Teaching Guide				
Identifying Data				2021/22
Subject (*)	Advanced Machine Learning for Computer Vision		Code	614535008
Study programme	Máster Universitario en Visión por Computador			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Obligatory	6
Language	English			
Teaching method	Hybrid			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da Información			
Coordinador	Rouco Maseda, Jose	E-mail	jose.rouco@udc.es	
Lecturers	Rouco Maseda, Jose	E-mail	jose.rouco@udc.es	
Web				
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.			
Contingency plan	1. Modifications to the contents No change 2. Methodologies All activities are maintained. The teaching will be online and the lessons will take place synchronously in the official schedule of classes. It may be that, for reasons of inconvenience, some of the classes will be held asynchronously, which will be communicated to the students in advance. 3. Mechanisms for personalized attention to students The tutorials will be telematic and will require an appointment. 4. Modifications in the evaluation No change in the evaluation. Evaluation activities that cannot be carried out in person will be carried out telematically through the institutional tools in Office 365 and Moodle. In this case, a series of validation measures will be required, which will require the students to have a device with a microphone and a camera, while appropriate validation software is not available. An interview may be arranged with each student to comment on or explain part or all of the tests carried out. In these scenarios, some of the activities under each heading may be modified, adapting them to the situation, but not their overall contribution to the final grade (the weighting percentage) 5. Modifications to the bibliography or webgraphy No change			

Study programme competences	
Code	Study programme competences
A2	CE2 - To know and apply machine learning and pattern recognition techniques applied to computer vision
B1	CB6 - To 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

B2	CB7 - That students are 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
B5	CB10 - That students possess the learning skills to enable them to continue studying in a largely self-directed or autonomous manner
B6	CG1 - Ability to analyze and synthesize knowledge
B8	CG3 - Ability to develop computer vision systems depending on existing needs and apply the most appropriate technological tools
B10	CG5 - Ability to identify unsolved problems and provide innovative solutions
B11	CG6 - Ability to identify theoretical results or new technologies with innovative potential and convert them into products and services useful to society
C1	CT1 - 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
C2	CT2 - Ability to work as a team, organize and plan

Learning outcomes			
Learning outcomes	Study programme competences		
To know, apply and evaluate advanced neural models.	AC2	BC1 BC2 BC5 BC6 BC8 BC10 BC11	CC1 CC2
To know deep learning techniques, with end-to-end training approaches, and minimizing the use of tagged data.	AC2	BC1 BC2 BC5 BC6 BC8 BC10 BC11	CC1 CC2
To solve computer vision applications using advanced machine learning methods.	AC2	BC1 BC2 BC5 BC6 BC8 BC10 BC11	CC1 CC2

Contents	
Topic	Sub-topic
Multilayer perception and backpropagation.	
Convolutional and recurrent networks	
Principles of deep learning	
Self-supervised learning and autoencoders	
Advanced neural models for computer vision.	
Advanced supervised learning paradigms	
Selected topics in machine learning for computer vision	
Advanced applications in computer vision.	

Planning

Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	10	20	30
Case study	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	4	16	20
Objective test	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	2	0	2
Laboratory practice	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	16	32	48
Research (Research project)	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	10	40	50
Personalized attention		0	0	0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Participatory lessons with the aim of learning the theoretical content of the subject
Case study	Elaboration and presentation of selected state-of-the-art methodologies related to the subject.
Objective test	Continuous evaluation tests during the course. Evaluation by examination at the end of the course as an alternative.
Laboratory practice	Analysis and resolution of practical cases with the aim of strengthening the practical application of the theoretical content. Practice in computer classrooms, learning based on the resolution of practical cases, autonomous work and independent study of the students, and group work and cooperative learning.
Research (Research project)	Learning based on the resolution of practical cases, autonomous work and independent study of the students, and group work and cooperative learning.

Personalized attention	
Methodologies	Description
Research (Research project) Case study Laboratory practice	< br>Resolution of doubts during laboratory practices. Individualized advice during research projects and case studies.

Assessment			
Methodologies	Competencies	Description	Qualification
Research (Research project)	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	Resolution of practical cases of application of the subject through autonomous work of the student, and using the techniques learned during the course	20
Case study	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	Elaboration and presentation of works on selected state-of-the-art methodologies	15
Laboratory practice	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	Analysis and resolution of practical cases with the aim of strengthening the practical application of theoretical content	40
Objective test	A2 B1 B2 B5 B6 B8 B10 B11 C1 C2	Continuous evaluation tests during the course. Evaluation by examination at the end of the course as an alternative	25

Assessment comments
The evaluation corresponding to the objective test may be passed by means of the tests scheduled during the course or by means of the final exam.

Sources of information	
Basic	
Complementary	Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning. MIT Press. 2017. Artigos recentes en revistas e conferencias científicas relevantes: NIPS, ICML, IJCAI, AAAI, ECML, CVPR, ICDM, IEEE PAMI, IEEE TKDE, etc.

Recommendations
Subjects that it is recommended to have taken before
Fundamentals of Machine Learning for Computer Vision /614535007 Image Description and Modeling/614535004
Subjects that are recommended to be taken simultaneously
Visual Recognition/614535005
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.