Introduction to Robot Learning

Academic Year: (2019 / 2020)   **Review date: 09-05-2018**

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: CASTILLO MONTOYA, JOSE CARLOS

Type: Electives ECTS Credits : 3.0

Year : 1 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Programming (C, C++, Python, Matlab, etc...).

OBJECTIVES

The main goal of this course is to introduce the main techniques and applications of machine learning in robotics. We will study the main areas in which machine learning is employed nowadays, paying also attention to recent approaches such as Deep Learning.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction
   - Why is Machine Learning useful in robotics?
   - Supervised learning
   - Unsupervised learning

2. Techniques for data classification
   - Support Vector Machines
   - K-nearest neighbours
   - Naïve Bayes

3. Regression techniques for data prediction
   - Decision trees
   - Linear and non-linear models
   - Neural networks
4. Clustering techniques for grouping data and detecting patterns
   - K-means
   - Markov hidden models
   - Gaussian mixture models
5. New trends: Deep Learning
6. Machine learning applications in robotics
   - Human-Robot Interaction
   - Autonomous vehicles
   - Medicine

LEARNING ACTIVITIES AND METHODOLOGY

Magistral classes, laboratory practical sessions, individual tutorials, and personal work from the students

ASSESSMENT SYSTEM

The assessment system in this course will follow the continuous evaluation model, where participation in the classroom, laboratory performance and a final test for assessing the knowledge obtained will be comb

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Alpaydin, Ethem   Introduction to machine learning, MIT Press, 2010

- John Paul Mueller and Luca Massaron Machine Learning For Dummies, John Wiley & Sons, 2016
- Sonia Chernova, Andrea L. Thomaz Robot Learning from Human Teachers, Morgan & Claypool Publishers, 2014

ADDITIONAL BIBLIOGRAPHY
- Vishnu Nath, Stephen E. Levinson Autonomous Robotics and Deep Learning, Springer Science & Business Media, 2014
- Yasser Mohammad and Toyoaki Nishida Data Mining for Social Robotics: Toward Autonomously Social Robots, Springer, 2016