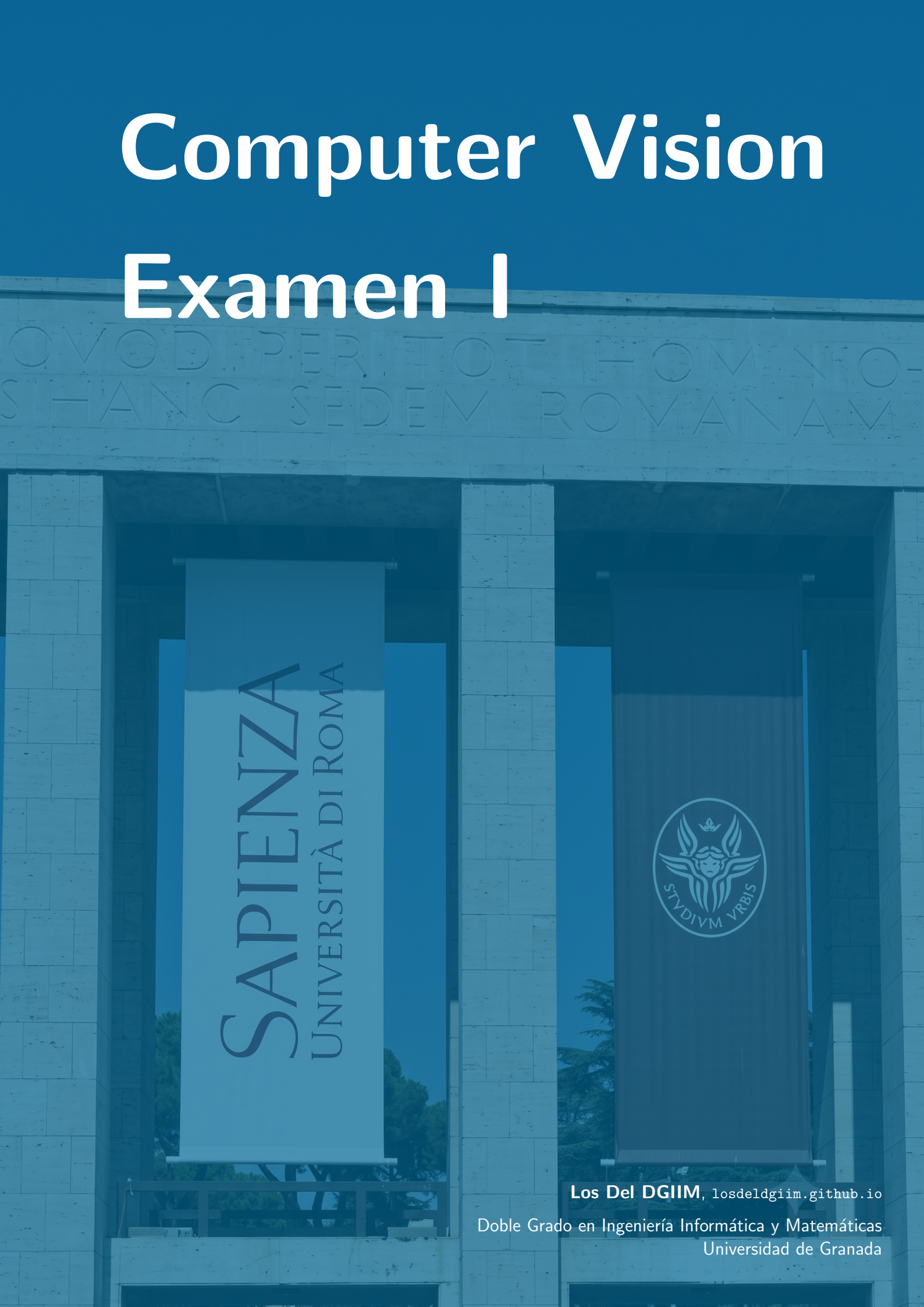
Computer Vision
Examen I



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Doble Grado en Ingeniería Informática y Matemáticas
Universidad de Granada

Computer Vision
Examen I

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Asignatura Computer Vision.

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Grupo Grupo B.

Profesor Irene Amerini.

Descripción Examen final escrito de Computer Vision.

Fecha febrero de 2023.

Duración 100 min.

Observación. In order to pass the exam you need to get 18 and a minimum of 8 points in each of the two parts. The exam consists in 6 exercises.

1. Part I

Ejercicio 1.1 (4 points)**.** Given an image Im and a filter f_1, shows the intermediate passages and the the resulting image g after applying the convolution operator between Im and f_1. Use the following coordinates $(3,3),(1,1),(2,4)$ with zero padding.

$$Im = \begin{bmatrix} 3 & 1 & 2 & 0 \\ 0 & 2 & 1 & 5 \\ 1 & 0 & 1 & 3 \\ 1 & 2 & 0 & 5 \end{bmatrix} \qquad f_1 = \begin{bmatrix} -2 & 3 & 2 \\ 0 & -1 & -2 \\ 1 & -2 & 0 \end{bmatrix}$$

Ejercicio 1.2 (6 points)**.** a. List the main steps of the Harris corner detector.

b. Is the Harris corner detector robust with respect to uniform intensity changes in the image, i.e. uniform intensity shifts and intensity scaling? Justify your answer. Is the Harris corner detector robust with respect to rotation? Justify your answer.

Ejercicio 1.3 (6 points)**.** Describe the optical flow algorithm. What is the aperture problem? What is the direction in the image along which optical flow cannot be reliably estimated?

2. Part II

Ejercicio 2.1 (6 points)**.** Describe the camera calibration algorithm, reporting what is the input data, which quantities can be estimated with it and how it works (starting and ending equations will be sufficient).

Ejercicio 2.2 (6 points)**.** Explain what are the epipoles e and e' in a two-view geometry, reporting also their characteristics, their main features, and the most important epipoles-related equations.

Ejercicio 2.3 (4 points)**.** What is an hierarchical set of features in a Deep Learning model? Do we need to take any special action to build it when employing a deep convolutional neural network?