COURSE DATA

DATA SUBJECT

Code: 36421
Name: Image processing
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	Escola Tècnica Superior d'Enginyeria	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1406 - Degree in Data Science	Signals	COMPULSORY

COORDINATION

BENAVENT GARCIA MARIA ROSER

SUMMARY

Students on this course are introduced to the fundamentals of image processing from the point of view of data science, the concept of digital image, and the various ways of representing an image. They learn the basic methods of image preprocessing for contrast modification, noise elimination and edge enhancement as well as techniques for extracting the features of the image and for segmenting the image.

The lecture classes will be taught in Spanish. The language for the practical and laboratory classes will be stated in the course guidelines available on the website for this degree.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Given the basic nature of this course and its position in the curriculum, the only prerequisites are those stipulated for admission to the degree.

COMPETENCES / LEARNING OUTCOMES

1406 - Degree in Data Science

(CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

(CE10) Ability to digitally process signals and extract information from them.

(CG06) Ability to access and manage information in different formats for subsequent analysis in order to obtain knowledge from data.

(CG07) Ability to autonomously make decisions and to properly and originally elaborate reasoned arguments, in order to obtain reasonable and contrastable hypotheses.

(CT02) To be able to complete technical, scientific, social and human training in general, and to organise self-learning with a high degree of autonomy.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

DESCRIPTION OF CONTENTS

1. Fundamentals of the digital image

Introduction to computer vision, acquisition, geometry, topology, sampling, quantization, color.

2. Transformations of the image in the spatial and frequency domain.

Spatial processing: convolutions and correlation. Domain of frequency. Fourier transform. Arithmetic, logical and geometric operations. Binary mathematical morphology.

3. Image preprocessing

Contrast manipulation. Elimination of noise. Edge enhancement.

4. Image formats and image data compression

Image formats. Compression techniques with and without losses.

5. Feature extraction.

Low-level features extraction: color, shape and texture. Motion analysis.

6. Image segmentation and classification.

Image segmentation. Segmentation methods: thresholding, region-based, Watershed transform. Classification.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	5,00
Individual or group project	20,00
Independent study and work	20,00
Preparation of lessons	25,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

MD1 - Theoretical activities.

The main concepts will be explained and illustrated with examples, sometimes using computer tools. Students will complete online questionnaires via the e-learning platform before attending the lecture sessions to encourage them to participate in these sessions and increase their understanding of the contents presented. (CG06, CB01, CB05, CT02, CE10).

MD2 - Practical activities.

Exercises during the course will be solved either by the students themselves or by the teacher. After each thematic unit, students will complete individual exercises (workshops) via the e-learning platform. These exercises will be corrected by the students themselves by comparing their own work with the solutions suggested by their lecturers, as well as viewing evaluable interactive videos. A mini-project will be proposed based on a topic of the subject. This work will be done in pairs/individually (CG07, CT02, CE10).

MD3 - Cross-disciplinary competences.

Attendance at all activities related to digital image processing will be encouraged. (CT02).

MD4 - Laboratory work and/or computer classroom.

At each laboratory session students will complete a practice activity on the contents viewed in the group theoretical classes. Students will then prepare a report on each practice session individually or in pairs in accordance with the work conducted in the laboratory. (CG06, CG07, CE10).

The University of Valencia's e-learning platform (*Aula Virtual*) will be used to communicate with students. Students will also have access to the learning materials used in class and the problems and exercises they need to solve via this platform.

EVALUATION

Evaluation will be continuous throughout the course and will comprise the following components:

SE1 - An objective test will consist of one or more exams comprising theoretical and practical issues and problems. At the first examination sitting, the score obtained on these exams will account for 50% of the final grade. Students will need to obtain a minimum score of 5 points out of 10 on this component to pass the course (CG06, CB01, CB05, CT02, CE10).

SE2 - Evaluation of practical activities will be based on the student's papers, reports, online tests and/or oral presentations. Attendance at these activities, which will be conducted in the computer laboratory, is compulsory unless absence is properly justified. The score students obtain on this component will account

for 30% of their final grade. (CG06, CG07, CE10).

SE3 - Continuous assessment will be based on the student's participation and degree of involvement in the teaching-learning process, attendance at face-to-face activities, solution of issues and problems set periodically, and presentation and exposition of assignments. The score they obtain on this component will account for 20% of the final grade. (CG07, CT02).

The activities conducted for components SE2 and SE3 cannot be re-taken.

At the second examination sitting, an exam will account for 60% of the final grade. To pass the course, students will need to obtain a minimum of 5 points out of 10 on this exam. The grade students obtained during the academic year on component SE2 will account for 30% of the final grade. If the student has not realized the SE2 activities during the school period, there will be a test/oral exam that assesses the specific knowledge of this block. The grade obtained during the teaching period in the SE3 block will be maintained (which is non-recoverable) and will represent 10% of the final grade in this second call.

Copying or plagiarism or any other fraudulent practice in any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

In all cases the evaluation system will be governed by the University of Valencia's regulations on grading and assessment for bachelor's degrees and master's degrees, which is available at:

http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf

REFERENCES

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Hall, 1999

- Peters, James F. (2017) Foundations of Computer Vision: Computational Geometry, Visual Image Structures and Object Shape Detection. [Recurs electrònic].

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