

60942 - Electronic neural networks

Syllabus Information

Academic Year: 2019/20

Subject: 60942 - Electronic neural networks

Faculty / School: 110 -

Degree: 533 - Master's Degree in Telecommunications Engineering

ECTS: 5.0

Year: 2

Semester: First semester

Subject Type: Optional

Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

- **Lectures** will provide the theoretical background 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 done in the classroom, with special emphasis on intelligent environments (sensor data processing, computer vision, embedded intelligence for home appliances...).
- The students will do **laboratory work**, developing ANN applications by using software frameworks.
- **Individual or group assignments (course project).**

Students are expected to participate actively in the class throughout the semester.

4.2.Learning tasks

The course includes the following learning tasks:

Classroom activities (1.96 ECTS: 49 hours):

- **Lectures** (T1) (20 hours). Presentation of the fundamentals of ANN and machine learning, including theoretical concepts and practical applications. Course materials are available in advance at <https://moodle2.unizar.es/add/>
- **Case studies** (T2) (10 hours). Different case studies will be worked out at the classroom, related to fields such as computer vision, speech recognition, quality of service of communications, home appliances with embedded intelligence, etc.
- **Laboratory sessions** (T3) (15 hours). Five laboratory sessions will be carried out in small groups, consisting of simulations of ANN. Each session will be evaluated in the laboratory.
- **Tutorials** (T6) (2 hours). Guidance and supervision of course assignments and projects.
- **Evaluation activities** (T8) (2 hours). Assessment will be based on coursework (laboratory work and assignments) and final examination.

Autonomous work (3.04 ECTS: 76 hours):

- **Assignments** (T6) (51 hours). Individual or group assignments will be proposed, in the form of a course project. The assessment criteria include: difficulty, development, achieved results, quality of the written report and oral presentation.
- **Study** (T7) (25 hours). Study, preparation of laboratory work and time for preparing the final exam. Students can also attend tutorials to solve specific problems.

4.3.Syllabus

The course will address the following **topics**:

1. Fundamentals of Artificial Neural Networks and Machine Learning
2. Supervised learning
3. Unsupervised learning
4. Kernel machines (RBF, Support Vector Machines)
5. Deep Learning
6. Electronic implementations
7. Digital circuit implementations
8. Applications development

Laboratory sessions

- 1: Introduction to machine learning. Tools
- 2: Dimensionality reduction. Unsupervised models
- 3: Supervised models: linear and SVM
- 4: MLP and Deep Learning
- 5: Deep Learning (II)

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website <https://eina.unizar.es/> and <https://moodle2.unizar.es/add/>

4.5.Bibliography and recommended resources

Basic resources:

- In <http://moodle2.unizar.es>
- **Slides (course notes) and laboratory notes**

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=60942&Identificador=C70302>