



**Actividades Transversales de Doctorado**  
**Universidad Politécnica de Cartagena**  
**Curso 2020/21**

1. Información general de la actividad /General course information					
Nombre/ Name	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS				
Nivel /Level	Doctorado				
Modalidad de impartición / Teaching mode	ONLINE				
Lengua impartición/ Language	ENGLISH				
ECTS	1	hours / ECTS	30	Total hours	30

2. Datos del profesorado / Lecture data	
Profesor /Lecturer in charge	Dr Javier Molina-Vilaplana
Departamento o Servicio/ Department/Service	AUTOMATICS, ELECTRIC ENGINEERING AND ELECTRONIC TECHNOLOGY
Area de conocimiento /Knowledge area	Systems Engineering and Automation
Despacho /Office location	1ª planta del Hospital de Marina. Sub-ala Noroeste. Despacho: 2068.
Teléfono /Telephone	00349685359
URL / WEB	javi.molina@upct.es
Horario de Atención /Office hours	

3. Fechas por edición / Dates	
1ª edición / 1st edition-	Introduction to artificial neural networks
Fecha/Date	16-20 November 2020
Horario/Hours	10h – 13h
2ª edición / 2nd edition	
Fecha/Date	
Horario/Hours	
3ª edición / 3rd edition-	
Fecha/Date	
Horario/Hours	

(añadir o eliminar tantas ediciones se haga. Si la docencia es continua a lo largo del curso se indicará solo en la 1ª edición)

4. Objetivos del curso/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>
5. Contenidos teóricos / Theory programme
<ol style="list-style-type: none"> <li>1. FUNDAMENTALS <ol style="list-style-type: none"> <li>1.1 Artificial Neurons. Connectionist Models.</li> <li>1.2 Networks of neurons. Topologies.</li> <li>1.3 Training of Artificial Neural Networks.</li> </ol> </li> <li>2. NEURAL NETWORKS LEARNING ALGORITHMS. <ol style="list-style-type: none"> <li>2.1 Perceptron and ADALINE.</li> <li>2.2 Exclusive OR problem</li> <li>2.3 Multilayer Perceptrons.</li> </ol> </li> <li>3. BACKPROPAGATION ALGORITHM <ol style="list-style-type: none"> <li>3.1 Basic algorithm.</li> <li>3.2 Advanced algorithms.</li> <li>3.3 Deficiencies.</li> </ol> </li> </ol> <p><b>BASIC BIBLIOGRAPHY</b></p>

**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)

## **6. Contenidos prácticos / Practical programme**

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

## **7. Sistema de evaluación/ Sistem of evaluation**

Evaluation will be based on:

- i) results of some exercises proposed in class
  - ii) discussion on topics proposed to be read as homework
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## 8. Distribución horaria de los contenidos, incluyendo las tareas de los alumnos/ Hours distribution

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