60942 - Electronic neural networks

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	533 - Master's Degree in Telecommunications Engineering
ECTS	5.0
Course	2
Period	First semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

- The course will be based on combining theoretical explanations with case studies and laboratory work.

- Lectures will provide theoretical background on fundamentals of artificial neural networks (ANN) and machine learning, and how these systems can be implemented in computers and electronic circuits.

- Case studies and real engineering applications of ANN will be worked out at the classroom, with special emphasis on intelligent environments (sensor data processing, computer vision, embedded intelligence for home appliances...).

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- The students will do laboratory work, developing ANN applications in MATLAB by using real databases.

- Individual or group assignments (course project) will be proposed.

- Student participation is considered very important in order to acquire the learning outcomes and skills needed.

5.2.Learning activities

Classroom activities: 1,8 ECTS (45 hours)

1) Course lectures (T1) (20 hours).

Fundamentals of ANN and machine learning will be developed, mixing theoretical concepts and practical applications. Course materials are available in advance at https://moodle2.unizar.es/add/

2) Case studies (T2) (10 hours)

Different case studies will be worked out at the classroom, related to fields as computer vision, speech recognition, quality of service of communications, home appliances with embedded intelligence, etc.

3) Laboratory work (T3) (15 hours).

Five laboratory sessions will be carried out in small groups, consisting of MATLAB simulations of ANN. Each session will be evaluated in the laboratory.

Personal work: 3,2 ECTS (80 hours)

4) Assignments (T6) (25 hours)

Individual or group assignments will be proposed, in the form of a course project. The project assessment will be based on difficulty, development, achieved results, quality of the written report and oral presentation.

5) Personal study (T7) (53 hours)

This activity includes personal study, preparation of laboratory work and the required time for preparing the final exam. Students can also attend tutorials to solve the specific problems they can face in the course.

6) Evaluation activities (T8) (2 hours)

Assessment will be based on coursework (laboratory work and assignments) and final examination.

5.3.Program

Course program

1. Fundamentals of Artificial Neural Networks and Machine Learning

2. Unsupervised learning: SOM

3. Supervised learning: MLP

4. RBF, Support Vector Machines, Deep Learning and other models

5. Electronic implementations

6. Digital circuit implementations

7. Applications development

Laboratory sessions

1: Data preprocessing and competitive networks

2: Perceptrons: application to binary and real data

3: Hybrid neural networks and applications

4: Development of pattern classification applications

5: Development of applications related to data fitting

5.4.Planning and scheduling

Timetables for classroom and laboratory sessions will be published prior to the beginning of the course at the web of EINA: https://eina.unizar.es/
A course timetable is also provided to the student, which includes a detailed description of the dates for submission: https://moodle2.unizar.es/add/

5.5.Bibliography and recomended resources