



Universidad  
Politécnica  
de Cartagena | Campus  
de Excelencia  
Internacional

# **INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS**

# **INTRODUCCIÓN A LAS REDES NEURONALES**

**Transversal Activities of Doctorate**

**Universidad Politécnica de Cartagena**

1. General course information					
Name	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS				
Level	Doctorate				
Code					
University	Universidad Politécnica de Cartagena				
Language	English				
ECTS	1	hours / ECTS	10	Total hours	30

2. Lecture data			
Lecturer in charge	Dr Javier Molina-Vilaplana		
Department	Systems Engineering and Automation		
Knowledge area	Systems Engineering and Automation		
Office location	1ª planta del Hospital de Marina. Sub-ala Nordoeste. Despacho: 2068.		
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Office hours	Mornings 10.00-14.00 Monday-Friday		

3. Course objectives
<p>The course attempts to provide the engineering graduate student with a brief insight in artificial neural networks. The fundamental properties of neural networks are sketched and the most basic examples of training algorithms are discussed. The students are encouraged to implement some of these algorithms. Some advanced simulations tools will also be presented. The course may be useful for those interested in a subsequent one more focused in applications of neural networks.</p>

4. Theory programme
<p>1. FUNDAMENTALS</p> <p>1.1 Artificial Neurons. Connectionist Models.</p> <p>1.2 Networks of neurons. Topologies.</p> <p>1.3 Training of Artificial Neural Networks.</p> <p>2. NEURAL NETWORKS LEARNING ALGORITHMS.</p> <p>2.1 Perceptron and ADALINE.</p>

2.2 Exclusive OR problem

2.3 Multilayer Perceptrons.

### 3. BACKPROPAGATION ALGORITHM

3.1 Basic algorithm.

3.2 Advanced algorithms.

3.3 Deficiencies.

#### BASIC BIBLIOGRAPHY

**An Introduction to Neural Networks. B. Krose and P Van der Smagt. (English)**

<http://www.infor.uva.es/~teodoro/neuro-intro.pdf>

**Redes Neuronales Artificiales. A.J. Serrano, E.Soria, J.D. Martin (Spanish)**

[http://ocw.uv.es/ingenieria-y-arquitectura/1-2/libro\\_ocw\\_libro\\_de\\_redes.pdf](http://ocw.uv.es/ingenieria-y-arquitectura/1-2/libro_ocw_libro_de_redes.pdf)

## 5. Practical programme

- 1) ADALINE. Applications
- 2) BACKPROPAGATION. XOR Problem.
- 3) MATLAB NEURAL NETWORK TOOLBOX.

## 6. Hours distribution

Activity	Location	Student work	Hours
Theory programme	CONTROL LAB. DEPARTMENT OF SYSTEMS ENGINEERING AND AUTOMATION.	Attend class	6
		Homework: study of the theory contents	10
Practice	CONTROL LAB. DEPARTMENT OF SYSTEMS ENGINEERING AND AUTOMATION.	Attend class	4
		Homework:	8
Tutoring	Virtual	Virtual ...	2
			<b>30</b>