FACE MASK DETECTION AND COUNTER WITH AN ALERT SYSTEM

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Abstract: Due to this unexpected pandemic, we are going on these days, wearing a face mask became mandatory to save ourselves as well as others from the virus. But it is difficult to monitor every customer whether he is wearing a mask or not. But it is very important. So, to overcome this problem we came up with a solution to monitor every customer using a deep learning concept. So, we are developing a face mask detector with OpenCV/Keras and updating the count of customers waiting outside with an email alert system if at least one customer is not wearing a mask. This helps us easily identify the customers wearing masks or not, which helps us to take safety measures according to it. We tried using different types of platforms such as mobilev2net and resnet architecture but the accuracy of resnet architecture is more compared to the other architecture.

Keywords: Mask detection, OpenCV, E-mail, Thingspeak

I. INTRODUCTION

As we all know that there is an ongoing pandemic of coronavirus disease 2019 (COVID- 19) which is accelerating day by day, self-protection is the only way out which can be done by wearing masks. Given this current situation, our team decided to make a face mask detector with people counter and an alert system. The basic task at hand is to check whether the person is wearing a mask or not through an available image or video. So in this era of automation and artificial intelligence, we decided to come up with a project that is going to automate the process of face mask detection using open CV and deep learning thereby making the life of frontline warriors easy. Developing this face mask detector is not only the way but we should develop it in a more portable way that can be used in any area. So, to make it portable we are using a Resnet classifier. This is the only way to make this project portable and user friendly. There are two phases in this face mask detector. Phase1: Train the face mask detector. Phase2: Apply face mask detector. Phase 1 is the basic step in which we will train the project using the datasets and train it to vary between different types of images. This will be the testing and comparison set to the real images. In phase 2, the given image is compared with the stored dataset and gives us the original output of whether the person is wearing a mask or not. The detailed explanation is in phase 2 the face mask classifier is loaded from the disk, then the camera detects the image and extracts the ROI of each face. This ROI is applied to each face mask classifier to detect the mask. Finally, it gives the output.

II. OBJECTIVE

To design a hands-free entry system using a face mask detector in surveillance to combat the further spread of the virus. This will ensure to reduce the transmission of pathogens on high-touch surfaces, like door handles, and to prevent entry in a community area without a face mask. To accomplish this task, we will fine-tune the Resnet architecture, which will help us train hundreds of layers quickly and make sure that there won't be a drop in the training percentage.

III. RELATED WORK

Input from Realtime video as input andthis video is processed using the algorithm developed. Use the testing algorithm to detect if the person identified in the image is wearing a mask or not this then gives a digital output that includes the status of the person and the accuracy of the output. This output will be displayed on the screen. Data Pre-processing to convert images to Grayscale and separate labels and Build Convolutional Neural Network using the Sequential API of Keras. images Train the Face Mask Detection Classifier on Image Data using Keras and Tensor flow as the 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 Into the program. Use the Live Webcam Video stream to Detect and 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 is Denied if the person has not worn the face mask. Trigger an Audio and Email to the concerned person/authority alerting them if the person is not wearing the mask.

IV. PROPOSED METHODOLOGY.

4.1 Train A Model

A dataset containing images will be used to train and test the code. This dataset contains 690 images with people wearing masks and 600 images with people without a mask. 80% of the dataset is used for training the algorithm and the remaining 20% is used for testing. In the training first, use two arrays in which one will contain the data(images) and the other will contain the image's label(names). Then both arrays are changed into a NumPy array. Now split the data set into training and testing parts. Arrange every image in the dataset according to our requirements so use different syntaxes to alter the dimensions of every image now using the Resnet architecture.

4.2 Create Model with Resnet

Using resnet creates a base model which is used to train the algorithm. This base model is used to predict different images in the dataset, and the label used in the second array is matched with these images. This will help in serializing the data to end the training part of the system. Coming to the testing part a Real-time video will be given as input. A video is nothing but a combination of frames so this testing part extracts a frame from this real-time video every 1 second this frame is going to be used for mask detection once the frame is extracted the algorithm will identify the person in the image and bounds the face of the person in a rectangular box.

4.3 Predicting the Output

When a frame is extracted, it is converted into data which is then stored in an array if the value of the array happens to be greater than 0 it means that the face of the person is identified by the algorithm. According to the output if the person is wearing a mask he will be bound with a green box. If not he will be bound with a red box every image will be compared with a set of images in the data set and the output is given according to the results. So, the value stored in the array will help us identify the face of the person in the image as soon as this happens the detection of the mask takes place so if the person is wearing a mask it's going to print yes along with its accuracy.
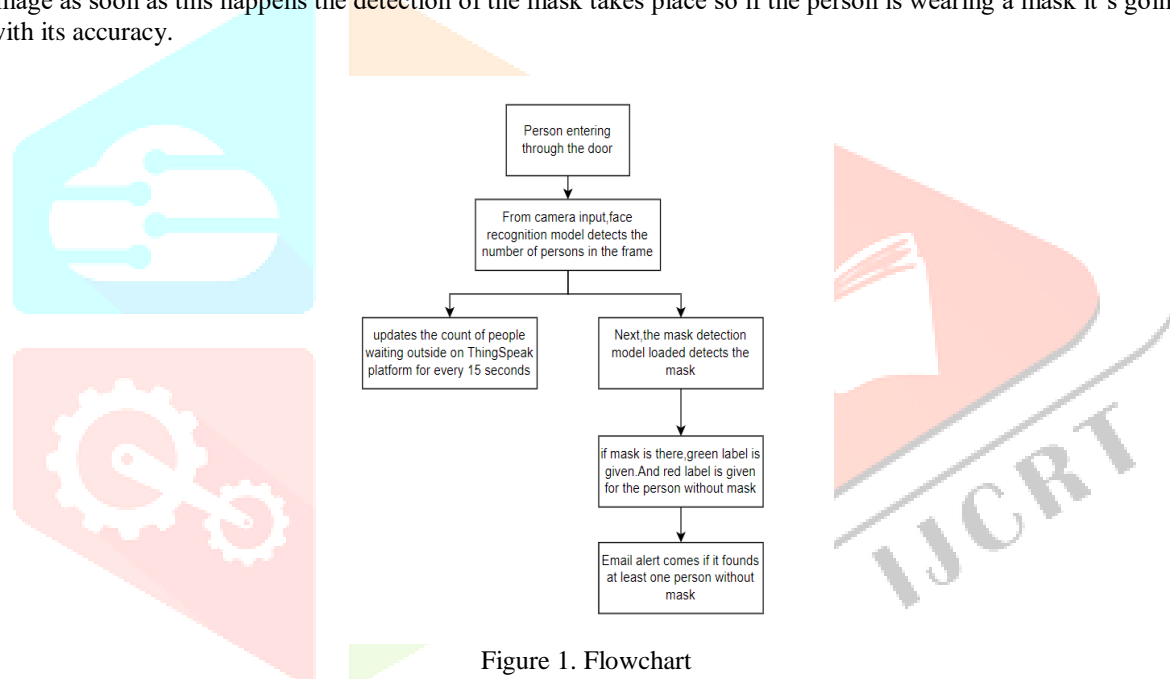

Figure 1. Flowchart

When a person enter through the door, Face recognition model detects the number of persons in the frame from front camera input. It updates the count of people waiting outside on ThingSpeak platform for every 15 seconds. Next the mask the mask detection model loaded detects the mask. Therefore if mask is there, green label is shown to the face and red label is shown to the face if the person is without the mask from there an Email alert comes, if it found at least one person without mask.

V. RESULTS AND DISCUSSION
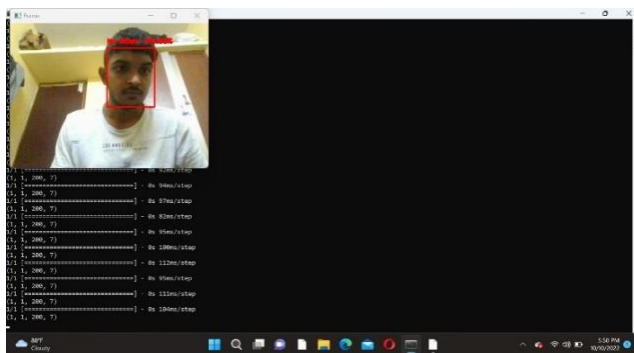
5.1 OUTPUT

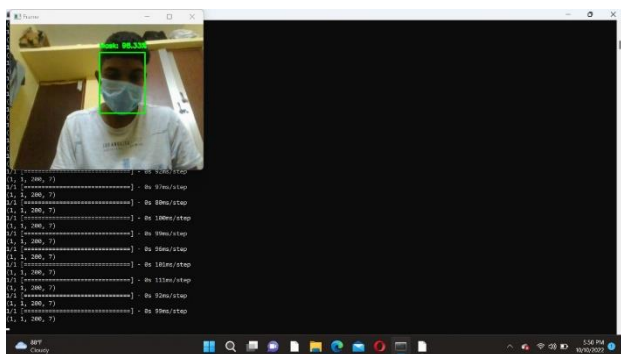

Figure 2
Red label to the face without mask

Figure 3
Green label to the face with a mask

Figure 4
Receiving an alert mail

Getting an email alert if the person is found without a mask in real-time. As integrated the whole system to speak can see the real-time count of the number of people at any time. If anyone is found without a mask then alert mail as shown above.
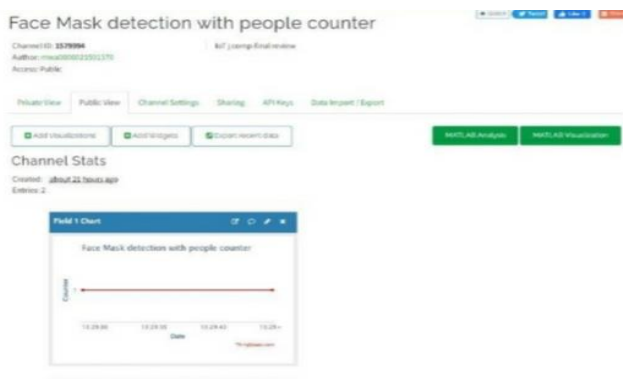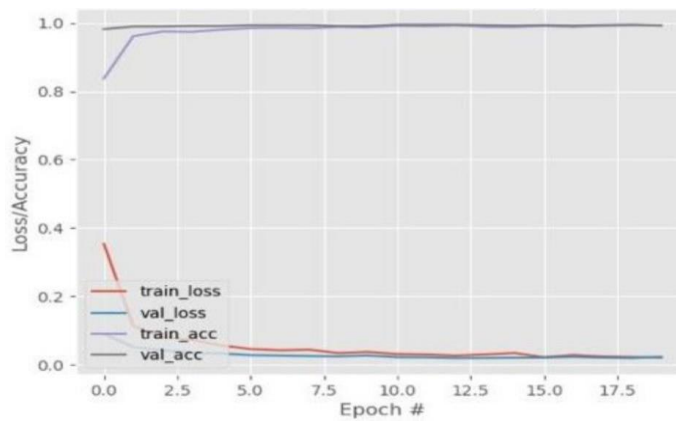

Figure 5.
Channel Stats

Figure 6.Training loss and accuracy

If mask is there, green label is shown to the face and red label is shown to the face if the person is without the mask from there an Email alert comes, if it found at least one person without mask.　　　　　　　　　　As training and validation loss are converging to zero over the number of epochs and the accuracy of both training and accuracy also increase, the model is giving accurate results.

5.2 Conclusion

Successfully detected the masks and mail is being sent in real-time if anyone is found without a mask. Integrated the whole system with thing speak and can check the number of people inthe area in real-time. This helps us easily identify whether the customers wearing masks or not, which helps us to take safety measures according to it Even though focused on detecting face masks, This project is also applicable to real-time detection of weapons, helmets, etc. provided to have an appropriate dataset.

5.3 Future Enhancements

Nonuniformity of sizes of different kinds of images (overcome of color, each pixel has a huge amount of information which is difficult to process (overcame by gray scaling) disturbances in images like poor contrast due to glare (overcame by normalization). Labels are in a textual form that was not understood by the model(overcame by using "one-hot encoding", using "Label binarized()".Collecting libraries and inclusion of them in our project.

VI. ACKNOWLEDGMENT

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