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Face Mask Detection During Covid Pandemic

[1]Sangamesh S K, [2]Prof Pavitra M G , [3]Prof Shashidhar T H
[1,2,3]Department of Computer Science and Engineering,
RTE Society's Rural Engineering College Hulkoti,Gadag

ABSTRACT- Globally, everyone's lifestyle is changing. Throughout such changes, wearing a mask was critical for each person. Detecting individuals who are not wearing masks is difficult owing to the huge number of populations generated by the Coronavirus pandemic. This project may be utilised as a digital scanning tool in schools, hospitals, banks, and airports, among other places. The method of identifying people's faces and classifying them into two groups, those who wear masks and those who do not, is accomplished using image processing and deep learning. With the assistance of this initiative, a person charged with monitoring the public may be situated in a distant location and yet monitor effectively and provide appropriate directions. Numerous Python libraries, including OpenCV, Tensorflow, and Keras. Convolutional Neural Networks are a subclass of Deep Neural Networks in Deep Learning. They are utilised to train the models for this project.

Keywords: ANN, CNN, RCNN

I.INTRODUCTION

The practise of wearing face masks in public is increasing worldwide as a result of the Covid-19 pandemic. Because of Covid-19, individuals will refrain from using masks to protect their health from air pollution. While some feel self-conscious about their appearance, they conceal their emotions via their facial movement. Someone treated the use of facemasks as a means of preventing Covid-19 transmission. Covid-19 is the most recent pandemic virus that have wreaked havoc on human health in the past century. In 2020, the rapid spread of Covid-19 compelled the WHO to declare it a pandemic. In less than a half-dozen months, Covid-19 infected over 5 million people in 188 countries. The virus spreads through close contact and in densely populated regions. The corona virus pandemic has resulted in an unparalleled level of international scientific collaboration. In many ways, computer science-supported machine learning and deep learning will aid in the battle against Covid-19. A machine-learning algorithm enormous amounts of data in order to predict the spread of Covid-19, to operate an early warning system for possible pandemics, and to categorise susceptible populations.

Citizens in many countries are obliged to wear face masks in public. We have a proclivity for enacting these regulations and laws as a consequence of the exponential growth of cases and deaths in many industries. However,the method observation massive team so find indviduals is changing into a lot of difficult. The monitoring process includes the identification of anybody not wearing a

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face mask. We provide a technique for identifying mask faces that is based on machine learning and image processing techniques. The proposed model may be utilised to identify the mask via the use of a photograph and real-time detection. Individuals wearing or not wearing a mask. The model is built using OvenCV, Tensor Flow, and Keras to integrate deep learning and traditional machine learning methods. We have a propensity to compare them in order to choose the most effective algorithm programme that produced the highest accuracy and spent the least amount of time inside the technique of

This method is successful in avoiding dissemination in mayuse instances when used with the current Covid-19 lock-in period. The following are some use cases that will benefit from the formsystem.

Airports: the suggested method may also be necessary for locating passengers at airports. There is no disguise. Frequently, the traveler's data is recorded through camera inside the system at the entryway. Any traveller who discovers a request will notify the airport authorities immediately in order for them to take appropriate action.

Hospital: the proposed system are often integrated with CCTV cameras, and therefore the data are often manage to ascertain if its employees are wearing masks. If you discover some doctors .If the aren't wearing a mask ,they're going to receive a reminder to wear a mask.

Office: The suggested method may assist in ensuring that safety requirements are met in order to prevent. The spread of covid-19 or any other illness transmitted through the air. If any workers do not wear masks, they will get reminders to do so.

The aim of this research is on identifying individuals who are using masks or who do not assist in reducing the transmission and spread of covid-19. The scientist has shown that wearing a mask aids in reducing the spread of Covid-19.

II. Face Mask Detection With Different ANN And Compare Them

Artificial neural network

I am using different architecture and models of ANN were used for face mask detection. ANN can be used in face mask detection because these models can simulate the way neurons work inhuman brain. I comparison between different neural network for face mask recognition system and lastly we use those model which have better accuracy.

Retinal connected of neural network(RCNN)

I am presented face mask detection system based on a RCNN that examine small windows of animage to check each window contain face with or without mask. First, a preprocessing step,adaptedfrom,isappliedtowindowoftheimage.Thenwindowispassedthroughtheneural network, which decides whether the window contain face with or without mask. They used the two training dataset of image. In first dataset with mask images collected by me consist of total800 images. The

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second dataset without mask consist of 750 images, The recognition face with mask and withoutmaskequalto80% accuracy rate.

Principal Component Analysis with ANN:
I am using PCA with class specific linear projection to detect or recognized face with or withoutmask in a real time video stream. The system steps to search for face with or without mask in animage:

1. Selectevery20x20regionofinputimage
2. Use intensity values of itspixelas400inputsto ANN
3. Feed values is forward through ANN and
4. If the value isabove0.5theregion represent a face
5. Repeatstepsseveraltimes,eachtimeonaresizedversionoftheoriginalinputimagetosearch for faces at different scales.

Convolution Neural Network:
In this planned method, the mask detection model is constructed victimization the successive API of the keas, library. this permits us to make the new layers for our model step by step. the assorted layers used for our CNN model is represented below. The 1st layer is that the Conv2Dlayer with one hundred filters and therefore the filter size or the kernel size of 3X3. During this first step, the activation operates used is the ‘ReLu’. This ReLu function stands for corrected linear measure which is able to output the input directly if ispositive, otherwise, it'lloutputzero. The input size is also initialized as 150X150X3 for all the photographs to be trained and tested victimization this model
In the second layer, theMaxPooling2D is employed with the pool size of 2X2The next layer is once more a Conv2D layer with another one hundred filters of constant filter size 3X3 and {also the} activation operate used is that the ‘ReLu’. This Conv2Dlayer is followed by a MaxPooling3=2D layer with pool size 2X2.

In consecutive step, we have a tendency to use the Flatten () layer to flatten all the layers intoone1Dlayer.AftertheFlattenlayer,weusetheDropout(0.5)layertoforestallthemodelfrom over fitting. Finally, towards the end, we have a tendency to use the Dense layer with fifty units and therefore the activation operates ‘ReLu’.

The last layer of our model are going to be another Dense Layer, with solely 2 units and the activation function used will be the ‘Softmax’ function. The softmax function outputs a vector which is able to represent the chance distributions of every of the input units. Here, two input units are used.The soft ax function will output avector with two probability distribution value.

Fast Neural Networks(FNN)

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The proposed FNN for the face mask detection. A FNN approach to reduce the computational time for locating human faces with or without mask. Each image is divided into small sub images and then each one is tested separately using a fast ANN. The experimental result of comparison with conventional neural network showed that high speed achieved when applying FNN.

Table1:Comparisonofneuralnetworkmethod

s.no	Methodology	Recognitionrate(%)
1	RCNN	90.45
2	PCAwithANN	95.67
3	CNN	95.22
4	FNN	94

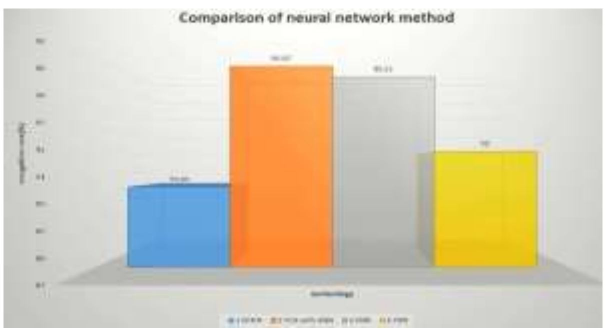

Figure1:visualizationof neural network method comparison

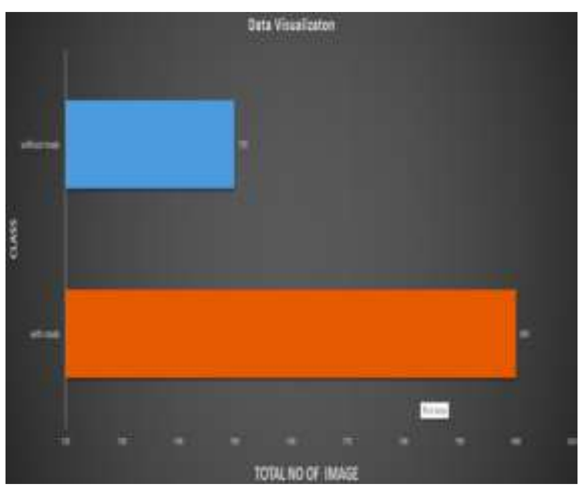

Figure 2:Datavisualize

III.DATACOLLECTION

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The dataset pictures for covert and unmasked faces were collected from images dataset offered within the public domain the masked images were obtained from the factitious generated by me through the picture redaction tool and few from collected from the public domain. Within thedata set the onsite of 800 with masked face and 750 are while not masked face. The data set is collected for the training the mask detection model.

IV.METHODLOGY

Face detection

The downside of face mask detection is all regarding face detection. However, before face mask detection is possible, on should be able to faithfully notice a face and its landmarks. This can bebasicallyasegmentationproblemandinsensiblesystem,mostofthetroublegoesintofinding thistask.Afteralltheparticulardetectionsupportedoptionsextractedfromlandmarksisbarely a minorstep these facial

Figure 3:Stepsinfacedetection Proposed System for the Face Mask Detection

The proposed system focuses on how to identify a person wearing a mask on the image/video stream. Help with computer vision and deep learning algorithm by using OpenCV, tesnsor flow, Keera's library.

Method:

1. Train deep learning model(MobileNetV2).
2. Apply face mask detecto rover images/live video stream.

Step1.Datavisualization

In the first step, let us visualize the total number of images in the dataset in these two categories.We can see that there are 800 images in the "Yes" category and 750 images in the "No"category.

Categories	Labeled	Totalimage count
With facemask	Yes	800
Without facemask	No	750

Step2.DataAugmentation

In the next step, we expand the data set to include a larger number of images for training. In this step of data expansion, we rotate and flip each image in the data set. We see that after data

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expansion, we have total 2851 images of which the “yes” category contains 1430 images, andthe“no”categorycontains1421 images.

Step3.Splittingthe data

In this step, we divide the data into a training set, and the training set will contain the images on which the CNN model will be trained and test set and the

Set	Labeled	Total imagecount
Training	Yes	1129
Test	Yes	301
Training	No	1121
Test	No	300

images on which the model will be tested.In this case, we use split_size =0.8, which means that 80% of the total images will enter thetrainingset,andtheremaining20%of the images will enter the testset.

Aftersegmentation,weseethattherequiredimagepercentagehasbeenallocated to the training set and test set as described above.

Step4.Building the Model

In the next step, we will use Conv2D,

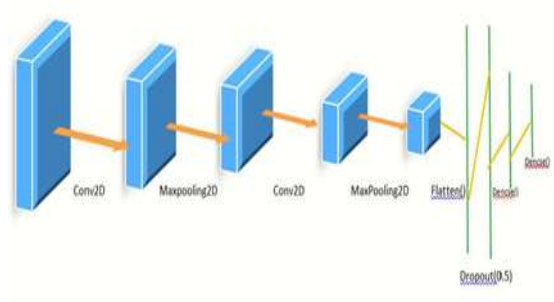

Figure4:CNNModelforFaceMask(self)

To construct a sequential CNN model, we use MaxPooling2D, Flatten, Dropout, and dense. We utilise the " soft axe " function in the last dense layer to generate a vector that contains the probability of each of the two categories. We utilise the "ADAM" optimizer and "binarycross entropy" as our loss function in this case since there are just two kinds. Additionally, you may utilise MobileNetV2 to improve accuracy.

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Step5.Pre-Training theCNNmodel

After setting up the model let us create ”train generator” and “validation_generator” to make itfit our model in the next step. We see a total of 2250 images in the training set and a total of 551images inthetest set.

Step6.Training theCNN model

This is the primary phase in which we load images into the training and test sets in order to utilise the keras library's sequence model. I trained the model for a total of twenty epochs. However, we may train the model for a greater number of epochs to increase accuracy and prevent over fitting. After 20 iterations, we see that our model has an accuracy of 97.86 percent on the training set and 99.22 percent on the test set. This indicates that it has been properly trained and is not excessively fitted.

Step7.Labeling the Data

After developing the model, we assign two probabilities to the output.

["0" denotes "without mask," whereas "1" denotes "with mask"]. Additionally, I use RGB values to set the colour of the enclosing rectangle. ["RED" denotes "without mask" and "GREEN" denotes "with mask"].

Step8.ImportingtheFace DetectionProgram

Fromnowon,weplantouseittodetectwhetherwearewearingamaskthroughthepc’swebcam.Forthis,first ofall, we needto implement face detection

Step9. Detecting theFaceswithandWithoutMask

In the last step, we use the Oven CV library to run an infinite loop to use our webcam, where the cascade classifier is used to detect faces. The code

webcam =cv2.videoCapture (0) indicates the usage of the webcam. The model will predict the likelihood of each of the two categories[without mask, with mask]). Based on a higher probability, tags will be selected and displayed around our face.

V.RESULT

Experimental Result

The experimental result of system performance are evaluated with the MobileNetV2 classifier and ADAM optimize

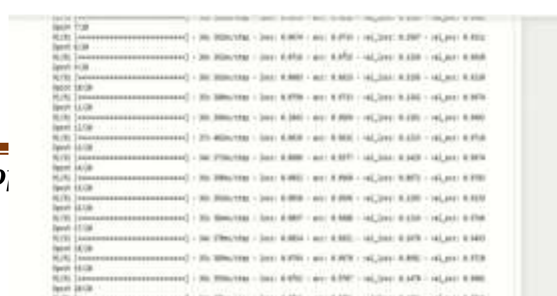

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Figure 5:Compilationscreenfortraining scriptofface maskdetection

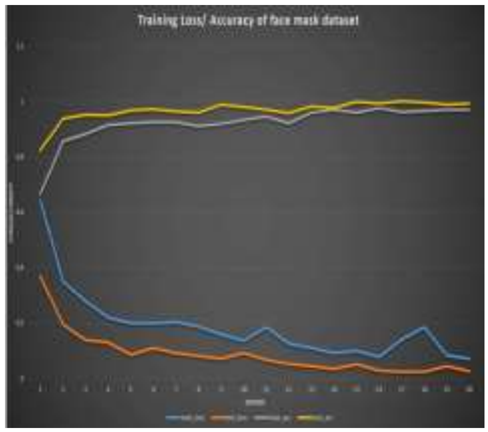

Figure 6:TrainingLoss/Accuracy curves of facemask detection dataset

Face Mask Classifier Performance Metrics

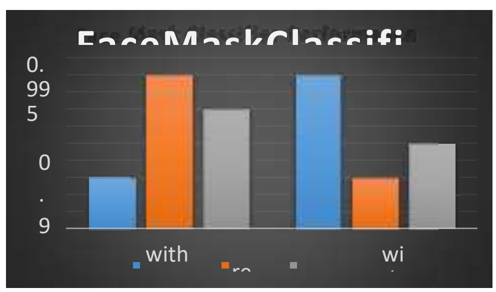

Figure 7: Performance metrics Histogram graph

By combining all of the components of our design, we are able to get an accurate mask observation system. This system makes use of the MobileNetV2 classifier. The resulting system performs well and has the capability of detecting face mask images with numerous faces at a variety of angles.

Facemaskdetectionfromimage:

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Figure 8: Detect facewithmaskfromimage

Fig 9:Detect facewithoutmaskfromimage

Facemask detectfromrealtimeimage:

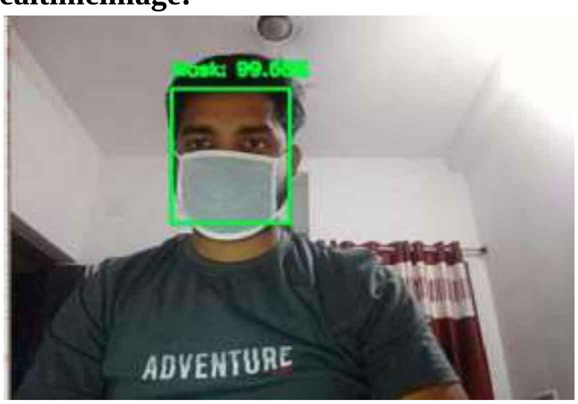

Fig:-9 A Detect facewithmask

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Figure10: Withoutmaskinrealtimevideostream

VII..CONCLUSION

As technology advances and new trends emerge, we now have a unique facemask detector that may benefit the public health care system. The design, which is based on the MobileNetV2 classifier and the ADAM optimizer, may be utilized in both high- and low-computing situations. Our face mask recognition algorithm is trained on a CNN model, and we utilized OvenCV, Tensor Flow, Keras, and Python to determine whether or not a person is wearing a mask. The model was tested with image and real-time video stream. Accuracy of model is attained, and model optimization is a continual process. This particular model may serve as an example of edge analytics in action.

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