Intelligence in Networks

Academic Year: (2022 / 2023) **Review date: 06-04-2022**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: CALLEJO PINARDO, PATRICIA

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Programming skills:
- Programming
- Systems Programming
- Systems Architecture

OBJECTIVES

The main objective of this course is to analize the concept of "intelligence" in information and communication systems and study the main techniques that allow to incorporate "intelligent" behaviours in them. At the end of the course, the students have to study the fundamentals of Artificial Intelligence, the impact of the incorporation of intelligent mechanisms in software and hardware systems and the areas where these technologies may bring the most significant advances.

Competences or specific skills that the student must acquire include:

- Knowledge of the main concepts and techniques of Artificial Intelligence.

- Capacity to analyze the application and feasibility of different AI techniques to solve a specific problem, and evaluate the impact on real-world systems (analysis, abstraction, problem solving and capacity to apply theoretical concepts).

In addition, the student will acquire general skills:

- Ability to work in teams and share and distribute the work load to deal with complex problems.

- The student must learn how to plan the development of a system with a certain degree of complexity.

- The student must learn how to search for useful information in different sources for the design and implementation of a given engineering problem.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Concepts and history of Artificial Intelligence

2. Problem solving and search strategies
   2.1. Concepts
   2.2. Uninformed search strategies
   2.3. Heuristic search strategies
   2.4. Game theory

3. Knowledge Based Systems (KBS) and expert systems
   3.1. Knowledge representation
   3.2. Fundamentals of formal logic, logic programming and inference systems
   3.3. Management of uncertaintity
   3.4. Agents

4. Machine learning
   4.1. Concepts of machine learning, Data Science/Analytics/Mining
   4.2. Techniques, tools and applications
   4.3. Supervised learning

4.4. Unsupervised learning
4.5. Other
5. Linguistic Engineering (Natural Language Processing)

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities include:

- Theoretical lectures, individual and group tutoring sessions, student presentations, student personal work, including study, tests and exams; focused on the acquisition of the specific coginitive competences of the course

- Practical lectures, lab sessions, individual and group tutoring sessions, including study, tests and exams; focused on the development of the specific instrumental competences and most of the general competences, such as analysis, abstraction, problem solving and capacity to apply theoretical concepts

- Development and presentation in class of a group project, focused on any of the topics that are included in the course, whose objective is to check that the student is able to develop (design, implement and validate) a software system that includes one or several Artificial Intelligence components to solve a given engineering problem

ASSESSMENT SYSTEM

The assessment system is based on:

- a continuous evaluation of the student work (80% of the final grade) based on:

1) the development and presentation of a final course project (40%).
2) lab sessions, participation in class activities and exercises and tests to evaluate the acquired skills (40%).

- a final conceptual-practical evaluation on the course programme (20% of the final grade), with a minimum grade of 3,5 out of 10. This evaluation will be based on a written exam or replaced by a project, depending on the course evolution.

% end-of-term-examination:	20
% of continuous assessment (assigments, laboratory, practicals…):	80

BASIC BIBLIOGRAPHY

- Fernández, Gregorio Representación del conocimiento en sistemas inteligentes, online: http://www.gsi.dit.upm.es/~gfer/ssii/rcsi/, 2004
- Han, J.; Kamber, M. Data Mining: Concepts and Techniques (2nd Edition), Morgan Kaufmann Publishers, 2006
- Russell, S.J.; Norvig, P. Artificial Intelligence. A modern Approach (2nd ed), Prentice-Hall, 2003
- Witten, Ian H.; Frank, Eibe; Hall, Mark A. Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann, 2011

ADDITIONAL BIBLIOGRAPHY

- Mira, J.; Delgado, A.; Sánchez Boticario, J. Aspectos básicos de la Inteligencia Artificial, Ed. Sanz y Torres, 1995
- Nils J. Nilsson Inteligencia artificial: una nueva síntesis, McGraw-Hill, 2000
- P. Adriaans, P.; Zantinge, D. Data Mining, Addison-Wesley, 1996
- Piatetsky-Shapiro G., Frawley J. (eds.) Knowledge Discovery in Databases, MIT Press, 1991
- Rich, E.; Knight, K. Artificial Intelligence, McGraw-Hill, 1994

BASIC ELECTRONIC RESOURCES

- . Weka 3: Data Mining Software in Java: http://www.cs.waikato.ac.nz/ml/weka/
- . Brief History of AI: http://aitopics.org/misc/brief-history
- . SWI Prolog: http://www.swi-prolog.org/
- . RapidMiner: https://rapidminer.com/
- . Kaggle: Your Machine Learning and Data Science Community: https://www.kaggle.com/
- . The Total Beginner's Guide to Game AI: https://www.gamedev.net/tutorials/programming/artificial-intelligence/the-total-beginners-guide-to-game-ai-r4942/

- . Drools - The Business Logic integration Platform: https://www.drools.org/