INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

Face Mask Detection Using Deep Learning

Atharva Pawar, Sanket Doke, Tanmay Kere, Swati Nadkarni, Panjab Mane

UG Student, Dept. of I.T, Shah and Anchor Kutchi Engineering College, Mumbai, Maharashtra, India

UG Student, Dept. of I.T, Shah and Anchor Kutchi Engineering College, Mumbai, Maharashtra, India

UG Student, Dept. of I.T, Shah and Anchor Kutchi Engineering College, Mumbai, Maharashtra, India

Head of Department, Dept. of I.T, Shahand Anchor Kutchi Engineering College, Mumbai, Maharashtra, India

Assistant Professor, Dept. of I.T, Shahand Anchor Kutchi Engineering College, Mumbai, Maharashtra, India

ABSTRACT*: -*The WHO (World Health Organization) have mentioned in a survey that there are two ways to protect people from COVID-19 which are social distancing and wearing mask. From these two ways wearing a mask is an important precaution to avoid from corona virus. Therefore, to keep track of people wearing mask or not is very important. The WHO has told that corona virus has become a global crisis and wearing mask has become mandatory in day-to-day life. Though life has become back to normal after the reduction in covid-19 cases, wearing a mask in public areas is mandatory. Reports has indicated people are not serious about wearing a mask. An efficient and economic approach of a hybrid model using deep learning and machine learning for face mask detection has been setup. There will be usage of dataset to build face mask detector with computer vision using OpenCV, python, TensorFlow and Keras. The main goal is to identify people wearing mask or not through live streaming using machine learning technology.

KEYWORDS*: -*COVID-19, Python, Face Mask Detection, Deep Learning, Keras, TensorFlow, OpenCV**.**

I. INTRODUCTION

 Wearing of mask is very common in China and other south-east Asian countries as a precautionary measure to avoid from diseases. After the covid-19 outbreak wearing mask has become mandatory. From the research it has come to notice that spreading of corona virus is coming contact to the person having symptoms of corona virus.it means that virus is spreading largely due to close contact between the people like speaking, coughing, sneezing etc. From RT-PCR test it tells whether person is covid positive or not. In overpopulated countries like India, Africa, Brazil etc wearing mask in public areas should be compulsory. Due to COVID-19 pandemic, lockdown was imposed all over the world due to which all people were closed in their homes and cannot go to the work which affected the economy of the world. And now after lockdown was opened all public started to get to their respective jobs. Nobody in the public areas or the work areas can keep an eye to check whether that person is wearing a mask or not. So, to find a solution about this issue an idea came to create face mask detection model. In this model we have used convolutional neural network for analysing the visual images. In this it takes the image data as input, captures all the necessary data and send to the neural network. Then the network gives the final output that represents the predication of the image. Mobile Net V2 is used as a convolution neural network. Mobile Net v2 has two layers depth wise convolution and point convolution. The architecture of MobileNetV2 contains the initial fully convolution layer with 32 filters, followed by 19 residual bottleneck layers. Figure 1 shows the mobile net v2 architecture which is used in this model.
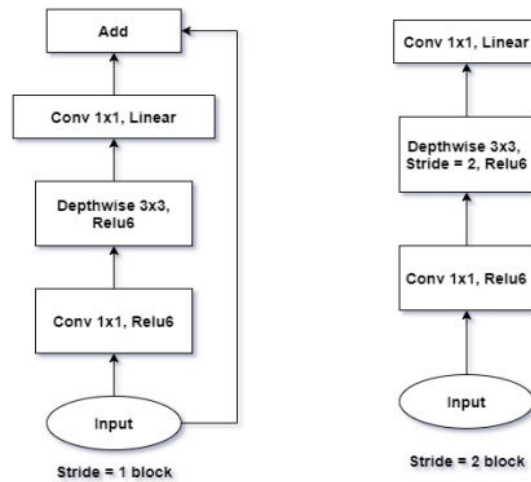
Figure 1: -Mobile Net V2

Different hype parameters have been used in this model which are learning rate, epoch and batch size. Due to these parameters model predicts the accuracy. OpenCV has been used for capturing the frames during the video streaming of the face.

II. RELATED WORK

In [1] they have made a face mask detection model using deep learning and computer vision. They have connected the model with the CCTV cameras for the face mask detection. They have used various machine learning techniques to run the model and run various algorithm to check which gives the best accuracy by comparing it with the hype parameters. In [3] they have explained the computer-based face mask detection model. There main goal is to recognize people not wearing the mask using image-processing techniques. For implementing the model, they have used Raspberry-pi and camera as hardware components to execute the model. In [5] they have created the face mask detection model on the basis of 4 approaches which are distance between the person and the camera, detection of eyeline, detection of part of face and detection of eye. They have analysed various algorithms to find the best accuracy. They have also created their own dataset in order to get more accurate results and with the help of CNN model they have made this system. In [6] they have proposed the face mask detection using Convolution Neural Network which is Mobile Net V2 to get more accuracy in which it takes image data as input, pre-process all the data and send to Mobile Net V2 to get the output.

III. PROPOSED SYSTEM

We have designed and modelled our system using python library like TensorFlow, OpenCV and Keras. The model which we have used in the system is Mobile Net V2 Convolution Neural Network. The method of using the Mobile Net V2 is called as Transfer Learning. The reason for using the transfer learning algorithm was that transfer learning uses the pre-trained model in your present model and gives the prediction which saves the time and makes training the model easy. The model is run with three most important hyper parameters which are the learning rate, number of epochs and the batch size. We have created our own dataset in which we have divided into two folders named as with mask and without mask. In with mask dataset, we have stored 1915 images of with mask people and in without mask folder we have stored 1918 images of without mask people. As we have used Mobile Net V2 the advantage is the it can handle millions of datasets so pre-processing or handling dataset becomes easy. We have downloaded this dataset from Kaggle. So, the next steps are Training the model with given dataset and lastly deploying the model.

In this paper we have developed face mask detection model using the mentioned libraries. We tested our model by changing values of the hyper parameters and mentioned which is the best to worst in the result section. After downloading the dataset, the next stage is the data pre-processing. In this we converted all our images into arrays so that we can create a deep learning model. The next step is training the model. For training the model we have used Mobile Net V2 convolution Neural Network from Transfer Learning. Input image is processed into array and then it is sent to Mobile Net V2 then it will do max pooling and it will flatten it and then create fully connected layer and will

give the output. The main reason behind using this convolution neural network compared to other was it gives more accuracy and require less parameters. It is also faster in process compared to other neural networks. After training the model it plots the training loss and accuracy. The next stage is applying the model in camera for face detection. For the detection OpenCV library is used which helps to detect the people through video streaming. After all these steps run the model, camera will be started and will show the green anchor box with accuracy if person is wearing the mask and red anchor box with accuracy if the person is not wearing a mask. The accuracy will differ because new image is captured after every second. We also added additional features like we have installed a buzzer and it activates when the person is not wearing the mask. For the proof of the person not wearing a mask it will take a screenshot of the person not wearing the mask and it will send via mail to the admin.
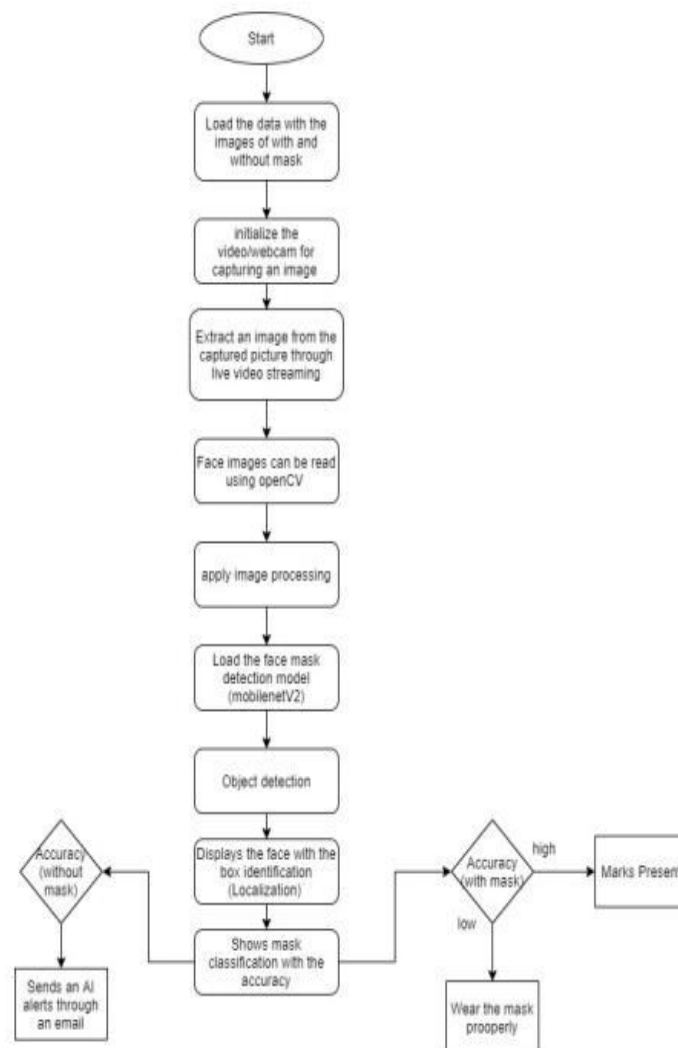
Figure 2: - Flow of Face Mask Detection Model

The Face Mask Detection Model is built using Deep Learning Technology to detect people wearing mask or not. This model can be connected to any surveillance system to identify people wearing a mask or not. It is most useful in crowded places like college, hospitals, corporate areas etc. As it sends alert mail to the admin not wearing a mask, he can easily identify the given person. The accuracy rate of detecting a person with face mask is about 95%-97%. The screenshot data of person not wearing a mask is stored automatically in the system.

IV. RESULTS

We have tested the model with the different scenarios on the basis of hyper parameters with epoch as 20 and batch size as 32 remain constant. The below table shows the comparison between the different hyper parameters and situations.

| Model	Learning rate	With mask distance	Without mask distance	Image quality	Multiple people capturing
1	1e-4	161cm	190cm	Good	4
2	1e-3	155cm	187cm	Average	3
3	1e-2	146cm	179cm	Bad	3

Table: - Result Comparison Table

According to above comparison model 1 is the best with greater accuracy. The plot of model 1 which we have run is shown below. Its displays the plot for training loss, validation loss, training accuracy and validation accuracy for Number of epochs versus loss or accuracy. From the plot we can clearly see that as the number of epochs increases the training and validation accuracy increases and the training and validation accuracy decreases. The model is not suffering from overfitting which is proved from when the validation accuracy is higher than the training accuracy. Figure 3 shows the plot for number of epochs versus loss or accuracy.
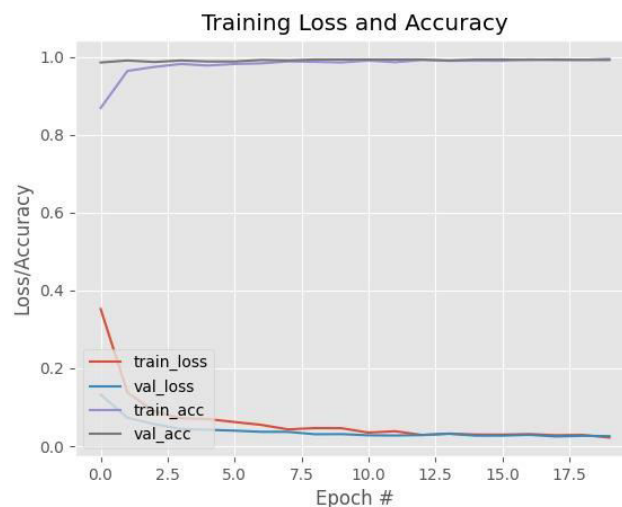

Figure3: -Graph of Number of epochs vs loss of accuracy

After training the model and seen the graph, now the time is to run the project and start the face mask identification of the person. Below Figure 3 shows the person wearing a mask with the green anchor box and accuracy.
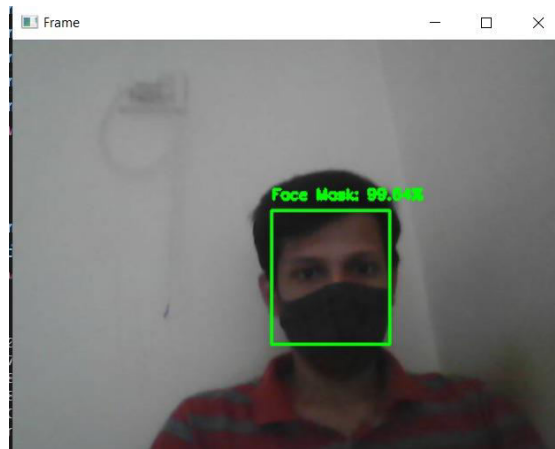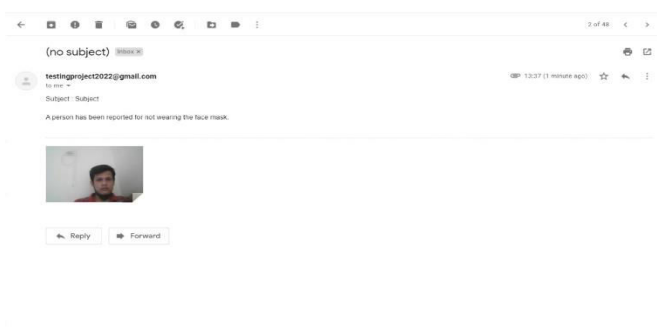
Figure 3: -Wearing a mask

Below Figure 4 shows person not wearing a mask with red anchor box and accuracy.
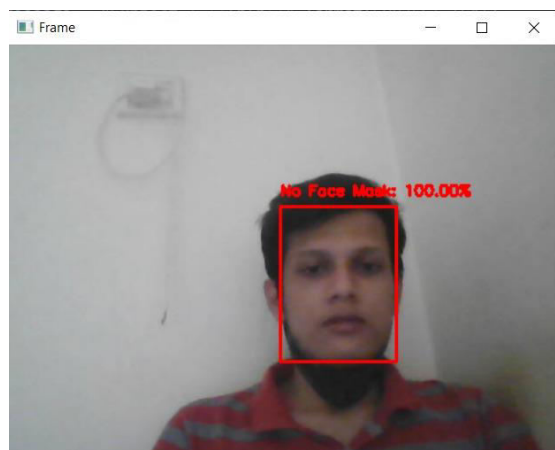
Figure 4: -Not wearing a mask

Below Figure 5 shows the screenshot of person not wearing a mask sent via mail to the admin.

Figure 5: - Mail Notification

So, these results will be displayed by our model after running it.

V. FUTURE WORK

The present model is designed specifically to identify person wearing a mask or not just for single person with giving the accuracy. It can also identify multiple persons and will work fine. But in future we can specially designed for identifying multiple persons and giving the best accuracy. Now in this model we have worked with two datasets i.e., with mask and without mask, but in future we can create three datasets and third one would be improper mask dataset which we will store dataset of people wearing mask under the nose or below chin level etc. In future we can also work with different convolution neural network with better accuracy. Now we take only screenshot of the person not wearing the mask but in future we can store the data of the people and in the mail along with the image of the person not wearing the mask it will display person name and other important details for better identification. In future we can connect our model with raspberry pi and connect camera with raspberry pi to make advancement in our project and get more accurate results to check the image quality and check the detection of the person with and without mask.

VI. CONCLUSION

To reduce spread the of COVID-19 we need to take precautionary measures. The main measure to protect from corona virus is wearing a mask. So, we have built a face mask detection model to check whether person is wearing a mask or not to protect from COVID-19. We have built this model using deep learning. We have used libraries like OpenCV, TensorFlow, Keras etc. We have used Transfer learning to build the model and from that we have used Mobile Net V2 convolutional neural network to build model with better accuracy and results. The proposed system states that it is capable of identifying people wearing a mask or not with accurate results through video streaming. Due to this face mask detection model, it will help to increase the rate of people wearing the mask and will help to protect the people from contracting to corona virus. This system will be very useful in crowded areas like shopping malls, schools, hospitals, corporate areas etc. where there is high rate of spreading Corona virus.

REFERENCES

[1] Vinitha.V1, Velantina.V2, "COVID-19 FACEMASK DETECTION WITH DEEP LEARNING AND COMPUTER VISION", International Research Journal of Engineering and Technology (IRJET) Volume: 07 Issue: 08 | Aug 2020 e-ISSN: 2395-0056   p-ISSN: 2395-0072.

[2] Sneha Sen M Dr. Harish Patidar, "Face Mask Detection System for COVID_19 Pandemic Precautions using Deep Learning Method", JETIR2010003 Journal of Emerging Technologies and Innovative Research (JETIR) 2020 JETIR October 2020, Volume 7, Issue 10 (ISSN-2349-5162).

[3] KALANGI B SUBRAMANYAM, S N S K KANTH, D J KUMAR, "COVID-19 Face Mask Detector with OpenCV", IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 8, Issue 5, October - November 2020 ISSN: 2320 – 8791.

[4] Karthik Srivathsa D S, Dr. A. Rengarajan, Nikhil Kumar H S, "DETECTING OF FACE MASK", International Research Journal of Modernization in Engineering Technology and Science Volume:02/Issue:12/December -2020 e-ISSN: 2582-5208.

[5] Sneha Sen and Khushboo Sawant, "Face mask detection for covid_19 pandemic using pytorch in deep learning", ICRIET 2020 IOP Conf. Series: Materials Science and Engineering 1070 (2021) 012061 doi:10.1088/1757-899X/1070/1/012061.

[6] Riya Chiragkumar Shah Rutva Jignesh Shah, "Detection of Face Mask using Convolutional Neural Network", https://arxiv.org/pdf/2106.05728.

[7] Anirudh Lodh , Utkarsh Saxena , Ajmal khan , Anand Motwani , Shakkeera , Sharmasth Vali , "Prototype for Integration of Face Mask Detection and Person Identification Model – COVID-19" Fourth International Conference on Electronics, Communication and Aerospace Technology (ICECA-2020) IEEE Xplore Part Number: CFP20J88-ART; ISBN: 978-1-7281-6387-1.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

📱 9940 572 462 💬 6381 907 438 ✉️ ijircce@gmail.com

Scan to save the contact details