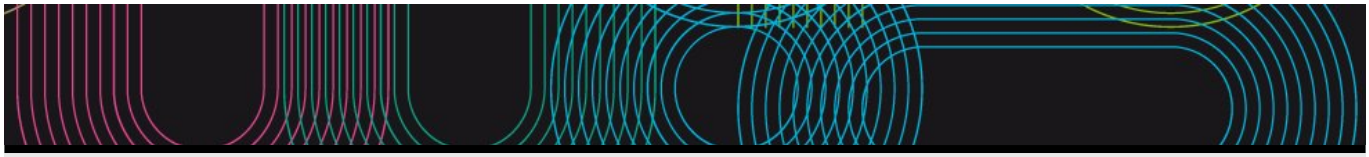

IDENTIFYING DATA				
Image and video analysis				
Subject	Image and video analysis			
Code	V05G306V01416			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	English			
Department				
Coordinator	Alba Castro, José Luis			
Lecturers	Alba Castro, José Luis			
E-mail	jalba@gts.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject is the continuation of the one of 3º Image Processing Fundamentals. The student will acquire knowledges and competence on high level techniques to analyse images and extract information of interest for different applications. The subject is taught and evaluated in English. The documentation is in English.			

Training and Learning Results	
Code	
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
B10	CG10 The ability for critical reading of scientific papers and docs.
B12	CG12 The development of discussion ability about technical subjects
C73	(CE73/OP16) The ability to construct, exploit and manage artificial vision, medical imaging, and multimedia data base systems.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

Expected results from this subject	Training and Learning Results		
Understand the foundations of standard techniques to analyze images.	B10 B12		D2
Apply image analysis techniques in computers.	B9 B12	C73	D4
Understand the foundations of image description techniques in advanced systems.	B10 B12		D2
Identify different analysis necessities for different imaging systems.	B9 B12	C73	D4
Design an image and video analysis and description system.	B4 B9	C73	D4

Contents
Topic

Image analysis	Overview of color spaces. Spatial filters.Filters and the convolutional networks. Segmentation based in colour, textures, outlines and models. Segmentation by means of trained models. Extraction of descriptive characteristics and invariants. There will be a hands-on practice for this part, programming a small project.
Description and classification of objects.	Clustering. Image descriptors. Classical and probabilistic decisors. Classification. convolutional neural networks (CNN). Deep learning based object detection. There will be a hands-on practice for this part, programming a small project.
Applications	Description of end-to-end pipeline processing. Classical approximation, with models of deep and hybrid learning. Real-time video processing There will be a hands-on practice for this part, programming a small project.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	10	20
Mentored work	24	82	106
Presentation	3	6	9
Introductory activities	3	0	3
Objective questions exam	2	0	2
Report of practices, practicum and external practices	0	10	10

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

Methodologies

	Description
Lecturing	Each 3-hour class will include one hour of explanation of subject contents, encouraging critical discussion and assimilation through computer programming and visualization.
Mentored work	Each 3-hour session will include 2 hours of "hands-on" working to assimilate the explained concepts through problem-based learning (PBL). Every Problem/Task will take several weeks of the subject during which the student will have to discover, alone or with the professor guidance, what he needs to solve the problem effectively.
Presentation	The third and last task will be presented in front of the class mates. The students from the same group will have to split the presentation, so both of them explain one part of the work.
Introductory activities	In the first class of the course, concepts learned in FPI and the programming tools for the course will be reviewed.

Personalized assistance

Methodologies	Description
Introductory activities	The introductory activities are related to motivation for learning how to to develop projects in real-life.
Lecturing	During the master sessions, the teacher asks questions to the class and/or specific student to grab their attention about the current topic.
Mentored work	This methodology gives a lot of room for personalized attention. The teacher sits with each of the groups and guides every student through the step-by-step process of building a solution.
Presentation	Every time a student has to deliver a presentation (in the last guided task and also when challenged to beat another group in a specific subtask), the teacher explains him/them how to improve the impact of their presentation.

Assessment

	Description	Qualification	Training and Learning Results
Objective questions exam	Each part of the subject has theoretical concepts that are explained in class. The concepts are assessed through these tests, that are also formally linked to the delivery of each guided task. They are meant to grade each student individually. They help to assess general competence A82. The concepts are discussed in class and also individually through the e-learning platform and/or counseling hours.	30	B10 C73 B12

Report of practices, practicum and external practices	Each part of the subject is learnt through a hands-on guided task. Most of the teacher's time is devoted to discuss, both in group and individually, how to go step by step through the process of building a solution. The score of the guided task includes: the follow-up of each student, the techniques used, the results achieved, the quality of the report and the oral presentation of the last one. The guided tasks help to assess general competences A4, A82, B1 and B3.	70	B4 B9	C73	D2 D4

Other comments on the Evaluation

The language of instruction and assessment is English.

Attendance in Continuous Assessment (CA) is mandatory, except under exceptional circumstances. CA is used to evaluate the course, based on the student's work in the laboratory and assignments related to the course content.

There is a Global Assessment (GA) exam on the official date set by the School Board, for students who have not passed CA and wish to pass the course. This GA exam will be graded from 0 to 10 points and includes all course topics along with concepts and techniques explained in the assignments. To pass, the student must score at least five points. Students who wish to improve their CA grade may also take this exam, in which case the final course grade will be the higher of the CA grade or the GA grade.

Throughout the semester, students will receive feedback on their progress in CA, along with the grades of each assignment and associated tests. Submitting any assignment or test constitutes official participation in CA, implying that the student has registered for the course even if they do not take the final exam.

The extraordinary opportunity at the end of the academic year will consist of an exam for students who have not passed either CA or GA. The course grade will be the grade of this extraordinary exam. This exam will be graded from 0 to 10 points and includes all course topics. To pass, the student must score at least five points.

In conducting academic activities for this course, the use of generative artificial intelligence (GAI) is permitted and encouraged. Its use should be ethical, critical, and responsible. If GAI is used, any results it provides should be critically evaluated, and any citations or references generated should be carefully verified. Additionally, the use of such tools must be declared. Failure to declare their use will be considered another form of plagiarism.

If plagiarism is detected in any tests or assignments, the final grade will be FAIL (0) and the incident will be reported to the school administration for appropriate action.

Sources of information

Basic Bibliography

Rafael C. Gonzalez, Richard E. Woods, **Digital Image Processing**, 3ª (2008),

Robert Laganière, **OpenCV 2 Computer Vision Application Programming Cookbook**, 2011,

Complementary Bibliography

Richard O. Duda, Peter E. Hart, David G. Stork, **Pattern Classification**, 2ª (2001),

Recommendations

Subjects that it is recommended to have taken before

Fundamentals of Sound and Image/V05G301V01209
Fundamentals of Image Processing/V05G301V01333
Multimedia Signal Processing/V05G301V01321
Video and Television/V05G301V01329