RESEARCH ARTICLE OPEN ACCESS

Covid-19 Face Mask Detection and Social Distancing at Public Places

Prof. Sharda.P.Tondare[1], Prof. Sonali.K.Pawar[2], Prof. Anuradha.S.Nigade[3] , Prof. Aparna.S.Patil[4], Isha Mandawkar[5], Nallamala Pooja[6] , Aditya Chakraborty[7],

1(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

2(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

3(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

4(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

5(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

Email: ishamandawkar2017@gmail.com

6(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

7(Department of Electronics and Communication Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune)

***Abstract*:**
Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. COVID-19 affects different peoplein different ways. Most infected people will develop mild to moderate illness and recover without hospitalization. Face mask detection had seen significant progress in the domains of Image processing and Computer vision, since the rise of the Covid-19 pandemic. The model uses proposed approach of deep learning, Tensorflow, Keras and OpenCV to detect face masks. This model can be used for safety purposes since it is very resource efficient to deploy. The technique deployed in this model gives an accuracy score of 0.9264.

***Keywords* — Covid-19, Deep Learning, Computer vision, Mask detection, Social distancing, Python, YOLO.**

I. INTRODUCTION

People's safety has become a major problem in many areas like malls, railway stations and streets during this pandemic situation where people gather in crowds. An efficient automated system to manage the crowd is essential. In a high-density crowd, because of inter-object occlusion, detection of humans in the crowd will be a challenge in computer vision. Wearing facemasks and maintaining social distance is rising due to the covid-19 virus all over the world. More than five million cases were infected by COVID-19 in less than 6 months across 188 countries. The virus spreads through close contact and in crowded and overcrowded areas.Social distancing is one of the pharmaceutical infection control actions that can stop or slow down the spread of a highly contagious disease. We can tackle and predict new diseases with the help of new technologies such as artificial intelligence, IOT, big data and machine learning. Existing systems are incapable of detecting facial masks with drastically low latency. So, we will create an automation process for detection. Here, we introduce a 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. The model is integrated between deep learning and techniques with Open CV, TensorFlow, YOLO and image processing techniques are used.

II. METHODOLOGY

The goal of the analysis is to determine whether people are wearing mask or not and following the essential guidelines of Covid-19 by detecting them with help of frames which will be result of division of the captured video by Raspberry Pi Camera.

A. Database

Data processing involves conversion of data. A technique adopted commonly in image data classification, which generates several images for a single source image at different orientations and zoom levels. It helps to substantially increase

the data required for predictions and classifications by adjusting the conditions of data biasedness.

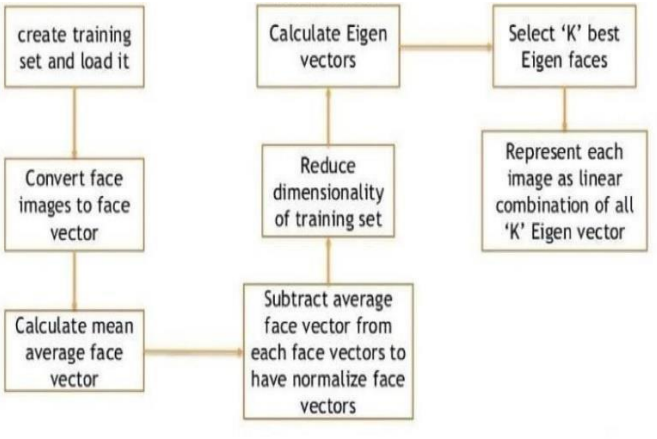

Fig 1 : Block diagram of database using PCA algorithm for training dataset and to represent the eigen vector

B. Application Directory

An application directory is a grouping of software code, help files and resources that together comprise a complete software package but are presented to the user as a single object. An application director oversees all activities related to application development. They coordinate tasks and supervise work phases related to the implementation of computer applications. Analyzing the performance of applications is also their responsibility.

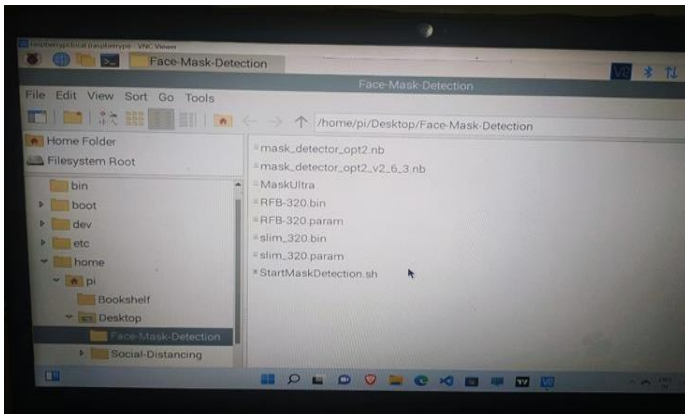

Fig 2: Image of application directory

C. Working

1. First RPi camera captures the video in the area placed. The images are then converted into coordinates.
2. In phase 1, we will train the model. Here we'll focus on loading the face mask detection dataset and training the model using TensorFlow and OpenCV on this dataset. These modules help to get the raw images data from huge open-source images data set
3. In phase 2, we will apply the face mask detector. Once the face mask detector is trained, we can then move on to loading the mask detector, performing face detection and then classifying each face as with mask or without mask.

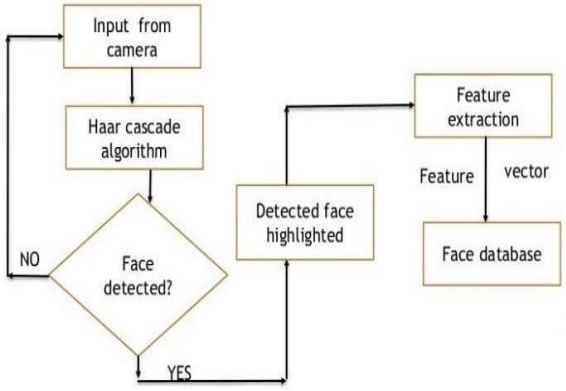

Fig 3: Flowchart of Facemask Detection

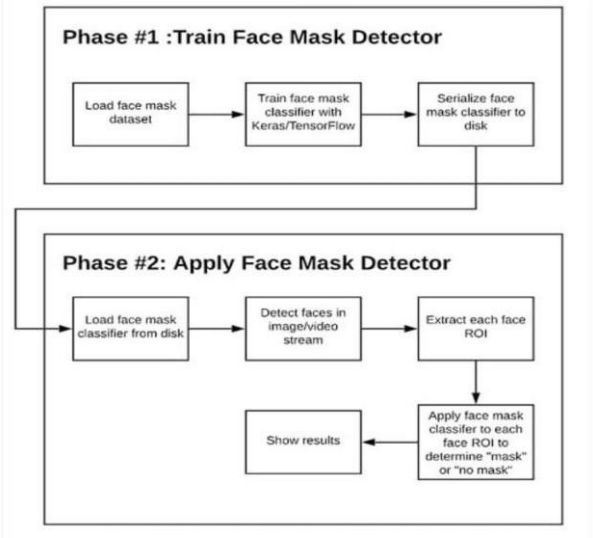

Fig 4: Working Model of Facemask Detection

1. Apply Object detection to detect all people in a video stream.
2. Based on the distances, we check to see if any two people are less than N pixels apart.
3. For the most accurate results, you should calibrate your camera through intrinsic/extrinsic parameters so that you can map pixels to measurable units.
4. Open CV social distancing detector implementation will rely on pixel distances.

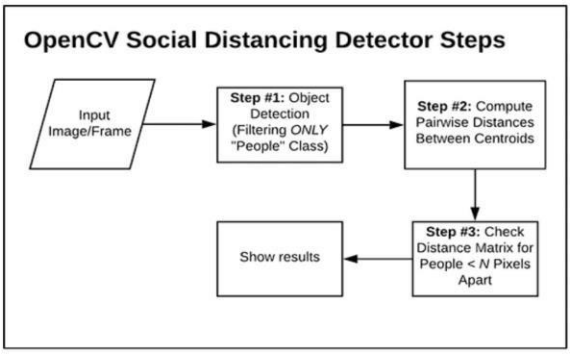

Fig 5: Working model of social distancing Detector

DISTANCE MEASUREMENT

For each pedestrain, the position in the top-down view is estimated based on the bottom-center point of the bounding box. The distance between every pedestrain pair can be computed from the top-down view and the distances is scaled by the scaling factor estimated from camera view calibration. Given the position of two pedestrains in an image as (x1,y1) and (x2,y2) respectively, the distance between the two-

$$d = \sqrt{(x2 - x1)^2 + (y2 - y1)^2} \cdots\cdots\cdots\cdots\cdots\cdots \text{(Equation 1)}$$

III. RESULT

The proposed work has been compared with existing research work in the same domain and it outfromed them. The prescribed model has also been evaluated on a test set. The model learns effectively on the training data. It learns fine details oimages accurately that it ends up miss-classifying the predicted data. As a result, the model gets saturated while evaluating the validation set of data.

Fig 6:- Proposed Image of a person without mask and with mask

Fig 7:- Proposed Image of a person without mask and with mask

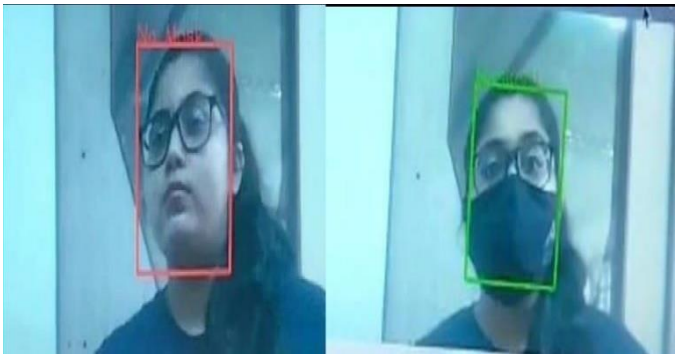

Fig 8:- Proposed Image of a person without mask and with mask

Table 1:- Proposed representation of table showing image accuracy

SR NO	IMAGES	ACCURACY
1	Image 1 :- A person without and with mask (Fig 3.1)	13.31
2	Image 2 :- A person without and with mask (Fig 3.2)	12.36
3	Image 3:- A person without and with mask (Fig 3.3)	11.46
4	Average accuracy of all three images	1.1

The below proposed captured images of the video shows the pedestrian walking on a public street.In this work, the video is fixed at a specified angle to the street. The perspective view of the video frame is transformed into a top down view for more accurate estimation. The social distancing detection in a video frame and results shown depicts the red points as whose distance with another pedestrian is below the acceptable threshold and the green points represent the pedestrian who keep a safe distance from other pedestrians

Fig 9:-Images of Social Distancing at public street (Courtesy:-PyImagesearch.com)[9]

Fig 10:-Images of Social Distancing at public street (Courtesy:-PyImagesearch.com)[9]

IV. CONCLUSION

The emerging trends and the availability of intelligent technologies make us develop new models that help to satisfy the needs of the emerging world. So, we have developed a Facemask detection and social distance monitoring which can possibly contribute to public healthcare. The model proposes an efficient real-time deep learning based framework to automate the process of monitoring the social distancing and facemask detection via object detection and tracking approaches. The system is accurate. Thus, it makes it easier to deploy our model to embedded systems like Raspberry Pi, etc. There are many systems that can detect both facemask and social distancing in different procedures. We believe that this approach will enlarge the safety of the individuals during the pandemic. The technique deployed in this paper gives an accuracy score of 1.1

REFERENCES

1. *Vinitha, Velantina,(2020), "Social distancing detection system with artificial intelligence using computer vision and deep learning", International Research Journal of Engineering and Technology (IRJET) e-ISSN:2395-0056*
   Available from -: https://www.irjet.net/archives/V7/i8/IRJET-V7I8698.pdf.
2. *C.Jagadeeswari, M.Uday Theja, "Performance evaluation of intelligent face mask detection system with various deep learning classifiers", International Journal of Advanced Science and Technology, Vol.29, No.11s, pp.3074-30780, (2020).*
   Available from-:https://www.ijert.org/review-on-literature-surveyofhumanrecognition-with-face-mask
3. *IEEE xplore, "Covid-19 Facemask detection using Tensorflow, Keras and Open CV".*
   Available from:- https://ieeexplore.ieee.org/document/9342585
4. *Rucha visal, Atharva Theurkar, Bhairavi Shukla, "Monitoring social distancing for covid-19 using Open CV and deep learning",International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056*
   Available from:-https://www.irjet.net/archives/V7/i6/IRJET-V7I6422.pdf
5. *Raspberry Pi 4 Model B; Available from:- https://www.raspberrypi.com*
6. *Pin configuration and description of components of Raspberry Pi Model 4 B ; Available from :- https://www.raspberrypi.com .*
7. *Raspberry Pi Camera; Available from :- https://www.raspberrypi.com*
8. *Representation of people wearing mask and not wearing mask, Available from :- https://www.pypi.org*
9. *Images of Social Distancing at Public street, Available from:- https://www.pyimagesearch.com*