Teaching Guide				
Identifying Data				2023/24
Subject (*)	Computer Vision II		Code	614544018
Study programme	Máster Universitario en Intelixencia Artificial			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	6
Language	English			
Teaching method	Hybrid			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da Información			
Coordinador	Barreira Rodriguez, Noelia	E-mail	noelia.barreira@udc.es	
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Web				
General description	The main objective of this subject is to study in more detail the computer vision techniques, in particular, advanced image segmentation, classification, detection and tracking techniques, as well as the applications of AI in the field of vision. Moreover, applications to solve real problems in this field will be studied. This subject will also provide the tools to apply the algorithms to practical cases and to develop new algorithms.			

Study programme competences / results	
Code	Study programme competences / results
A24	CE23 - Understanding and command of basic concepts and techniques of digital image processing
A25	CE24 - Ability to apply different techniques to computer vision problems
A26	CE25 - Knowledge and ability to design systems for detecting, classifying and tracking objects in images and video
A27	CE26 - Understanding and command of the multiple ways to represent images and signals in terms of their associated data and their main features
B1	CG01 - Maintaining and extending theoretical foundations to allow the introduction and exploitation of new and advanced technologies in the field of AI
B3	CG03 - Searching and selecting that useful information required to solve complex problems, with a confident handling of bibliographical sources in the field
B5	CG05 - Working in teams, especially of multidisciplinary nature, and being skilled in the management of time, people and decision making
B6	CB01 - Acquiring and understanding knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, frequently in a research context
B7	CB02 - The students will be able to apply the acquired knowledge and to use their capacity of solving problems in new or poorly explored environments inside wider (or multidisciplinary) contexts related to their field of study
B10	CB05 - The students will acquire learning abilities to allow them to continue studying in way that will mostly be self-directed or autonomous
C3	CT03 - Use of the basic tools of Information and Communications Technology (ICT) required for the student's professional practice and learning along her life
C4	CT04 - Acquiring a personal development for practicing a citizenship under observation of the democratic culture, the human rights and the gender perspective
C8	CT08 - Appreciating the importance of research, innovation and technological development in the socioeconomic and cultural progress of society

Learning outcomes	
Learning outcomes	Study programme competences / results

To know and to know how to use advanced image analysis techniques	AC24 AC25	BC1 BC3 BC6 BC10	CC4 CC8
To know and to know how to use advanced image processing techniques	AC23 AC24	BC1 BC3 BC6 BC10	CC4 CC8
To know how to analyse, design and develop solutions based on advances image processing and analysis techniques	AC24 AC26	BC5 BC7	CC3
To know how to evaluate the suitability of the methodologies applied in specific problems	AC24 AC25	BC6 BC7	CC3

Contents	
Topic	**Sub-topic**
Image classification	
Image segmentation	
Object detection	
Visual search	
Video processing	Optical flow Object tracking
Aspects of 3D	Skeletonization Symmetry
Structure from motion	3D depth estimation SLAM

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Laboratory practice	A25 B1 B3 B7 C3	14	42	56
Research (Research project)	A25 A26 B5 B7 C3	7	35	42
Mixed objective/subjective test	A24 A27 B1 B7	2	0	2
Guest lecture / keynote speech	A24 A27 B1 B6 B10 C4 C8	21	21	42
Personalized attention		8	0	8
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Laboratory practice	Analysis and resolution of practical cases using techniques learned in lectures.
Research (Research project)	Proposal of assignments in image analysis that require to identify the problem, to formulate it precisely, to develop suitable procedures, to interpret the results and to extract appropriate conclusions about the work.
Mixed objective/subjective test	Test with questions about the theoretical contents of the subject as well as practical problems.
Guest lecture / keynote speech	Oral presentation using audiovisual material and student interaction designed to transmit knowledge and encourage learning.

Personalized attention	
Methodologies	**Description**

Laboratory practice Research (Research project)	Teachers will answer the doubts during the laboratory practice. Teachers will provide personal advising for the supervised projects.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A25 B1 B3 B7 C3	Practical exercises about the topics learned in the lectures. It will be assessed the suitability of the proposed solutions and the quality of the obtained results.	40
Research (Research project)	A25 A26 B5 B7 C3	Assignments that consist of the development of image processing and computer vision applications. It will be assessed the suitability of the proposed solutions and the quality of the obtained results.	60
Mixed objective/subjective test	A24 A27 B1 B7	Written test with theoretical questions and practical problems to be solved.	0

Assessment comments
The laboratory practice during the year is 40% of the final grade. However, students can achieve this percentage of the final grade with mixed test. This way, if the laboratory exercises are submitted, the exam is optional. If a student submits the laboratory practice and takes the mixed test, the mark obtained in the mixed test will prevail over the mark got in the laboratory practice. If the student does not deliver any of the assignments or takes the exam, he/she will be considered as "absent". In the second chance: In case of an "absent" student in the first chance, the assessment will comprise the research projects (up to 60%) and the mixed text (up to 40%). If the student has summited the laboratory practice and/or any research project but he/she has not passed the subject, the first chance marks in both parts will be kept. To pass the subject, the student should submit the non-delivered/failed research projects and/or take the mixed test.

Sources of information	
Basic	- M. Sonka, V. Hlavac, R. Boyle (2015). Image Processing, Analysis and Machine Vision. Cengage Learning - M. Elgendy (2020). Deep Learning for Vision Systems. Manning - R. Szeliski (2010). Computer vision: algorithms and applications. Springer
Complementary	- I. Goodfellow, Y, Bengio, A. Courville (2016). Deep Learning. MIT Press

Recommendations
Subjects that it is recommended to have taken before
Computer Vision I/614544017
Subjects that are recommended to be taken simultaneously
Deep Learning /614544013
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.