Automatic Face Recognition System Using Deep Convolutional Mixer Architecture and AdaBoost Classifier

Authors Qaisar Abbas , Talal Saad Albalawi , Ganeshkumar Perumal and M. Emre Celebi

Publication Year 2023
Grant Number IMSIU-RP23047
DOI link https://doi.org/10.3390/app13179880

Abstract: In recent years, advances in deep learning (DL) techniques for video analysis have developed to solve the problem of real-time processing. Automated face recognition in the runtime environment has become necessary in video surveillance systems for urban security. This is a difficult task due to face occlusion, which makes it hard to capture effective features. Existing work focuses on improving performance while ignoring issues like a small dataset, high computational complexity, and a lack of lightweight and efficient feature descriptors. In this paper, face recognition (FR) using a Convolutional mixer (AFR-Conv) algorithm is developed to handle face occlusion problems. A novel AFR-Conv architecture is designed by assigning priority-based weight to the different face patches along with residual connections and an AdaBoost classifier for automatically recognizing human faces. The AFR-Conv also leverages the strengths of pre-trained CNNs by extracting features using ResNet-50, Inception-v3, and DenseNet-161. The AdaBoost classifier combines these features' weighted votes to predict labels for testing images. To develop this system, we use the data augmentation method to enhance the number of datasets using human face images. The AFR-Conv method is then used to extract robust features from images. Finally, to recognize human identity, an AdaBoost classifier is utilized. For the training and evaluation of the AFR-Conv model, a set of face images is collected from online data sources. The experimental results of the AFR-Conv approach are presented in terms of precision (PR), recall (RE), detection accuracy (DA), and F1-score metrics. Particularly, the proposed approach attains 95.5% PR, 97.6% RE, 97.5% DA, and 98.5% of F1-score on 8500 face images. The experimental results show that our proposed scheme outperforms advanced methods for face classification.