VNIVERSITAT DE VALÈNCIA

Course Guide
34676 Intelligent Systems

COURSE DATA

Data Subject	
Code	34676
Name	Intelligent Systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	School of Engineering	3	First term

Subject-matter

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	13 - Information systems and intelligent systems	Obligatory

Coordination

Name	Department
BONET ESTEBAN, ENRIQUE VICENTE	240 - Computer Science
DOMINGO ESTEVE, JUAN DE MATA	240 - Computer Science
PONS SOSPEDRA, SUSANA	240 - Computer Science

SUMMARY

The subject "Intelligent Systems" is taught in the first quarter of third year of Computer Engineering, and is largely based on concepts introduced in previous courses of the degree, especially "Discrete Mathematics and Logic" and other related to programming.

Its purpose is to provide an introduction to the field of Artificial Intelligence. Artificial Intelligence includes many advanced programming techniques such as declarative programming, functional programming or object-oriented programming, and uses different methodologies for intelligent problem solving such as heuristic search, the knowledge-based systems, neural networks, agent-based systems. Finally, this type of system is used primarily in issues not satisfactorily resolved by other means and are still subject of research, such as natural language recognition, speech recognition, computer vision, robotics, and so on.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is advisable to have taken the 'Informática', 'Programación', 'Matemática Discreta y Lógica' (first year) and 'Estructura de Datos y Algoritmos' (second year, first semester) courses prior to taking this course.

OUTCOMES

1400 - Degree in Computer Engineering

- G4 - Ability to define, evaluate and select hardware and software platforms for the development and implementation of computer systems, services and applications, in accordance with both the knowledge and the specific skills acquired in the degree.
- R8 - Ability to analyse, design, build and maintain applications in a robust, secure and efficient manner by choosing the most suitable paradigm and programming languages.
- R15 - Knowledge and application of the fundamental principles and basic techniques of intelligent systems and their practical application.
- C1 - Ability to know the fundamentals, paradigms and techniques in the field of intelligent systems, and to analyse, design and build computer systems, services and applications that use these techniques in any field of application.
- C2 - Ability to acquire, obtain, formalise and represent human knowledge in a computable form for solving problems through a computer system in any field, particularly in those related to aspects of computing, perception and action in intelligent environments.
- C3 - Ability to recognise and develop computational learning techniques and to design and implement applications and systems that use them, including those for the automatic retrieval of information and knowledge from large volumes of data.

LEARNING OUTCOMES

This course allows for the following learning outcomes:

- To know the concept and main elements of an intelligent system.
- To have knowledge and understanding of the basic theories that support the analysis, design and implementation of an intelligent system.
- To have the statistical and computer fundamentals necessary to interpret, value and create new theories and technological developments related to intelligent computer systems and their applications.
- To properly characterize problems and search processes.
- Know the different types of knowledge, their representation and procedures of inference.
- To correctly characterize learning problems and pattern classification.

- To determine when a practical problem should be addressed using the techniques of intelligent systems and choose the techniques specific to it.
- To know the technological tools for building an intelligent system and know how to use them effectively to build one such system.
- To determine the complexity of a computer system project based on an intelligent system, properly plan and manage its implementation.

To complement the above results, this subject also to acquire the following skills and social skills:

- Preparation and submission of documents and papers.
- Ability to critical discussion on a topic, using logical arguments and organized.

DESCRIPTION OF CONTENTS

1. Introduction

Lecture 1: Introduction
1.1. Objectives and Definitions of Artificial Intelligence
1.2. Division of Artificial Intelligence
1.3. History and current achievements of Artificial Intelligence
1.4. Philosophical problems and future prospects of AI. Weak and strong AI.

2. Intelligent Agents

Lecture 2: Intelligent Agents
2.1. Concept of intelligent agent
2.2. Types of Agents

3. Heuristic Search

Lecture 3: Heuristic Search
3.1. Representation of search problems: state space
3.2. Search methods
3.2.1 Search strategies supported by the information
3.2.1.1. Preferential search for the best.
3.2.1.2. A *, A * PI and A*SRM
3.2.1.3. TABU search.
3.2.2 Trees game
3.2.2.1. Minimax.
3.2.2.1.1. Minimax expected (random elements).
3.2.2.1.2. Minimax multiplayer (more than two players).
3.2.2.1.3. Maximax (non-zero sum games).
3.2.2.2. Alpha-beta.

4. Knowledge Representation

Lecture 4: Knowledge Representation
4.1. Knowledge Representation Schemes
4.1.1. Formal logic
4.1.2. Production Rule Systems
4.1.3. Semantic Networks
4.2. Incomplete Knowledge Representation Schemes
4.2.1 Reasoning with uncertainty
4.2.1.1. Empirical models: MYCIN, PROSPECTOR.
4.2.1.2. Probabilistic models: Bayesian networks, Modified Prospector, Hidden Markov Models
4.2.1.3. Posibilistic models: Fuzzy Logic

5. Symbolic Machine Learning

Lecture 5: Symbolic Machine Learning
5.1. Concept and Types of Learning
5.2. Syntactic learning: formalisms and algorithms
5.3. Statistical learning: formalisms and algorithms
5.4. Reinforcement learning

6. Neural Networks

Tema 6: Neural Networks
6.1. Natural neural networks
6.2. Artificial neural networks
6.3. Supervised networks
6.4. Unsupervised networks
6.5. Deep learning

7. Laboratory

The labs are designed to develop practical aspects and applications of artificial intelligence, covering topics such as:
1. Knowledge Based Systems.
2. Heuristic search.
3. Game trees.
4. Mechanisms of perception. Sensors, data and internal representations.
5. Vision.
6. Robotics.
7. Planning.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	5,00	0
Development of individual work	10,00	0
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	30,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

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Teaching will consist of a combination of lectures, problem sessions and practical activities to be performed by the student. This teaching will be supplemented by individual work of students, focusing on the study, problem solving, and job preparation for delivery. In addition, there will be sessions on lab work with your computer.

• ***The theoretical activities*** *consist of conducting classes in an hour in which the themes will be developed to provide a global and inclusive, analyzing in detail the key issues and more complex, promoting at all times, the share of students.*

• ***Hands-on activities*** *will include conducting meetings of problems and issues in the classroom as well as conducting two seminars, which will address two issues on applications and less formal aspects of the subject.*

• ***The student's personal work*** *consists mainly in three aspects:*

o *Preparing lessons in advance and reading recommended texts.*

o *Problem solving proposed by professor.*

o *Development works to be delivered to professor.*

• ***Laboratory sessions*** *will consist in solving problems related to the theoretical content through software.*

EVALUATION

The evaluation of the course in the first call is conducted by:

- Continuous assessment based on participation and degree of involvement in the teaching-learning process, given regular attendance and classroom activities provided for resolution of issues and problems raised (N_Continua).
- Objective test individual, consisting of several tests or knowledge tests, which consist of both theoretical and practical issues and problems (N_Examenes).
- Assessment of practical activities based on the achievement of objectives in the lab sessions and problems, and the preparation of papers / reports. Occasionally you may make oral presentations (individually and / or group) to evaluate the ability of preparing documents and knowledge transfer (N_Practicas). This grade cannot be altered in later opportunities.

The final grade will be a weighted average of the three grades.

A grade of 5 out of 10 or higher will be required to pass the course.Alumni that, due to laboral reasons or other of similar nature that will have to be documentally proved cannot assist to the lab sessions will have to agree with the lecturers an avaluation system that will involve in all cases the delivering of homeworks or lab reports due on time and possibly a personal interview for their assessment. No out-of-term lab reports will be admitted neither wil be allowed such works specifically intended for the second call.

At the second call, there will be an exam about the contents and activities of the course. The final grade will be a weighted average of the three grades. In order to pass the course, a grade of 5 out of 10 or higher will be required in the exam. No minimal grade will be required for the part/s not able to be altered.

In any case, the evaluation of this subject will be done in compliance with the University regulations in this regard, approved by the Governing Council on 30th May 2017 (AGCUV 108/2017).

REFERENCES

Basic

- Inteligencia Artificial: Un Enfoque Moderno, S. Russell, Prentice Hall, 2ª ed, 2005.
- Neural Networks, a systematic approach. Raúl Rojas. Springer-Verlag, Berlin, 1996

Additional

- Fundamentos de Inteligencia Artificial, L.A. Munárriz, Universidad de Murcia, 1994.

- Prolog Programming for Artificial Intelligence, I. Bratko, Addison-Wesley, 1990.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The teaching method for this subject will follow the teaching model approved by the Academic Committee of the GII / GIM degrees:

https://go.uv.es/catinfmult/ModeloDocenciaGIIGIM

Lectures and laboratories will be delivered synchronously at established times, and may be followed by students who are permitted by health regulations to attend the classroom, and who wish to do so. They will be recorded simultaneously for use in asynchronous mode by those students who cannot attend. It will not be compulsory for students to physically attend the sessions, but it will be (especially in the case of laboratories) a requirement to at least follow the sessions in synchronous mode, with an interactive connection with the teacher.

Were facilities closed because of COVID-19, lectures will be replaced by synchronous sessions that will run according to the degree timetable. If such situation affects evaluation activities, they will be replaced by online methods by using the IT tools provided by the University. The weights for each activity will remain the same as specified in the teaching guide.