

Computer Vision

Examen V

SAPIENZA
UNIVERSITÀ DI ROMA



Los Del DGIIM, losdeldgiim.github.io

Doble Grado en Ingeniería Informática y Matemáticas
Universidad de Granada

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Descripción Examen final escrito de Computer Vision.

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Duración 60 min.

Observación. The total sum of all the exercises is 32 points, although the maximum mark of the exam is 30.

Ejercicio 1 (8 points). Explain the role of scale-space representation in computer vision. In your answer, discuss:

- a) Why analyzing an image at multiple scales can be useful.
- b) How Gaussian filtering is used to construct a scale-space representation.
- c) The difference between smoothing at a single scale and building a Gaussian pyramid.
- d) One application where multi-scale analysis is important.

Ejercicio 2 (8 points). Describe the Harris corner detector. In your answer, explain:

- a) The intuition behind detecting corners using local intensity variations.
- b) The role of the second-moment matrix.
- c) How the corner response function is computed and interpreted.
- d) Whether the detector is robust to rotation, intensity changes, and scale changes. Justify your answer.

Ejercicio 3 (8 points). Explain the concept of epipolar geometry between two images. In your answer, discuss:

- a) The meaning of epipolar lines and epipoles.
- b) How the fundamental matrix relates corresponding points in two images.
- c) Why the fundamental matrix has rank 2.
- d) How epipolar geometry can reduce the search space in stereo matching.

Ejercicio 4 (8 points). A surveillance camera is used to monitor a fixed outdoor area. During the day, illumination changes strongly because of shadows, clouds, and sunlight. You need to design a traditional computer vision method to detect moving objects while reducing false detections caused by lighting variations. Describe:

- a) Which preprocessing steps you would apply.
- b) How you would model the background and detect foreground regions.
- c) How you would distinguish real object motion from illumination changes or shadows.