REAL TIME FACE MASK DETECTOR

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ABSTRACT

The present scenario of COVID-19 demands an efficient face mask detection application. The main goal of the project is to implement this system at entrances of colleges, airports, hospitals, and offices where chances of spread of COVID-19 through contagion are relatively higher. Reports indicate that wearing face masks while at work clearly reduces the risk of transmission. It is an object detection and classification problem with two different classes (Mask and Without Mask). A hybrid model using deep and classical machine learning for detecting face mask will be presented. A dataset is used to build this face mask detector using Python, OpenCV, and TensorFlow and Keras. While entering the place everyone should scan their face and then enter ensuring they have a mask with them. If anyone is found to be without a face mask, beep alert will be generated. As all the workplaces are opening. The number of cases of COVID-19 are still getting registered throughout the country. If everyone follows the safety measures, then it can come to an end. Hence to ensure that people wear masks while coming to work we hope this module will help in detecting it.

Keywords *: Tensorflow, Keras, Covid 19*

1. INTRODUCTION

COVID-19 had a massive impact on human lives. The pandemic lead to the loss of millions and affected the lives of billions of people. Its negative impact was felt by almost all commercial establishments, education, economy, religion, transport, tourism, employment, entertainment, food security and other industries. According to WHO(World Health Organization), 55.6 million people were infected with Coronavirus and 1.34 million people died because of it as of November 2020. This stands next to black death which almost took the lives of 60 percent of population in Europe in the 14th century. After the person gets infected, it takes almost fourteen days for the virus to grow in the body of its host and affect them and in the meantime, it spreads to almost everyone who is in contact with that person. So, it is extremely hard to keep the track of the spread of COVID-19[1].

COVID-19 mainly spreads through droplets produced as a result of coughing or sneezing by an infected person. This transfers the virus to any person who is in direct close contact (within one-meter distance) with the person suffering from coronavirus. Because of this, the virus spreads rapidly among the masses. With the nationwide lockdowns being lifted, it has become even harder to track and control the virus. Face masks are an effective method to control the spread of virus. It had been found that wearing face masks is 96 % effective to stop the spread of virus. The governments, all over the world, have imposed strict rules the everyone should wear masks while they go out. But still, some people may not wear masks and it is hard to check weather everyone is wearing mask or not. In such cases, computer vision will be of great help.

There are no efficient face mask detection applications to detect weather the person is wearing face mask or not. This increases the demand for an efficient system for detecting face masks on people for transportation means, densely populated areas, residential districts, large-scale manufacturers and other enterprises to ensure

safety. This project uses machine learning classification using OpenCV and Tensorflow to detect facemasks on people.

Fig . 1 Data set containing images with and without mask

Fig.1 shows us different types of people's facial images. These images are utilized to achieve the purpose of model training.

1.1 Tensorflow

TensorFlow, an interface for expressing machine learning algorithms, is utilized for implementing ML systems into fabrication over a bunch of areas of computer science, including sentiment analysis, voice recognition, geographic information extraction, computer vision, text summarization, information retrieval, computational drug discovery and flaw
detection to pursue research . In the proposed model, the whole Sequential CNN architecture (consists of several layers) uses TensorFlow at backend. It is also used to reshape the data (image) in the data processing.

1.2 OpenCV

OpenCV (Open Source Computer Vision Library), an open-source computer vision and ML software library, is utilized to differentiate and recognize faces, recognize objects, group movements in recordings, trace progressive modules, follow eye gesture, track camera actions, expel red eyes from pictures taken utilizing flash, find comparative pictures from an image database, perceive landscape and set up markers to overlay it with increased reality and so forth . The proposed method makes use of these features of OpenCV in resizing and color conversion of data image

2. LITERATURE SURVEY

In paper [1] authors Ariya Das, Mohammad Wasif Ansari & Rohini Basak have briefly studied Real time face mask detection and explained the motivation of the work at first. Then, we illustrated the learning and performance task of the model. Using basic ML tools and simplified techniques the method has achieved reasonably high accuracy. It can be used for a variety of applications. Wearing a mask may be obligatory in the near future, considering the Covid-19 crisis. Many public service providers will ask the customers to wear masks correctly to

avail of their services. The deployed model will contribute immensely to the public health care system. In future it can be extended to detect if a person is wearing the mask properly or not.

In paper [2] authors Harish Adusumalli, D. Kalyani , R.Krishna Sri, M.Pratapteja & PVRD Prasada Rao have studied and explained that with the increasing number of COVID cases all over the world, a system to replace humans to check masks on the faces of people is greatly needed. This system satisfies that need. This system can be employed in public places like railway stations and malls. It will be of a great help in companies and huge establishments where there will be a lot of workers. This system will be of a great help there because it is easy to obtain and store the data of the employees working in that Company and will very easy find the people who are not wearing the mask and a mail will sent to that respective person to take Precautions not wearing mask.

In paper[3] authors Roshan M Thomas, Motty Sabu, Tintu Samson, Sihana Mol B, Tinu Thomas the authors have concluded that after the breakout of the worldwide pandemic COVID-19, there arises a severe need of protection mechanisms, face mask being the primary one. According to the World Health Organization, the corona virusCOVID-19 pandemic is causing a global health epidemic, and the most successful safety measure is wearing a face mask in public places. This proposed system can detect and recognize human face(s) in real-time world. Compared to the traditional face detection and recognition system. It can still guarantee a high test rate in a sophisticated atmosphere, andthe speed of detection can meet the real time requirement, and achieve good effect. The proposed model shows greater accuracy and prediction for detecting and recognising human faces. The results show us that the current technology for face detection and recognition is compromised and can be replaced with this proposed work. Therefore, the proposed method works very well in the applications 4of biometrics and surveillance. Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work

3. PROBLEM STATEMENT AND OBJECTIVE

3.1 PROBLEM STATEMENT

As per our study , very little body of research is attempted to detect mask over face. Thus, our project aims to a develop model that can accurately detect mask over the face in public areas (such as airports. railway stations, crowded markets, bus stops, etc.) to curtail the spread of Coronavirus and thereby contributing to public healthcare. The face detection model is to detect the face of individuals and conclude whether they are wearing masks or not at that particular moment when they are captured in the image.

3.1 OBJECTIVES

- To develop a novel object detection method that combines one-stage and two-stage detectors for accurately detecting the object in real-time from video streams with transfer learning at the back end.
- Improved affine transformation is developed to crop the facial areas from uncontrolled real-time images having differences in face size, orientation and background. This step helps in better localizing the person who is violating the facemask norms in public areas/ offices.
- To create unbiased facemask dataset with imbalance ratio equals to nearly one
- To create a proposed model that requires less memory, making it easily deployable for embedded devices used for surveillance purposes.

4. SYSTEM ARCHITECTURE

This chapter describes about the System's Architecture. System Architecture consists of three main modules i.e Training, Deployment & Detection.

1) **Training**: Here we'll focus on loading our face mask detection dataset from disk, training a model (using Keras /Tensorflow) on this dataset, then serializing the face mask detector to disk.

2) **Deployment**: Once the face mask detector is trained,we can then move on to loading the mask detector , performing face detection, and then classifying each face as 'with mask' or 'without mask'

3) **Detection**: In this we will detect the face mask in

a) Detect COVID-19 face masks in images

b) Detect masks in real time video streams

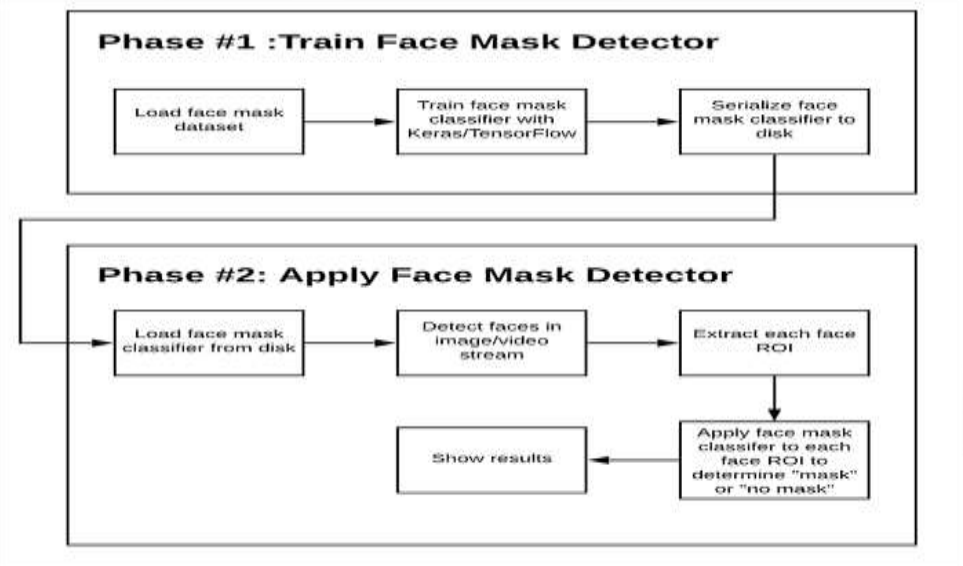

Fig. 2 System Architecture

In fig .2, first a base model is generated. This is done by using Keras and tensorflow. First a base model is generated and a head model is generated on top of that. The head model consists of a network with 128 layers. All these layers combined, will give out model which will be trained. The generated model is then trained with the labeled dataset by splitting it into two portions. One portion contains 75 percent images and it is used for training. The remaining portion contains the remaining 25 percent of images and is used for testing the model accuracy [1]. After the model is trained, it can be used for detection of facemask on human faces. The trained model is loaded and image which contains human faces with or without masks or a continuous video stream with humans is given as input. The image or a frame of the video, in case the input is a video stream, is first sent to the default face detector module for the detection of human faces. This is done by resizing the image or the video frame first, followed by detecting the blob in it. This detected blob is sent to the face detector model which outputs only the cropped face of a person without the background. This face is given as the input to the model which we trained earlier. This outputs weather there is a mask or not.

4. CONCLUSIONS

In this work, a deep learning-based approach for detecting masks over faces in public places to curtail the community spread of Coronavirus is presented. The proposed technique efficiently handles occlusions in dense situations by making use of an ensemble of single and two-stage detectors at the pre-processing level. The ensemble approach not only helps in achieving high accuracy but also improves detection speed considerably. Furthermore, the application of transfer learning on pre-trained models with extensive experimentation over an unbiased dataset resulted in a highly robust and low-cost system. The identity detection of faces, violating the mask norms further, increases the utility of the system for public benefits. In this paper , we have developed a deep learning model for face mask detection using Python, Keras, and OpenCV. We developed the face mask detector model for detecting whether person is wearing a mask or not. We have trained the model using Keras with network architecture. Training the model is the first part of this project and testing using webcam using OpenCV is the second part.

5. REFERENCES

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