IDENTIFYING DATA
Advanced machine learning for computer vision

Subject	Advanced machine learning for computer vision			
Code	V05M185V01205			
Study programme	Máster Universitario en Visión por Computador			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	English			
Department				
Coordinator	Alba Castro, José Luis			
Lecturers	Alba Castro, José Luis			
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General description	The objective of this subject is to know and apply advanced neural models, to know the techniques of the state of the art of deep learning, with end-to-end training approaches, and minimizing the use of tagged data, to solve computer vision applications using the methodologies covered in the subject.			

Training and Learning Results

Code	
A1	CB6 Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study
A5	CB10 Students should possess the learning skills to enable them to continue studying in a largely self-directed or autonomous manner.
B1	Capacity for analysis and synthesis of knowledge
B3	Ability to develop computer vision systems depending on the existent needs and apply the most suitable technological tools
B5	Ability to identify unsolved problems and provide innovative solutions
B6	Ability to identify theoretical results or new technologies with innovative potential and turn them into products and services useful to society
C2	To know and apply automatic learning and pattern recognition techniques applied to computer vision
D1	To practice the profession with a clear awareness of its human, economic, legal and ethical dimensions and with a clear commitment to quality and continuous improvement
D2	Capacity for teamwork, organization and planning

Expected results from this subject

Expected results from this subject	Training and Learning Results
To know, apply and evaluate advanced neural models.	A1 A2 A5 B1 B3 B5 B6 C2 D1 D2

To know deep learning techniques with end-to-end training approaches, and minimizing the use of labelled data.	A1 A2 A5 B1 B3 B5 B6 C2 D1
To solve computer vision applicationsusing advanced machine learning methods	A1 A2 A5 B1 B3 B5 B6 C2 D1 D2

Contents

Topic
Multilayer perceptron and backpropagation
Convolutional neural networks and recurrent networks
Principles of deep learning
Self-supervides learning and autoencoders.
Advanced Neural models for computer vision.
Advanced paradigms of supervision
Selected subjects in machine learning for computer vision.
Advanced Applications in computer vision.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	16	32	48
Case studies	4	16	20
Project based learning	10	40	50
Lecturing	10	20	30
Objective questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	Analysis and resolution of practical cases with the objective of reinforce the practical application of the theoretical contents. Practices in computing labs, learning based in the resolution of practical cases, autonomous work and independent study of the students, and work in group and cooperative learning.
Case studies	Elaboration and presentation of works on selected and related state of the art methodologies.
Project based learning	Learning based on the resolution of practical cases, autonomous work and independent study of the students, and group work and cooperative learning.
Lecturing	Participatory lessons aimed at learning the theoretical contents of the subject

Personalized assistance

Methodologies	Description
Laboratory practical	Resolution of doubts during laboratory practices.
Case studies	Individualized advice during the case study.
Project based learning	Individualized advice during the realization of the projects

Assessment

Description	Qualification	Training and Learning Results

Laboratory practical	Analysis and resolution of practical cases with the objective of affirming the practical application of theoretical contents	40	A1 A2 A5	B1 B3 B5 B6	C2	D1 D2
Case studies	Elaboration and presentation of works on selected state-of-the-art methodologies	15	A1 A2 A5	B1 B3 B5 B6	C2	D1 D2
Project based learning	Resolution of practical cases of application of the subject by means of autonomous work of the student, and using the techniques learned during the course	20	A1 A2 A5	B1 B3 B5 B6	C2	D1 D2
Objective questions exam	Tests for continuous assessment during the course. Evaluation by means of a final examination of the course as an alternative	25	A1 A2 A5	B1 B3 B5 B6	C2	D1 D2

Other comments on the Evaluation

The evaluation corresponding to the objective test can be passed by means of the programmed tests during the course or by means of a final exam.

Sources of information

Basic Bibliography

Complementary Bibliography

Ian Goodfellow, Yoshua Bengio, Aaron Courville., **Deep Learning.**, MIT Press., 2017

Artigos recentes en revistas e conferencias científicas relevantes: NIPS, ICML, IJCAI, AAAI, ECML, C,

Recommendations

Subjects that are recommended to be taken simultaneously

Visual recognition/V05M185V01203

Subjects that it is recommended to have taken before

Image description and modeling/V05M185V01102

Fundamentals of machine leaming for computer vision/V05M185V01103