Face Mask Detection System for Public Safety

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***Abstract*—The increase in number of cases of infectious diseases in recent times has caused a serious threat to public health. Ways of transmission is different, but the respiratory droplet has the greatest capacity to interrupt social communication, and can be prevented by the face mask. Face masks are part of an infection control method to completely remove the spread of viruses. The ongoing COVID-19 virus has even resulted in a global usage of face masks.But some people are still refuse to put on a mask when they leave the house, without considering the rules in their area. Thi system identifies and warns those who are not willing to wear face masks on public places that include offices,sports venues,hospitals/healthcare organizations,densely populated areas,entertainment and hospitality industry.**

***Index Terms*—Virus,Covid-19,Machine Learning,Face Mask,Face mask classifier Convolutional Neural Network,TensorFlow**

I. Introduction

A. Problem Definition

Face mask detection involves detecting the location of the face and then determining whether it has a mask on it or not. The issue is accurately connect to general object detection method to detect the classes of objects. Face identification categorically deals with distinguishing a specific group of distinct properties, i.e. Face. It has various applications, such as autonomous driving, education, surveillance etc. This paper presents a simple approach to make the above system using the basic Machine Learning (ML) and Deep Learning packages such as TensorFlow, Keras, OpenCV, MobileNet and Sk-Learn.This system can therefore be used in real-time applications which require face mask detection for safety purposes due to the widespread of Covid-19.

B. Existing Technology

Facial recognition involves usage of computing to identify human faces in images or videos, and then measuring some specific facial characteristics. This can be the distance between eyes, relative positions of the nose, chin and mouth etc.When facial recognition is used to identify faces in a crowd, it requires a sufficient database of faces against which to compare the main image.These images can be legally collected by enrolling large numbers of users into systems. Not applicable in present scenerio.Facial recognition systems will need to make suitable for the purpose.

Identify applicable funding agency here. If none, delete this.

II. Proposed System

The face mask recognition system uses Deep learning to detect the person is with or without a mask. It can be connected with any surveillance system installed at your premises. The authorities or admin can check the person through the system to confirm their identity. The system sends an alert message to the authorized person if someone has entered the premise without a face mask.The system can also be used in a live video camera. With required improvements this can be integrated with CCTV cameras to detect and identify people with mask and without mask. The accuracy rate of detecting a person without a face mask is 90-95 percent depending on the digital capabilities. The data has been transferred and stored automatically in the system to enable reports whenever you want.This project can be integrated with embedded systems for application in airports, railway stations, offices, schools, and public places to ensure that public safety guidelines are followed.

III. Technology

Configure Working Directory and Mount Google Drive to make use of Google Colab. Data Pre-processing to convert images to Grayscale and separate out labels and images. Build a convolutional Neural Network using Sequential API of Keras.Train the Face Mask Detection Classifier on Image Data using Keras and Tensorflow as Backend. Evaluate the model to see the Loss and Accuracy in Graphical form. Save or Serialize

the Face Detection Classifier Model.Download the model on the Local System and Load it in the program. Use the Live Webcam Video stream to Detect the Face.Extract the Region of Interest of the Face.Engage trained Face Mask Detection Model to the face identified and determine if the person is wearing Mask or Not. Throw a Warning Message in terms of Pop Up window to highlight that Access Denied if the person has not worn the face mask.Trigger an Email to the concerned person/authority alerting them if the person is not wearing the mask.For the live video detection,we used MobileNet instead of Convolutional Neural Network(CNN).The input image is given to MobileNet and then we are doing max pooling and then we get a fully connected layer and then output.MobileNet was very faster in image processing than CNN.

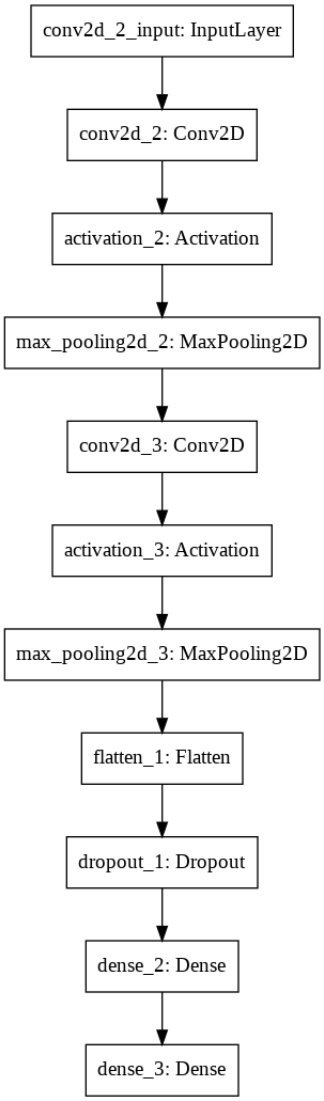

Fig. 1. Architecture

A. Working

In phase 1,loaded the face mask dataset and trained the face mask classifier with Keras/Tensorflow.Then serialize the face mask classifier to a disk. In phase 2,loaded the serialized face mask classifier from the disk and detect the faces in the image or video stream.Then we have to extract each face ROI.Apply face mask classifier to each face ROI to determine whether there is 'mask' or 'no mask'.

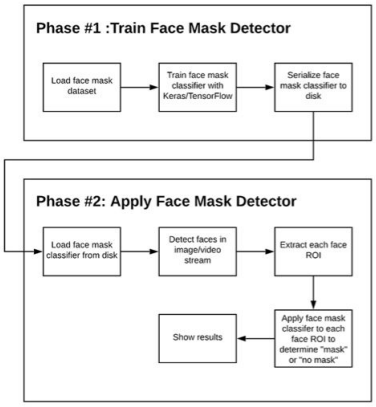

Fig. 2. Working

B. Dataset

Dataset was used for train the system.It consists of 3188 images in which 1915 images with people wearing face masks and the rest of images with people who do not wear face masks.

Fig. 3. Dataset

IV. Objective

Deep Learning : The model is trained against data set containing several images of people with mask and without mask. In order to train a traditional face mask detector, we need to divide our project into two distinct phases, each with its own respective sub-steps. In the trainig section we will focusing on loading our face mask detection dataset from disk, training a model (using Keras/TensorFlow) on this dataset, and then arranging the face mask detector to disk.In the deployment part,once the face mask detector is trained, we can then move on to load the mask detector, performing face detection, and then classifying each face as with mask or without mask.

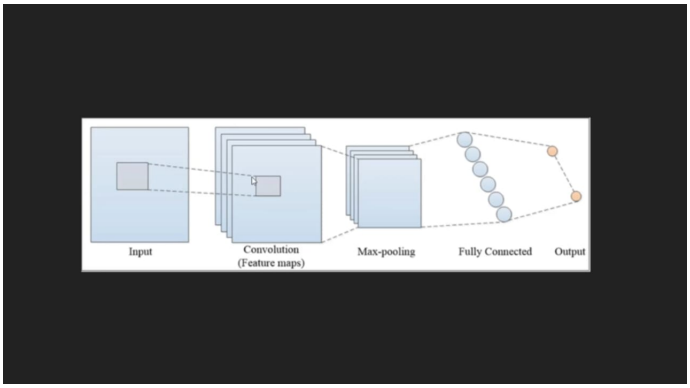

Fig. 4. block diagram.

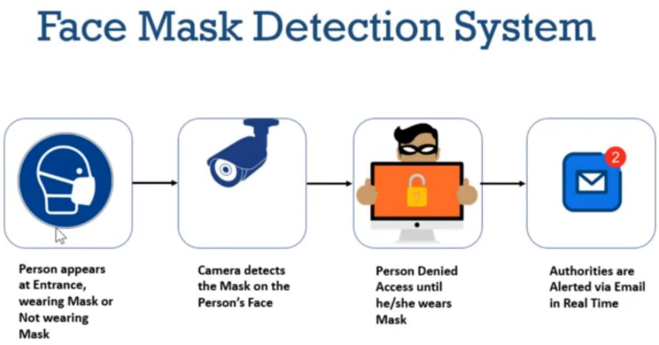

Fig. 5. proposed block.

V. Results and Observations

A. First level precaution

The first stage to be accomplished was the permission to access if the person weared a mask or to deny the access if the person is without a mask.Fig.5 gives the result of permission of access and fig.6 gives the result of denied access.

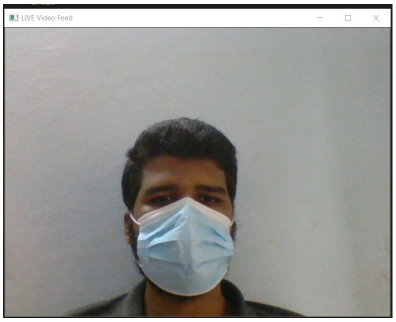

Fig. 6.

B. Alert message to the authorities

The next stage is to send an alert message if a person was violated the rules and regulations.Fig.7 gives the result of this stage.

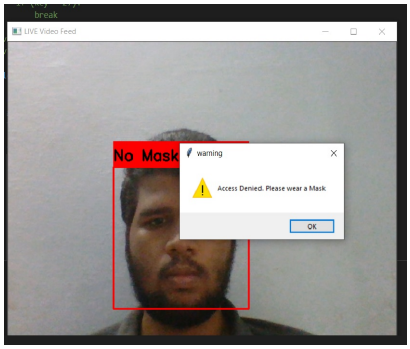

Fig. 7.

Fig. 8. Alert Message

C. Second level precaution

The last stage is to detect, if the person is with or without a mask in the public.It could be evaluated by the security in realtime.This stage was succesfully done.The proposed result is given in Fig.8 and given result with mask is given in Fig.9 and without mask is given in Fig.10.

Fig. 9.

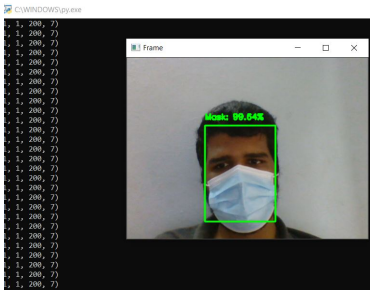

Fig. 10.

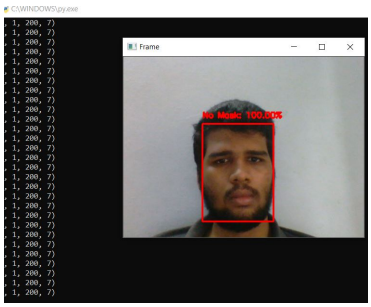

Fig. 11.

VI. Conclusion

A face mask detection system is designed and implemented which detects users with and without mask and warns them by the combined effect of artificial intelligence and machine learning. The system worked well even in dim conditions. Thus making it feasible for indoor applications. The technology assures reliable and real time face detection of users wearing masks. In addition to, the system is easy to deploy into any existing system of a business while keeping the safety and privacy of users' data. Since there is no hardware components, makes the system cheaper. So the overall cost and performance of the proposed system is good when compared to the existing expensive models.So the face mask detection system is going to be the leading digital solution for most industries, especially in retail, healthcare, and corporate sectors. It can be used for a variety of applications. Wearing a mask may be compulsory 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 extremely to the public health care system. In future it can be extended to detect if a person is wearing the mask properly or not.

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