Smart Cities

Academic Year: (2023 / 2024) **Review date: 23-05-2023**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: CALLEJO PINARDO, PATRICIA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

"Machine Learning", "Knowledge Representation and Reasoning" and "Business Analytics" is recommended.

OBJECTIVES

The main objective of this course is to study in detail all aspects of "smart cities", a concept that refers to the application of Artificial Intelligence and Information and Communication Technologies for the planning, management and provision of services in the cities of the future, through the innovative and disruptive use of data, technologies and available resources, involving citizens, to help solve major challenges of today's big cities such as traffic congestion, environmental pollution, inequality in access to opportunities and reduced quality of life.

At the end of the course, the student will know the fundamentals and the most important application areas of AI in the cities of the future and will be able to approach and analyze the deployment of this type of solutions in scenarios that can achieve significant improvements.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Artificial Intelligence in the city of the future.
1.1. Technology fundamentals.
1.2. Required infrastructures.
1.3. Application scenarios.

This topic presents the most important concepts about smart cities, analyzing the necessary infrastructures in the cities and the different application scenarios.

2. Energy and efficiency.
2.1. Energy consumption models.
2.2. Intelligent energy management systems.
2.3. Analysis and recommendation systems for energy efficiency.

This topic is dedicated to energy management in smart cities, with the aim of improving energy efficiency, through the development of models and patterns of energy consumption by citizens and city infrastructures, and their optimized management through the use of intelligent systems and recommendation systems for citizens.

3. Environmental sustainability.
3.1. Environmental, noise, light and water pollution analysis models.
3.2. Intelligent systems and networks for monitoring and management of pollution.
3.3. Efficient waste management.

The objective of this topic is the management of environmental sustainability in smart cities, working on the reduction of different types of pollution, through the use of intelligent systems with analysis models applied to the detection of problems and generation of alerts, and the optimization of urban waste management.

4. Mobility and sustainable transport.
4.1. Mobility analysis and prediction models.
4.2. Alert and response systems to traffic incidents.
4.3. Optimization of transport networks.

This topic is dedicated to mobility management in smart cities, with the aim of optimizing transport networks, reducing travel time and energy use and increasing user satisfaction.

5. Smart municipal services.
5.1. Application scenarios.
5.2. Optimization of the quality of service in administrative services and tax management.
5.3. Optimization of the quality of service in sports, cultural and leisure services.
5.4. Optimization of public safety.

This topic analyzes the possibilities of applying technologies in the management of the different municipal services, with the aim of increasing the quality of the service offered and therefore the citizen's satisfaction with the city's services.

6. Citizen behavior.
6.1. Citizen sensor.
6.2. Citizen participation in social networks.

This topic focuses on the analysis of the behavior of citizens, who become another sensor, at a higher level of abstraction, providing very elaborate and valuable information on the functioning of the city, for example, during their interactions with city services, or data analysis including natural language processing in surveys and/or comments on social networks.

LEARNING ACTIVITIES AND METHODOLOGY

Training activities include:

- Lecture sessions (AF1), doubt resolution classes (AF3), student presentations (AF7), individual tutorials (AF5) and student's personal work (AF7); oriented to the acquisition of theoretical knowledge (MD1 and MD2)

- Laboratory practices and problem classes (AF2), individual tutorials (AF5) and student's personal work (AF7); oriented to the acquisition of practical skills related to the program of the course (MD3)

- Development and presentation of a group project (AF6), to be chosen among the different topics covered by the course, oriented to verify that the student is able to develop (design, implement and validate) a computer system equipped with Artificial Intelligence elements that is able to solve specific aspects of smart cities (MD4 and MD5)

ASSESSMENT SYSTEM

ORDINARY EVALUATION
The evaluation system is fully based on the continuous evaluation of the student's work (100% of the grade) through:

- the development of exercises in practical sessions (40%)
- the evaluation of the student's participation in different class activities (10%)
- the development and presentation of a final course project (50%)

EXTRAORDINARY EVALUATION
The student must do a different project from the one done in the course (if any). Likewise, the student will have to do or repeat those practical assessments that he/she has not passed.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100