



METADATA

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Authors: Tziritas, G., Professor Emeritus, UOC, Komodakis, N., Assistant Professor, UOC

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Abstract

The main objectives of the book are to introduce the fundamental concepts and methodologies applied in image processing and analysis and to provide solid knowledge that can be the basis for further study and research in this field. The entire fundamental topics of image processing and analysis are covered, starting from the basic characteristics of images, their digitization, image enhancement by pixel-based processing, as well as spatial filtering or in the frequency domain. Also, the book includes orthogonal transformations with emphasis on the Fourier transform, cosine transform and principal component analysis, as well as wavelet transform. We refer to filtering to smooth images, including noise reduction. Image restoration methods are presented concerning regularization theory. We further focus on the basic methodologies

and techniques of morphological processing. A thorough discussion of image compression techniques is given with a detailed presentation of coding schemes and standards. The localization of image region contours through edge detection and tracking of active contours in level sets is presented in detail. A comprehensive report on image segmentation is given, using both classical methods and Markov random field models, graph cuts and level sets. Corner detection and feature extraction are considered and are also used in the content description, which also includes statistical and geometric features. Matching images based on feature points or dense fields is presented in detail. Finally, an extensive introduction to neural networks and deep learning is included with a focus on convolutional neural networks.

