Foundations of Artificial Intelligence

Academic Year: (2023 / 2024) **Review date: 07-04-2023**

Department assigned to the subject:

Coordinating teacher: MOLINA LOPEZ, JOSE MANUEL

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

OBJECTIVES

The syllabus consists mainly of four blocks:

- First, the origins of computers and Artificial Intelligence are introduced along with researchers such as Turing and the ethical problems that can arise. It is intended to foster discussions between opponents and advocates using a movie.

- The second block goes into some technical details. The most prominent techniques in AI are introduced and how they are used to solve problems. It is suggested to use different electronic materials to get an overall notion of the kind of problems to deal with and the techniques to handle them.

- The third block focuses on Machine Learning. It provides a review of different techniques in the field and a software development will be requested to show how to apply these concepts and how to obtain meaningful results.

- The fourth and last block describes various applications of AI in the real world in scenarios such as IoT, Smart Cities, autonomous vehicles, cyber-security, NLP, etc. It is suggested to visit research groups and companies working in these areas.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Computer Science and Artificial Intelligence
Universal Turing Machines
Can computers think? Computability and algorithm complexity
Artificial Intelligence: reality vs expectations

2. Prominent paradigms in AI
Expert systems
Informed search
Stochastic local search. Genetic algorithms
Neural networks

3.- Machine Learning
What is ML?
Real applications of ML
Applications in social networks

4.- Social, scientific and industrial matters
AI and Big Data
Industry 4.0
Singularity

LEARNING ACTIVITIES AND METHODOLOGY

An activity will be presented for each section of the syllabus::
1.- Watching a movie and a debate in groups against and in favour of AI
2.- Usage of various web applications to better understand how different AI techniques work
3.- Development of a text mining application in groups
4.- Presentation of a work about a topic of interest introduced in any of the visits to the research groups

BASIC BIBLIOGRAPHY

- A.K.Dewdney The new Turing Omnibus. 66 excusions in Computer Science, Owl Books, 1993
- Borrajo, D., Gonza¿lez Boticario, J., & Isasi Viñuela, P Aprendizaje automa¿tico, Sanz y Torres, 2006
- Callan, R Artificial intelligence, Palgrave Macmillan, 2003
- Charles Petzold The annotated Turing, Wiley, 2008
- Herbert A. Simon The sciences of the Artificial, The MIT Press, 1996
- Institute of Physics Publishing Machine learning¿: science and technology, publisher, 2020
- John L. Casti The Cambridge Quintet. A work of scientific speculation, Abacus, 2003
- Lance Fortnow The Golden Ticket. P, NP and the search for the impossible., Princeton University Press, 2013
- Martin Davis The Universal Computer. The road from Leibniz to Turing, Norton, 2000
- Merino Grande, C Aplicación del aprendizaje automático a la industria 4.0, -, 2019
- Roger Penrose The Emperor's New Mind, Oxford, 2016
- Seth Lloyd Programming the Universe. A Quantum Computer Scientist Takes on the Cosmos, Vintage Books, 2007
- Zbigniew Michalewicz, David B. Fogel How to Solve it: Modern Heuristics, Springer, 2004