Course guide
2709951 - CV - Computer Vision

Last modified: 30/01/2026

Unit in charge: Barcelona School of Informatics
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN INNOVATION AND RESEARCH IN INFORMATICS (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN DATA SCIENCE (Syllabus 2021). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer:

Others: Segon quadrimestre:
MANUEL FRIGOLA BOURLON - 10

PRIOR SKILLS

Basic statistics, elementary programming, algebra.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
CTR6. REASONING: Capacity for critical, logical and mathematical reasoning. Capability to solve problems in their area of study. Capacity for abstraction: the capability to create and use models that reflect real situations. Capability to design and implement simple experiments, and analyze and interpret their results. Capacity for analysis, synthesis and evaluation.

TEACHING METHODOLOGY

The teaching methodology will generally be deductive in nature. An attempt will be made to avoid the expository/lecture method. The approach will be based on:
- proposing a problem
- trying to solve it
- adding the necessary pieces of theory to be able to solve the problem adequately.

During the practices, cooperative learning will also be worked on, for solving the problem as a team.

LEARNING OBJECTIVES OF THE SUBJECT

2.Understand the limitations and capabilities of computer vision algorithms.

STUDY LOAD

Type	Hours	Percentage
Self study	102,0	68.00
Hours large group	24,0	16.00
Hours small group	24,0	16.00

Total learning time: 150 h

CONTENTS

Fundamentals of digital imaging

Description:
Types of images according to the different areas. Intensity images. Color images. 3D image for tomography, MRI, ultrasound images, etc. Color Spaces.

Digital image processing

Description:
Gray level transformations. Linear operators. Convolution. Image enhancement and smoothing. Contour detection. Nonlinear operators. Morphological filters. Geometric transformations.

Image segmentation.

Description:
Image binarization: global, local. Image segmentation: watershed, k-means, grouping by color.

Image descriptors

Description:
Numerical shape descriptors, regions, color histograms, Fourier descriptors, singular points, Haar.

Image recognition using Machine Learning

Description:
Image recognition and classification using descriptor vectors. Perceptual hash of images.

Image recognition using Deep Learning

Description:
Main deep neural networks for object detection and localization in images.

ACTIVITIES

Development of topic 1 of the subject

Full-or-part-time: 12h
Practical classes: 4h
Self study: 8h

Development of topic 2 of the subject

Full-or-part-time: 20h
Practical classes: 8h
Self study: 12h

Development of topic 3 of the subject

Full-or-part-time: 12h
Practical classes: 4h
Self study: 8h

Development of topic 4 of the subject

Full-or-part-time: 20h
Practical classes: 8h
Self study: 12h

Development of topic 5 of the subject

Full-or-part-time: 12h
Practical classes: 4h
Self study: 8h

Development of topic 6 of the subject

Full-or-part-time: 12h
Practical classes: 4h
Self study: 8h

Development of a real computer vision project

Specific objectives:
2

Related competencies :
CTR6. REASONING: Capacity for critical, logical and mathematical reasoning. Capability to solve problems in their area of study. Capacity for abstraction: the capability to create and use models that reflect real situations. Capability to design and implement simple experiments, and analyze and interpret their results. Capacity for analysis, synthesis and evaluation.

Full-or-part-time: 56h
Practical classes: 16h
Self study: 40h

Presentation of the computer vision project

Full-or-part-time: 5h 54m
Practical classes: 4h
Self study: 1h 54m

GRADING SYSTEM

The subject will be evaluated continuously. Throughout the course, a series of exercises will be requested that will serve to evaluate the student. There will be no final exam.

The final grade for the subject (NF) will be obtained from the practices that are compulsorily done in class in person (LAB) and from the submissions of the practices that the student must work on at home (HW). Some exercises will be solved in groups and some individually. In group exercises the grade will be unique for all its components.
The final grade will be calculated as follows:

NF = Average(HW) * 0.5 + Average(LAB) * 0.5

Where, HW and LAB represent the vector of grades for the work done at home and in the laboratory respectively.

BIBLIOGRAPHY

Basic:
- Torralba, Antonio; Isola, Phillip; Freeman William T. Foundations of computer vision. The MIT Press, 2024. ISBN 9780262378673.