

# Deep Learning in Biometry

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## Abstract

In the recent years we are witnessing a dominance of deep neural network learning approach in the machine learning field. Eventhough the neural network concept is more than 50 years old, only the recent developments enabled its wide use. Namely, availability of processing power, especially graphical processing units, availability of large databases, and the refined knowledge about the approach itself. Convolutional neural network as a special case of deep learning approach is widely used in computer vision domain, also in biometry. A lot of image material is obtained through surveillance scenarios, where we can use modalities like face, gait, and ears for recognition, normally within a multibiometrics system. Each modality has to be first detected and then recognized. The following examples are discussed in this context: 1) network for ear detection in the wild, where, different from competing techniques from the literature, our approach does not simply return a bounding box around the detected ear, but provides accurate and detailed, pixel-wise information about the location of the ears in the image; 2) training network with limited training data for ear recognition in the wild, where we explore different strategies towards model training with limited amounts of training data and show that by selecting an appropriate model architecture, using aggressive data augmentation, and selective learning on existing (pre-trained) models, we are able to learn an effective model; 3) face deidentification (anonymization) with generative network that provides privacy guaranties and at the same time retains certain important characteristics of the data even after deidentification.

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