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Face Recognition: A Dynamic Analysis Model

(FaceRec-ADAM)

1. Abstract

Numerous attempts have been made in the past to carry out the task of face recognition efficiently. This problem expands its horizons, engulfing the challenges of image enhancement, image segmentation and feature extraction. A variety of algorithms present today act as tools to solve this very challenge of facial recognition. Each tool set provided, although excel in certain scenarios, are associated with some challenges and limitations. The limitations posed by such algorithms is what we aim to explore in this work by comparing their individual outcomes.

2. Introduction

Face recognition is a remarkable ability of human vision, but till date remains one of the greatest challenge to be implemented on a machine. The impact of face recognition spans across multiple fields, the most widespread use case being that of mobile phone security. In our work, we initially construct multiple models using various feature extractors and classifiers. Further we evaluate performances of such models to understand the effects of changing hyper-parameters on the accuracy of these model. Finally, we aim to build a system that compares such models in real time and provides the best results based on dynamic analysis.

3. Related Work

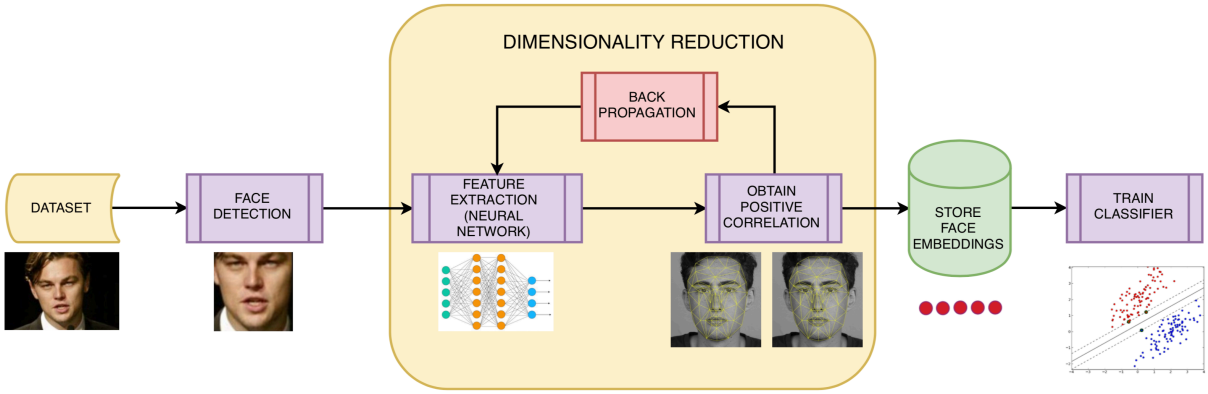
Over the last 20 years, several different techniques have been proposed for facial recognition. *"Face Recognition: Features versus Templates"* [1] shows implementations of two algorithms, first one is based on computation of set of geometrical features, such as nose width and length, and the second one is based on almost grey-level template matching. *"Face Recognition: A Convolutional Neural-Network Approach"* [2] presents a hybrid neural-network for human face recognition which compares favorably with other methods. The system combines local image sampling, a self-organizing map (SOM) neural network, and a convolutional neural network. *"Face Recognition System Using SVM Classifier and Feature Extraction by PCA and LDA Combination"* [3], presents a method for face recognition based on combination of PCA (Principal Component Analysis), LDA (Linear Discriminant Analysis) and SVM (Support Vector Machine). A combination of PCA and LDA was used for feature extraction and classification was carried out using SVM.

While [1] uses Frontal images of faces of 47 people: 26 males and 21 females, four images per person, [2] and [3] makes use of ORL face database consisting of 400 images of 40 individuals

(10 face images per person) which contains a high degree of variability in expression, pose, and facial details. [1] achieved 90% correct recognition using geometrical features and perfect recognition using template matching. In [2], the proposed method resulted in 3.8% error. In [3], PCA+LDA+SVM method had highest recognition rate than other two methods.

4. Approach

We aim to build an end to end system that performs the task of facial recognition. A face recognition system consists of two main stages, enrollment and recognition. In the enrollment stage, we create a database of the different face templates with an identifier assigned to them. The enrollment stage consists of different tasks. [6]



FACE RECOGNITION MODEL

The first task is to detect the faces in the input images and normalize them. Extracting features from the normalized images to reduce the data dimensions is the next task. Finally, the extracted features are stored as a template with an identifier in a database [7]. In the recognition stage, the initial stages are the same as the enrollment stage, where you carry out face detection and normalization in the test image and then do feature extraction. But, in the final stage, the extracted features are compared with the templates in the database to decide whether the new feature set matches one of the templates in the database. To build such an exhaustive system that encompasses all the possibilities we need to carry out performance analysis that provide us with feedback on their reliability [8].

5. Evaluation

This project aims to provide a detailed study and comparative analysis of the different algorithms that have been used for different tasks in face recognition systems. Accuracy and execution time will be evaluated for the comparison.

By comparing the different algorithms using metrics like accuracy and execution time we can decide which of them can be used for certain applications and what their shortcomings are. We also aim to evaluate the performance of facial recognition models generated after combining such algorithms.

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