Face Recognition Challenge

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Abstract:

Face Recognition is a recognition technique used to detect faces of individuals whose images saved in the data set. This technology is the least intrusive and fastest biometric technology. This project aims on building an application based on face recognition using different Python libraries like OpenCV, Numpy, TensorFlow, Keras, etc. The basic purpose is to identify the face and retrieve information stored in the database. It involves the following steps:

1. Load Data from “class” directories.
2. Resize Image: Resize the image to match with the standard size in the model.
3. Feature Extraction: Use CNN filters and pooling to extract features.
4. Model Training: Train the CNN based Model using Original and Augmented images.
5. Input Classification: Classify or Label an image using the trained Model.

Keywords:

Max Pooling, SoftMax, Tanh, Convolutional Neural Networks (CNN), Edge Detection, Feature Detection

Introduction

Face-recognition system is used for the identification or authentication of users, based on their unique facial properties. The primary features are represented using a suitable feature representation scheme and learn the discriminating features over which matching algorithms perform.

Plenty of face recognition methods have been designed that are performing well in controlled environments. It includes some of the prevalent methods such as principal component analysis, linear discriminant analysis, etc. This technology makes use of the fact that each person has specific unique physical traits that are one’s characteristics which can’t be lost, borrowed or stolen.

There are many methods for face recognition. These methods are namely LBPH, Eigenface methods, SVM (Scalar Vector Machine), Fisher face method, Convolutional Neural Networks, etc.

Literature Survey

There are several feature extraction techniques for face recognition. We will discuss two of them which are the PCA based approach and the Convolutional Neural Network based approach.

Principal Component Analysis

PCA is a statistical approach used for reducing the number of variables in face recognition. In PCA, every image in the training set is represented as a linear combination of weighted eigenvector and eigenfaces. These eigenvectors are obtained from covariance matrix of a training image set.

Convolutional Neural Network

This method is proposed to detect faces from different angles and can handle occlusion to some extent and it is also shown that proposed method performance can be further improved by using better sample strategies and augmentation techniques. The technique for active face recognition and acts consistently using human behaviours in usual face recognition scenarios are demonstrated. This network does visual processing more biologically possible which is relevant to the application.

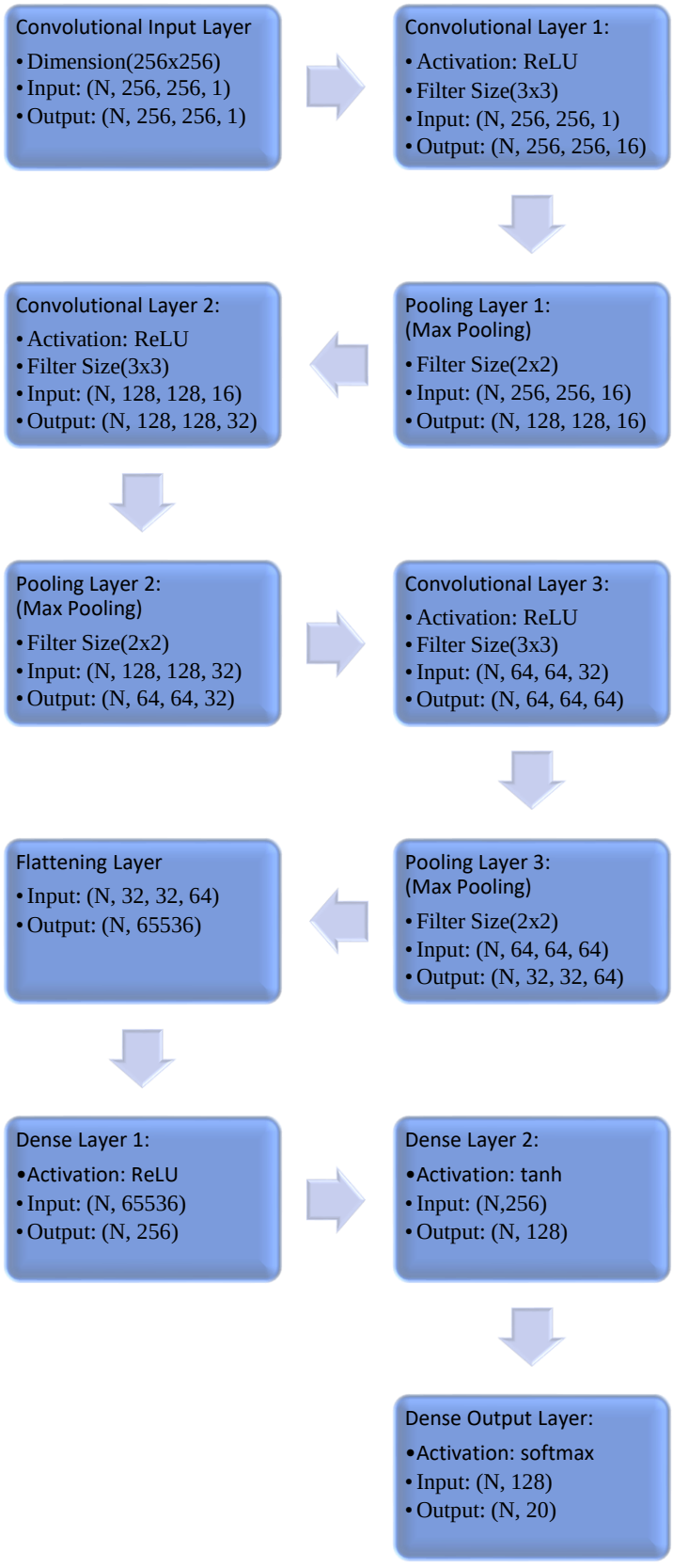
Adam Optimizer

Adam is an adaptive learning rate optimization algorithm that's been designed specifically for the deep neural networks. The algorithm leverages the power of adaptive learning rates methods to find individual learning rates for each parameter.

RMS Loss function has been used for calculating the error in the training the model and Adam optimizer to update the weights in the model.

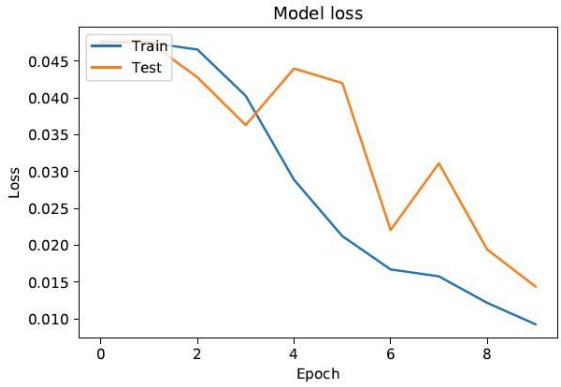
Implementation

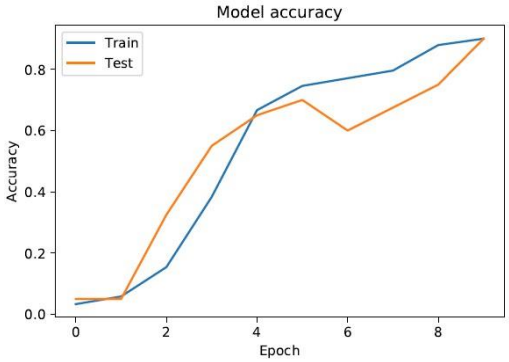
N: Number of input images



Result

The accuracy obtained through Convolutional Neural Networks is around 80-90% (Using 20 classes of data, currently available).





Conclusion

It is observed that face recognition is a dynamic field because of its potential use in a wide range of applications from commercial to private and from the government to the public sector. Face recognition is a highly challenging task having a large application in vast domains. We have used Convolutional Neural Networks technique.

References

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