

Computer Vision

Examen IV

SAPIENZA
UNIVERSITÀ DI ROMA



Los Del DGIIM, losdeldgiim.github.io

Doble Grado en Ingeniería Informática y Matemáticas
Universidad de Granada

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Grupo Grupo A.

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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). Discuss the role of image derivatives in edge and corner detection. In your answer, explain:

- a) The meaning of first-order and second-order image derivatives.
- b) How gradient magnitude and gradient direction are used for edge detection.
- c) How second-order derivatives can be used to identify intensity transitions.
- d) Why are derivative-based methods sensitive to noise and how can mitigate that.

Ejercicio 2 (8 points). You are given a set of images of the same building taken from different viewpoints, some images contain repeated structures such as windows, columns, or similar textures. You need to build a robust image matching pipeline for 3D reconstruction. Describe:

- a) Which local features and descriptors you would use and why.
- b) How you would match descriptors between image pairs.
- c) How you would remove incorrect matches caused by repeated patterns.

Ejercicio 3 (8 points). Explain the concept of homography and its use in image alignment. In your answer, discuss:

- a) What a homography matrix represents geometrically.
- b) Under which assumptions a homography can correctly map points between two images.
- c) How corresponding feature points can be used to estimate a homography.

Ejercicio 4 (8 points). Describe the process of recovering 3D structure from two calibrated images. In your answer, include:

- a) The role of camera calibration and intrinsic/extrinsic parameters.
- b) How triangulation is used to estimate the 3D position of scene points.