems encountered in the design of intelligent systems capable of reasoning and learning and knows how to analize the requirements in the design of these systems (EPS6).

Expected learning outcomes linked to specific competences :

- Knows the basics of using formal logic for knowledge representation in intelligent agents (GII-C5).
- Knows how to design a basic intelligent agent that is capable of acting in response to their environment and their internal knowledge (GII-C4).
- Understands the basics of representation, inference and learning under knowledge models based on Bayesian networks (GII C4-C5 and GII GII-C7).

Competences

Strategic:

CT2. Mastering a foreign language, especially English.

CT3. Training Experience in the use of the new technologies and the information and communication technologies.

Cross-disciplinary:

EPS6. Capacity of analysis and synthesis.

Specific:

GII-C4. Capacity to understand the basics, paradigms and techniques of the intelligent systems and analyse, design and build systems, services and computer applications that use these techniques in any field of application.

GII-C5. Capacity to acquire, obtain, formalise and represent the human knowledge in a computable form to solve problems by means of a computer system in any field of application, particularly in the ones related with computation, perception and performance in environments or intelligent surroundings.

GII-C7. Capacity to know and develop techniques of computational learning and design and implement applications and systems that use them, including the ones devoted to automatic extraction of information and knowledge from big volumes of data.

Subject contents

In this course, starting from basic knowledge of IA presented in the first semester, we will present different ways of representing knowledge and reasoning processes carried out on this knowledge as well as machine learning.

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Knowledge representation, and obtaining answers to questions through automated reasoning, allows us to create systems for solving various problems such as resolving conflicts in resource allocations in business environments or intelligent systems for searching on web systems, where a question as "give me websites where they talk about mammals," can get back as response pages where they talk about whales, even if these pages do not mention explicitly the relationship between mammals and whales.

Finally, we reinforce the basic knowledge on learning initiated also on the first semester, covering both learning systems widely used in real applications of artificial intelligence: Bayesian networks learning and clustering algorithms. Both of them are widely used in systems such as automatic recommenders for online shopping sites such as Amazon that can be used to Recomending buying a book based on a profile that is learned for each user, or spam filters for email tools like Thunderbird mail, where the decision to classify emails as spam depends on a model that is refined according to the experience of previously obtained spam.

The syllabus of the course will be the next one:

1. Knowledge Representation and Reasoning with First Order Logic
2. Integration of knowledge representation formalisms and efficient reasoning
3. Representation of Ontologies with Description Logics
4. Probabilistic models for knowledge representation and inference under incomplete information
5. Model learning from incomplete information: Bayesian networks and clustering

Methodology

There will be three types of activities:

1) Lectures

2) Laboratory classes

3) Independent work outside the classroom

Development plan

The first part of the course will focus on intelligent reasoning agents CP0 and CP1, and the second part to inference and learning under uncertainty and incomplete information with Bayesian networks.

Evaluation

Grades will be based on five different assessments:

1) A written test on the first part (intelligent agents based on formal logic). (18% of the final mark)

2) A practice about developing a simple agent. (30% of the final mark)

3) A written test on the second part (Bayesian models represantación knowledge). (18% of the final mark)

4) A practice aboud learning Bayesian models. (30% of the final mark)

5) Active participation in solving problems and proposed delivery and the delivery of other activities and active participation in class, the course will extend for a maximum of 3 points on the final grade**.**

Note that the first four items account for 96% of the mark. This means that to reach a ten you have to deliver some exercises, or participate actively in class.

Bibliography

All learning material will be provided during the course in the form of slides, notes and manuals of the different programs to be used.