FACE MASK DETECTION USING DEEP LEARNING

[1]Gadhave Suyash R., [2]Jadhav Kishor P., [3]Bothe Aditya S., [4]Bhende Pranav P., [5]Gayke Shivam P.

[1]Developer, [2]Guide, [3]Developer, [4]Developer, [5]Developer
[1]Computer Technology Department,
[1]Sanjivani K. B. P. Polytechnic, Kopargaon, Maharashtra, India.

Abstract: In the recent times, the Coronaviruses that are a big family of different viruses have become very common, contagious and dangerous to the whole human kind. It spreads human to human by exhaling the infection breath, which leaves droplets of the virus on different surface which is then inhaled by other person and catches the infection too. So it has become very important to protect ourselves and the people around us from this situation. We can take precautions such as social distancing, washing hands every two hours, using sanitizer, maintaining social distance and the most important wearing a mask. Public use of wearing a masks has become very common everywhere in the whole world now. From that the most affected and devastating condition is of India due to its extreme population in small area. This paper proposes a method to detect the face mask is put on or not for offices, or any other work place with a lot of people coming to work. We have used convolutional neural network for the same. The model is trained on a real world dataset and tested with live video streaming with a good accuracy. Further the accuracy of the model with different hyper parameters and multiple people at different distance and location of the frame is done.

Keywords— Face Mask Detection, Convolutional Neural Network, MobileNetV2.

I. INTRODUCTION

The trend of wearing face masks in public is rising due to the COVID- 19 corona virus epidemic all over the world. Before Covid-19, People used to wear masks to protect their health from air pollution. While other people are self-conscious about their looks, they hide their emotions in the public to hide their faces. More than five million cases were infected by COVID19 in less than 6 months across 188 countries. The virus spreads through close contact and in crowded and overcrowded areas. We can tackle and predict new diseases by the help of new Technologies such as artificial intelligence, IOT, Big data, and Machine learning. In order to better understand infection rates might be decrease through our technique. People are forced by laws to wear face masks in public in many countries. These rules and laws were developed as an action to the exponential growth in cases and deaths in many areas. However, the process of monitoring large groups of people is becoming more difficult in public areas. So we will create an automation process for detecting the faces.

Here we introduce a facemask detection model that is based on computer vision and deep learning. The proposed model can be integrated with Surveillance Cameras to impede the COVID-19 transmission by allowing the detection of people who are wearing masks not wearing face masks. The model is integration between deep learning and classical machine learning techniques with Open CV, Tensor flow and Keras. We will achieve the highest accuracy and consume the least time in the process of training and detection.

II. LITERATURE REVIEW

1. **TITLE: "Face Mask Detector":** Single Shot Detector architecture is used for the object detection purpose. In this system face mask detector can be deployed in many areas like shopping malls, airports and other heavy traffic places to monitor the public and to avoid the spread of the disease by checking who is following basic rules and who is not. It takes excessive time for data loading in Google Colab Notebook. It did not allow the access of webcam which posed a hurdle in testing images and video stream. We have modelled a facemask detector using Deep learning. We are processed a system computationally efficient using MobileNetV2 which makes it easier to Extract the data sets. We use CNN architecture for better performance. We can fix it in any kind of cameras.

2. **TITLE :"Face detection techniques: a review,":** Artificial Human beings have not tremendous ability to identify different faces than machines, so automatic face detection system plays an important role in face recognition, head-pose estimation etc. It has some problems like face occlusion, and non-uniform illumination. We use Neural Network to detect face in the live video stream. Tensor flow is also used in this system. In existing they use Adaboost algorithm, we are using mob net CNN Architecture model in our proposed system.

3. **TITLE: "Multi-Stage CNN Architecture for Face Mask Detection":** This system consists of a dual-stage (CNN) architecture capable of detecting masked and unmasked faces. This will help track safety violations, promote the use of face masks and ensure a safe working environment. Datasets were collected from public domain along with some data scraped from the internet. They use only pre-trained datasets for detection. We can use any cameras to detect faces. It will be very useful for society and for peoples to prevent them from virus transmission. Here we use live video detection using Open CV (Python library).

III. PROPOSED SYSTEM

The model proposed here is designed and modelled using python libraries namely Tensorflow, Keras and OpenCV. The model we used is the MobileNetV2 of convolutional neural network. The method of using MobileNetV2 is called using Transfer Learning. Transfer learning is using some pre trained model to train your present model and get the prediction which saves time and makes using training the different models easy. We tune the model with the hyper parameters: learning rate, number of epochs and batch size. The model is trained with a dataset of images with two class, with mask and without mask.

   i. Training the model with the taken dataset.
   ii. Deploying the model

In the paper we have developed a model using the above mentioned libraries. We have tested the model for different conditions with different hyper parameters, for which the results are mentioned in the next section. First we feed the dataset in the model, run the training program, which trains the model on the given dataset. Then we run the detection program, which turns on the video stream, captures the frames continuously from the video stream with an anchor box using object detection process. This is passed through the MobileNetV2 model layers which classifies the image as with or without mask. If the person is wearing a mask, a green anchor box is displayed and red if not wearing a mask with the accuracy for the same tagged on the anchor box. Figure 1 and Figure 2 shows the flow of the Face Mask Detection model used in this paper.
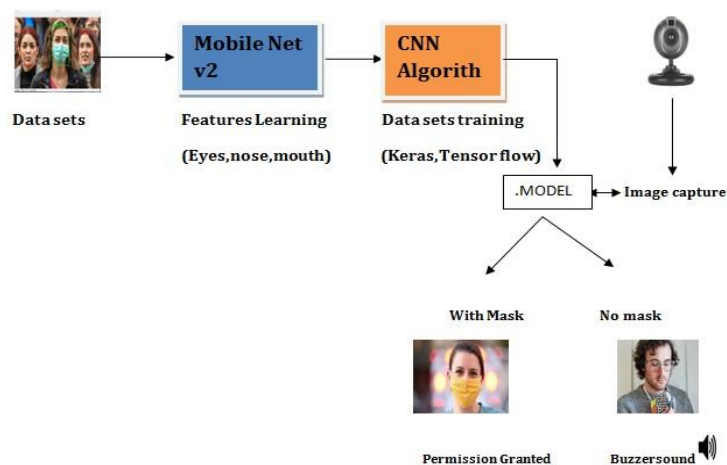
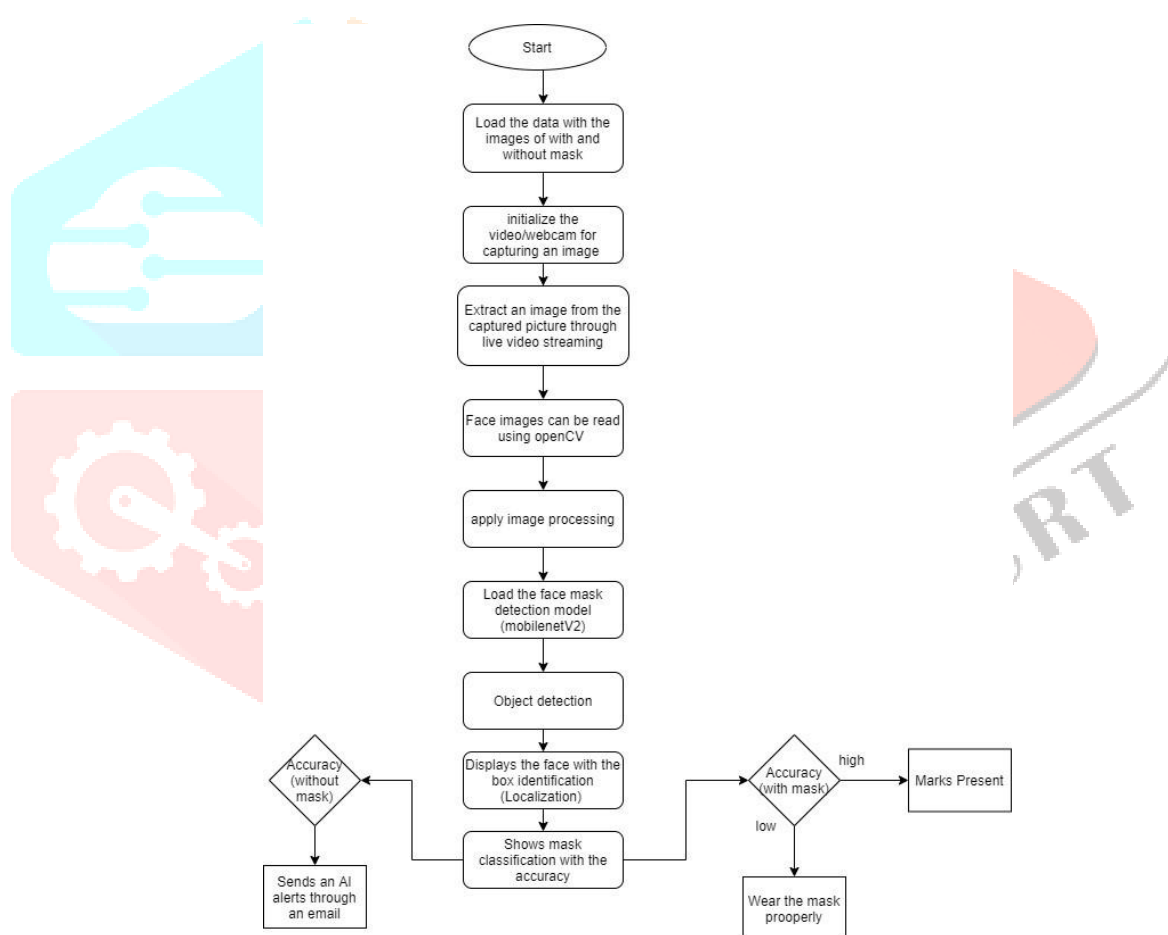*Figure 1. Flow of Face Mask Detection Model (1)*

Figure 2. Flow of Face Mask Detection Model (2)

The face mask recognition system uses AI technology to detect the person with or without a mask. It can be connected with any surveillance system installed at your premise. The authorities or admin can check the person through the system to confirm their identity. The system sends an alert to the authorized person if someone has entered the premises without a face mask. The accuracy rate of detecting a person with a face mask is 95-97% depending on the digital capabilities.

IV.   FUTURE SCOPE

The present model proposed gives great accuracy for single face with and without mask. For multiple faces also it gives quite good accuracy. Further we will work for improving the accuracy for multiple face mask detection, to classify the faces into three categories that is, with mask, without mask, Improper mask instead of just the two with and without mask class by adding datasets with images of people wearing masks not covering their noses properly and also to detect the masked face.

V.   CONCLUSION

To moderate the spread of the COVID-19 pandemic, measures should be taken. We have demonstrated a facemask detector using Convolutional Neural Network and move learning techniques in neural organizations. To train, validate and test the model. The model was induced on pictures and live video transfers. To choose a base model, we assessed the measurements like precision, accuracy, and recall and chose

MobileNetV2 architecture with the best exhibition having 99% precision and 99% recall. It is additionally computationally efficient using MobileNetV2 which makes it simpler to introduce the model to inserted frameworks. This face mask detector can be sent in numerous regions like shopping centres, air terminals and other substantial traffic places to screen people in general and to dodge the spread of the infection by checking who is following essential rules and who isn't.

VI.   REFERENCES

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