

## 69321 - Pattern recognition techniques

### Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Course	1
Period	Second 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 learning process that is designed for this subject is based on the following:**

This course has an applied orientation; therefore, the different techniques exposed will be illustrated with real cases. Although the mathematical and statistical content is important, we will focus on assimilate and understand the concepts, reaching the mathematical detail when necessary for the understanding of them.

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

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

### 5.2.Learning activities

**The learning activities under this subject are as follows :**

A01 Master class (22 hours)

In this activity the fundamental contents of the subject will be presented and a set of representative problems will be made. This activity will take place in the classroom. The materials presented in the lectures will be available to students through the Anillo Digital Docente.

A03 Laboratory sessions (4 hours)

Representative examples will be developed in the laboratory. The statements of the practices will be available to students in the Anillo Digital Docente.

A06 Work supervision

Supervision of the works to be developed by the students.

A08 Assessment

#### **Non-contact activities**

A06 Personal works

In this activity work related to the practices will be performed. Works will be done individually or in groups of two people maximum.

A07 Study

This activity includes both personal study aimed at achieving adequate monitoring of the subject, conducting practices, exam preparation and tutoring.

### 5.3.Program

#### **Master classes:**

- T1: Introduction to Machine Learning
- T2: Statistical Pattern Recognition
- T3: Parametric methods
- T4: Non-parametric methods
- T5: Combining classifiers

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- 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.Planning and scheduling

### Classroom calendar and presentation of works

Lectures and problem classes and practice sessions, held in the laboratory, will be given according to schedule set by the center (schedules available on their website). The other activities will be planned depending on the number of students and will be announced in advance.

## 5.5.Bibliography and recomended 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> .

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

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