JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

ATTENDANCE SYSTEM USING MULTIPLE FACE RECOGNITION

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Abstract:

In this rapidly growing technical world with lots of advancement happening every day, we need image classification for efficient data generation and facial data processing. The attendance system using multiple face recognition is a CNN -based system which employes face recognition algorithm to record attendance. The system works by capturing images of everyone's face and analyzing them to determine their identity. The system saves the time by providing solution to manage attendance records. It provides a convenient, time efficient and accurate way of marking attendance, making it ideal for use in Colleges, Universities and Businesses. This paper discusses the architecture, design and implementation of an attendance system the uses face recognition.

***Keywords*:** Deep Learning, CNN, VGG16, TRIPLET LOSS OPENCV, DLIB.

I. INTRODUCTION:

In recent years, because of the need in various industries, the Facial recognition technology has become so popular. One of thew most common applications is attendance system the uses facial recognition to record the attendance. The traditional method used to work manual attendance which was time consuming and not so efficient, then AI worked with fingerprint to mark the attendance of the employees, after the further evolution face recognition technology came in a Deep learning domain. Using multiple face recognition technology, attendance system can improve accuracy, efficiency and reliability.

Multiple face recognition overcomes the overhead of forming queue in front of camera in order to mark the attendance sequentially. Rather it identifies the more than face simultaneously. This technology enables the system to recognize the multiple individuals at the same time, which makes it perfect for even crowded space. It uses sophisticated algorithms to study the facial features such as the distance between the eyes, the shape of the nose, this kind of unique properties helps to identify the individuals accurately.

This paper presents an attendance management system that put to use multiple face recognition technology. The system aims to provide an accurate, time efficient and reliable solution for recording attendance in colleges, institutes. The system's architecture and implementation are discussed, and its performance is evaluated and tunned to demonstrate its accuracy in managing attendance records. The use of multiple face recognition technology is expected to provide a better solution over traditional attendance methods.

Attendance system using face recognition is not a new normal, but after COVID-19 outbreak, there was a need to maintain social distancing and avoid physical contact. Further-more candidates or users have to form a queue in order to mark their which is quite annoying and time consuming in today's rushing lifestyle. After figuring out this problem we developed a touchless attendance system using deep learning model. We tried various approaches using VGG16, VGG19, LBPH, RESNET, MOBILENET and compared the results. We have selected the best approach among them suitable for achieving the project goals. The system has been developed using Flask framework which is a modern, high-level, lightweight Python Web Framework that helps in rapid development and easy to use. It is backed up by powerful DBMS via sqlalchemy. The Basic Steps involved are as followed:
1.Collect Data: Gather data for all the candidates whose faces need to be recognized. This data can be collected using a camera or through existing images and label the collected data with the identities of the individuals in the images.

2.Modify the Siamese Network architecture: You will need to modify the Siamese Network architecture to support multiple faces. One way to do this is by adding a classification layer to the network that can output the identity of the recognized face.
3.Train the model: Train the modified Siamese Network on the labeled dataset. During training, the network should learn to distinguish between the different individuals and output their respective identities.
4.Test the model: Test the trained model on a set of test images to evaluate its performance in recognizing multiple faces. During testing, the model should be able to recognize the identities of the individuals in the images.

About CNN layers:

1.Input layer: This layer simply accepts the input data, including weights and bias, no specific computation is performed on this layer.

2.Convolution Layer: The convolutional layer applies filters to the input image to detect various features such as edges, shapes, and textures. The filters are applied to small regions of the input images, and the output of the layer is a set of feature maps. It's a core building block. It does the feature extraction; model learns everything from the input data.

3.Activation Function Layers: Activation function introduces the nonlinearity. It checks the weather to fire the neuron or not. RELU, SoftMax, sigmoid, tanH are some activation functions used.

4.Pooling Layers: This layer down samples the feature map gained from convolutional layer, chooses spatial data and helps avoiding overfitting by reducing the dimensionality of the data. By this we reduce the number of parameters and emphasizes the important features only to avoid overfitting.

5.Fully-Connected Layer: It's most complicated layer where every neuron in previous layer connected to every neuron in current layer and performs the necessary classification to give the output by using activation functions.

Architecture of CNN model named VGG16 which is used in this project is as follow:

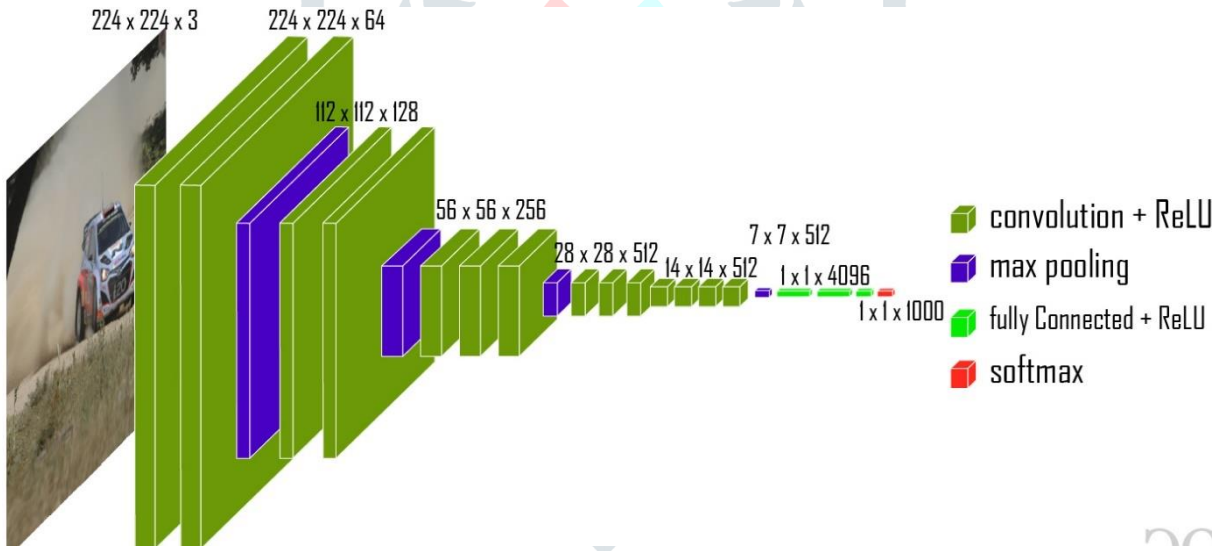

Fig: VGG16 CNN model(gfg)

Working of the project:

We first choose the transfer learning model for the project as the retraining the pretrained model is comparatively easy than training the whole model from scratch. So, we used the transfer learning, where a model trained on similar data is fine-tuned as per the requirement. We choose the VGG16 for face recognition and face classification also as it is the smaller model works well and can work on local system without GPU. This keras model has almost accuracy of 92.7%. Furthermore, the image is captured and then feed to model. The model weights were stored in .h5 file and then loaded to train on the dataset which has around 2622 celebrity faces.

We've used one-shot learning by Triplet loss function for training the network. It takes three images as anchor, positive and negative and tries to reduce the distance between anchor and positive image and reduces the distance between anchor and negative image. The parallelization and L2 regularization is handled by TensorFlow itself. The L2 regularization is applied to the output of 128 Dense layer.

For training we've trained model for 50 epochs on colab. For testing we've used friend's and family's images and then feed to model it extracted the features then those 128D features are passed to Siamese Network which then classifies the images to detect the name of that person. The session id we've generate for each person in that image which is then mapped to store in the database to mark the attendance.

II.TABLE:

CNN Models with accuracy:

Model	Accuracy	Max-Accuracy
Xception	0.809	0.809
VGG16	**0.809**	**0.816**
VGG19	0.813	0.809
ResNet50	0.806	0.816
InceptionV3	0.812	0.806
Inception ResNetV2	0.583	0.812
MobileNet	0.781	0.583
MobileNetV2	0.795	0.781
DenseNetV2	0.569	0.795
DenseNet121	0.797	0.642
DenseNet169	0.799	0.797
NASNetMobile	0.813	0.802
NASNetLarge	0.803	0.806

III.CONCLUSION:

From our findings, it was observed that face recognition systems built using Convolutional Neural Network (CNN) model require huge dataset. To solve this problem, state-of-the-art technique, One-Shot learning is used which makes the proposed system high performant even with less dataset available. One of the ways to implement one-shot learning is training a Siamese Network using a triplet loss function. This paper has focused on developing an attendance system based on face recognition backed by one-shot detection technique. An attempt has been made for improving the accuracy of the Siamese Network and triplet loss functions by applying various methods like avoiding repeated triplets and taking hard triplets. This takes us one step ahead in the process of developing more reliable and efficient face recognition systems that can be used for surveillance, security enhancement, visitor management, etc. However, inability to recognize occluded faces is a limitation of the proposed system and opens up for further research.

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