

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Year	1
Semester	Second semester
Subject Type	Optional
Module	---

1.General information**1.1.Introduction****1.2.Recommendations to take this course****1.3.Context and importance of this course in the degree****1.4.Activities and key dates****2.Learning goals****2.1.Learning goals****2.2.Importance of learning goals****3.Aims of the course and competences****3.1.Aims of the course****3.2.Competences****4.Assessment (1st and 2nd call)****4.1.Assessment tasks (description of tasks, marking system and assessment criteria)****5.Methodology, learning tasks, syllabus and resources****5.1.Methodological overview**

The methodology followed in this course is oriented towards achievement of the learning objectives. It has an applied orientation so the different techniques explained will be illustrated with real cases. Although the mathematical and statistical content is important, we will rather focus on assimilation and understanding of the concepts, using the mathematical knowledge when necessary for their understanding.

The techniques introduced in the lectures will be applied to real problems through simulations using MATLAB in the

69321 - Machine Learning

laboratory sessions. Finally, the student must address, as the final course assignment, one case study in greater depth, developing a complete real case of pattern recognition, obtaining not only numerical results, but also being able to interpret them properly.

5.2.Learning tasks

The course includes the following learning tasks:

- **A01 Lectures (18 hours)**. The fundamental contents of the course will be presented and a set of representative problems will be made. This activity will take place in the classroom. Lecture notes and materials will be available to students through the virtual platform Moodle (ADD).
- **A03 Laboratory sessions (8 hours)**. Representative examples will be developed in the laboratory. The details and instructions of the tasks will be available on Moodle.
- **A06 Tutorials**. Supervision of the assignments and tasks to be developed by the students.
- **A08 Assessment**.
- **A06 Assignments**. Preparation of tasks and work for laboratory sessions. They can be done individually or in pairs.
- **A07 Autonomous work and study**. This activity includes both personal study aimed at achieving adequate monitoring of the course, doing tasks, exam preparation and tutorials.

5.3.Syllabus

The course will address the following topics:

Lectures

- T1: Introduction to Machine Learning
- T2: Statistical Pattern Recognition
- T3: Parametric methods
- T4: Non-parametric methods
- T5: Combining classifiers
- T6: Artificial Neural Networks (ARN) introduction
- T7: Supervised models: linear classifiers and perceptron
- T8: Non-supervised ARN and clustering
- T9: Kernel models: RBF and SVM

Laboratory sessions

- S1: Face detection by parametric and non-parametric statistical methods
- S2: Facial biometrics
- S3: Artificial Neural Networks on practise

5.4.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.

5.5.Bibliography and recommended resources

Main references

- Slides available at <http://moodle2.unizar.es>.
- Lab statements available at <http://moodle2.unizar.es>.
- Materials for the personal work available at <http://moodle2.unizar.es>.

69321 - Machine Learning

- BB** Alpaydin, Ethem. Introduction to machine learning / Ethem Alpaydin . - 2nd ed. Cambridge, Massachusetts : MIT Press, cop. 2010
- BB** Haykin, S.. Neural Networks and Learning Machines / S. Haykin Pearson, 2009
- BB** Martín del Brío, Bonifacio. Redes neuronales y sistemas borrosos / Bonifacio Martín del Brío, Alfredo Sanz Molina ; prólogo de Lofti A. Zadeh . - 3ª ed. rev. y amp. Paracuellos de Jarama (Madrid) : RA-MA, D. L. 2006
- BC** Bishop, Christopher M.. Pattern recognition and machine learning / Christopher M. Bishop New York : Springer, cop. 2006
- BC** Duda, Richard O.. Pattern classification / Richard O. Duda, Peter E. Hart, David G. Stork . - 2nd ed. New York [etc.] : John Wiley and Sons, cop. 2001
- BC** Kohonen, Teuvo. Self-organizing maps / Teuvo Kohonen Berlin [etc] : Springer, cop. 1995
- BC** Kuncheva, Ludmila I.. Combining Pattern Classifiers / Ludmila I. Kuncheva. - 1 Wiley-Interscience, 2004
- BC** Witten, Ian H. Data Mining: Practical Machine Learning Tools and Techniques / IH Witten, E Frank, MA Hall Elsevier, 2011