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Face Mask Detection for Control of Growing Virus Using Tensor Flow and Keras

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ABSTRACT:
The World Health Organization (WHO) suggests everyone to wear a medical mask as it is one of the prevention measures that can limit the spread of certain respiratory viral diseases, including the Corona.
This pandemic caused by novel corona virus is continuously spreading all over the world. The impact of Corona has been fallen on almost all sectors of development of corona virus. The healthcare system is also facing the crisis.
Many precautionary measures have been taken to reduce the spread of this disease where wearing a mask is one of them. We propose this system it restricts the growth of CORONA by finding people who are not wearing any mask in people gathering places where all the public places are monitored with Closed-Circuit Television (CCTV) cameras.
While a person without a mask is detected, the corresponding authorityis informed through the city network. A deep learning architecture is used on a dataset that consists of images of people with and without masks collected from various.

KEYWORDS:
- Face detection
- Face recognition
- MobileNetV2
- OPEN CV2
- Pytorch
- image data generator

I. INTRODUCTION:

Corona was first identified on 31 December 2019, WHO was informed about the cases of unknown cause in Wuhan City, China.
Corona virus was identified as cause by Chinese authorities on 7
January 2020 and was temporarily named "2019-nCoV".

Corona virus belongs to a very know virus family called Covid-19.The trend of wearing face mask publicly is rising because of Covid-19 epidemic all over the world. Because of Covid-19 people want to wear mask to protest their health from this deadly virus .Somebody treated the wearing face masks works on preventing virus transmission.

It changed everything about human health within a year. In 2020, the transmission of virus has forced the WHO to declare Corona as international threat. Quite many million people were infected by Covid- 19 in span of few months across all countries.

The virus spreads through short contact and transmitted fast overcrowded areas. The corona virus has become a major challenge in scientific cooperation as well as in medical history. The virus took away many lives and recently the virus also affected the animals like lions.

Computer science Supported machine learning and deep learning will facilitate to fight against corona virus in many Ways. Machine learning set of values is large quantities of knowledge to forecast the distribution of Corona virus, to functioning early warning mechanism for potential pandemics, and classify vulnerable population.

People are forced by laws to wear face masks everywhere to stop theremission of virus in many countries.
These rules and law we have tendency yore developed as associate the action to the reduce growth in cases and deaths all over the countries.

However, the process observation massive teams of individuals are facing a lot of difficulties. The monitoring process involves in finding of anyone who is not wearing a face mask. Here we introduce a mask face detection process that supported machine learning and image process techniques.

This project will be detecting the mask with image and real time detection people wearing mask or not wearing a mask. The working model was integration in between deep learning and classical machine learning techniques with Open CV, Tensor Flow and Keas.

We have a tendency to introduce a

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comparison in between them to seek out the foremost appropriate algorithm program that achieved the very best accuracy and Consumed the smallest amount time withinthe method of coaching and detection.

II. LITERATURE SURVEY:

Usually most of the projects specialize in face construction identity when Wearing mask during these projects, the focus is on identification the people that wearing mask, or not help in decreasing the transmission and spreading of corona. The scientist has

In [1], the authors developed a face mask wearing condition recognition method. There is three categories of face mask-wearing. The categories are face mask wearing, incorrect face mask-wearing andno mask. Saber et al [2], have

Applied the principal component analysis on masked and without mask face recognition to identify the person. Also, PCA was utilized in. The author proposed a way that's used for removing glasses from human frontal faces. The authors used the YOLOv3 Algorithm for face detection.YOLOv3 uses Darknet-53 because the backbone [5]. Proposed a completely different GAN-based network, which will usually remove.

Mask covering the face area and presenting the image by implementing the missing hole. In [6], the authors presented a process for detecting the presence or absence of a compulsory surgical mask presence the OR. The general is the false positive face detection as made without missing mask detection is to give's alarms just for working staff who don't wear a mask. Set al [7] used deep learning real-time face emotion classification and recognition.

May use cases here are some important cases which will use form system. Airport: the proposed condition could also be important find travelers at airports. There is no mask. The traveler's data are often captured as a video within the system at the doorway. Any

Page No: 14passenger who finds no mask will alert the airportauthorities send in order that they can act quickly. [13]

Hospital: the main proposed system are often integrated with CCTV cameras, and therefore the data are usually manage to ascertain if its employees are wearing masks If you discover some doctors. If they are not wearing a mask, they are going to be receiving a reminder to wear a mask. [22]

Office: This system can help to take care of safety standards to stop. The spread of Corona or any such airborne disease If some employees aren't wearing masks, they're going to receive reminders to wear mask.[22]

The importance of the system must be supported the simplest performance. So, I'm using the Simple system performing indicators in order that you'll large –scale implementation. The system has been usewith the MobileNetV2 framework.

MobileNetV2: MobileNetV2 is that the new implement technology of mobile visual recognition, Including classification, object detection and semantic segmentation. The classifier uses deep intelligent separable convolution, its purpose is to reduce the complexity.

Expenditure and model size of the network, so it's suitable for mobile devices, or devices with low Computing power. In MobileNetV2, another important module introduced is that the reverse.

Residual structure the nonlinearity within the narrow layer is removed. Maintain because the feature extraction, MobileNetV2 achieves the simplest performance in object.

For MobileNetV2 classifier, ADAM optimizer is applied to see performance: ADAM. Adam, a stochastic optimization algorithm supported step by step the target function is predicated on an adaptive estimation of low-order steps. This manner it's computationally efficient and may be executed almost without memory. It's the diagonal of the gradient is

Rearrange unchanged, which is extremely suitable for the subsequent problems huge in terms Of knowledge and/or parameters. Hyper parameters are intuitive explain that they typically don't require muchadjustment. The empirical result publishes that Adam it works well in Practice and might be compared with other stochastic optimization method.

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III. PROBLEM STATEMENT:

This project tool is used to detect the total no of people who are wearing and people who are not wearing mask in a live video stream.

The tool will put some mark on the face of the person to divide them orto recognize them.

So that we can take certain precaution measures to be safe from not only corona (covid-19) and also from many deadly air-borne diseases and this also help for government. It will help them

To take appropriate action against the people who are violating and not following rules proposed by the law or government.

OBJECTIVES:

The expected outcome after training the code is the output of video frame or video streaming window will came as an pop up window and recognize the people in the video streaming that wearing a mask or notwearing a mask and also identify them and represent then by putting a square symbol with red color for people who are not wearing the maskand green color for wearing a mask.

METHODOLOGIES:

Machine Learning:

- It is a method of teaching prediction based on some data. It is a branch of artificial intelligence, which numerically improves on data. Over as more data as add in algorithm the performance of the system is improved.

Open CV:

- Open CV is a collection of algorithms for computer vision for image analysis it basically focus on real time image processing it is free for commercial and research use under BSD license.

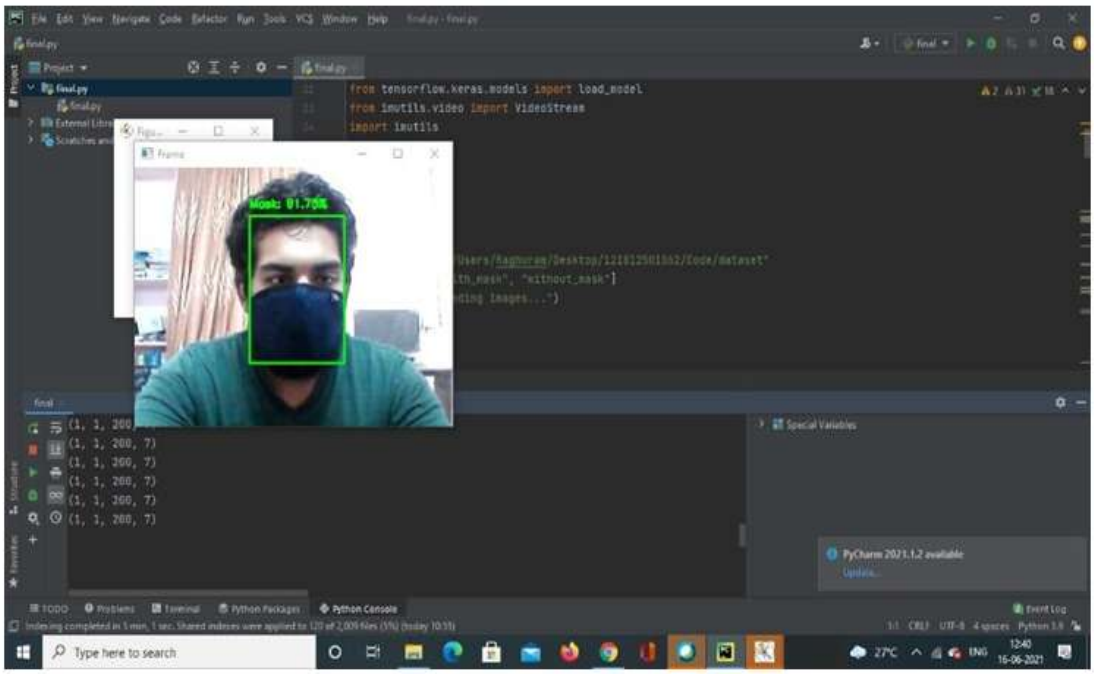
Tensor Flow:

- Tensor Flow is a mathematical computation library for training and building your machine learning and deep learning model with a simple to use high level APIs.

Pytorch:

- It is open source deep learning PyTorch frame work for tensor computation strong GPU acceleration it also helpsdifference for existing and training neural network automatically.

IMPLEMENTING:



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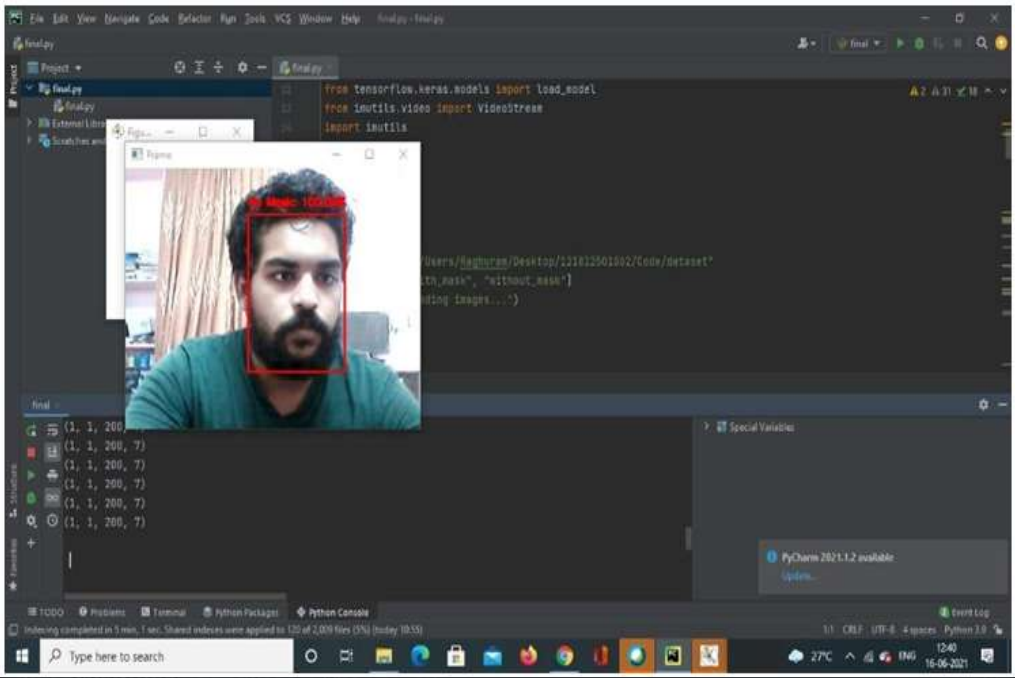

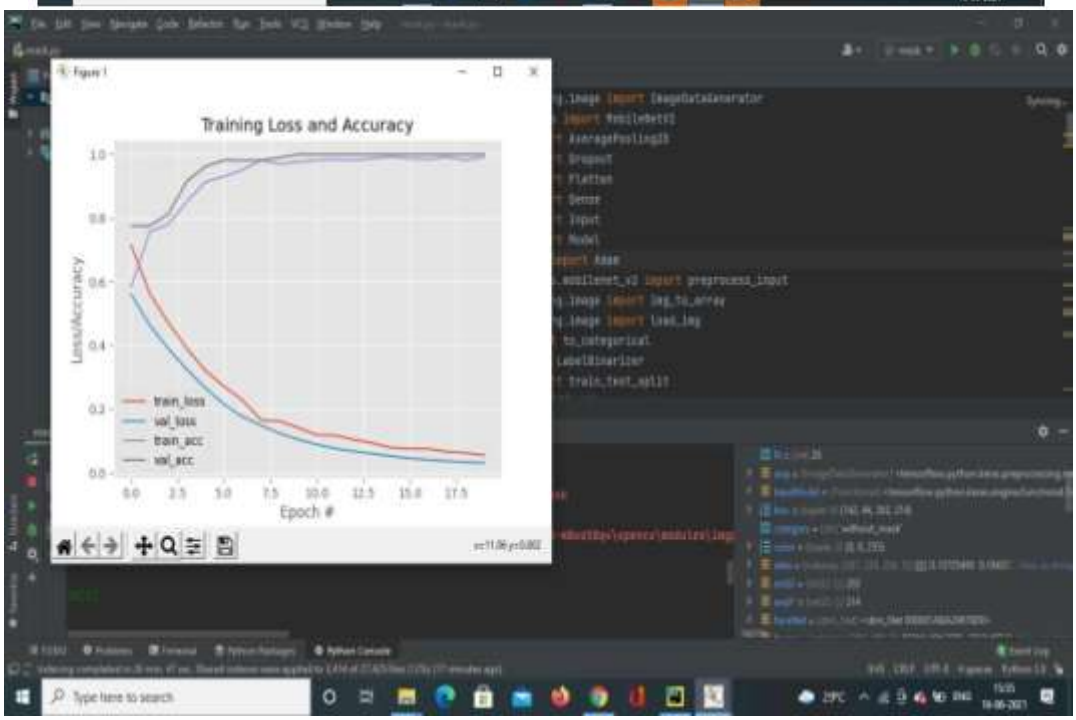

MATRIX TABLE MASKED FACE RECOGNITION ACCURACY

Category	Image Test Image	Test Image	Train Accuracy (%)	Test Accuracy (%)
Category 1	Non-masked Face	Masked Faces	100.00	90.04
Category 2	Non-masked Faces + Masked Faces	Masked Faces	99.96	98.50

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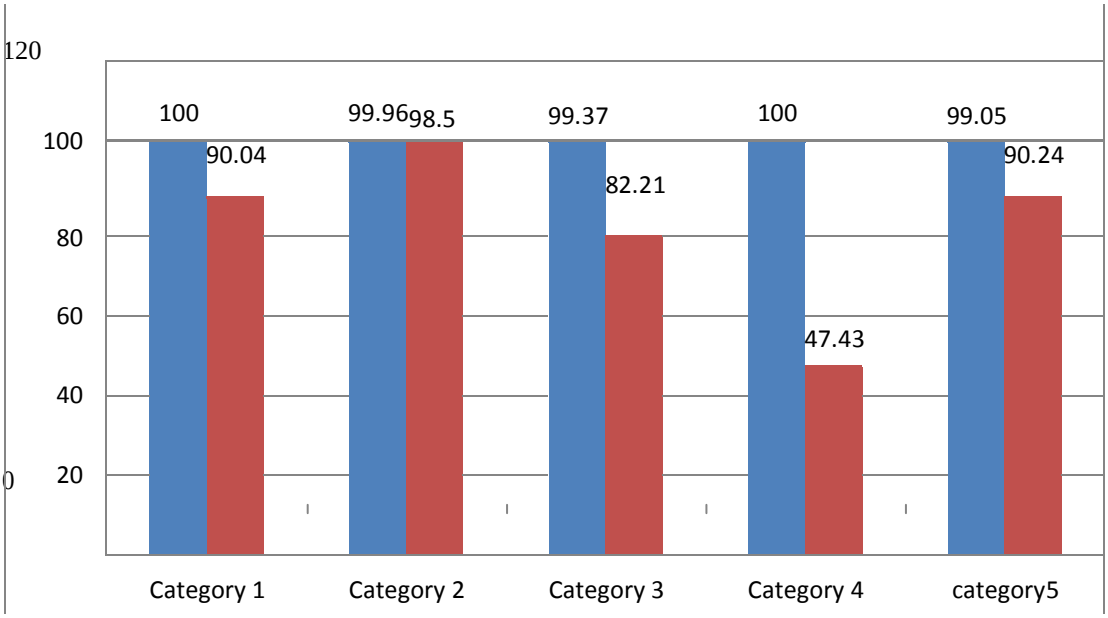
Category 3	Non-masked Faces + Masked Face	Masked Faces	99.37	82.21
Category 4	Non-masked Faces	Masked Faces (Complex)	100.00	47.43
Category 5	Non-masked Faces + Masked Faces (Complex)	Masked Faces(Complex)	99.05	90.24

From the above table-I, accuracy of masked face image recognition using Face Net is higher when we mixed masked and non-masked images for training rather than when we only use non-masked images for training. In the meantime, it has been found that when the complexity of masked increased then the recognition accuracy decreased. A graphical representation of these recognitions accuracy also presented in figure 7 for better data visualization. Fig. 7. Training and testing accuracy of masked face recognition to show the performance and correctness of a classification algorithm, the Precision-Recall curve is another visualization technique.

BAR CHART REPRESENTATION OF FACE MASK ACCURACY (%)



TRAIN ACCURACY:

TEST ACCURACY:

For various thresholds, the precision recall curve has been shown different changes among precision and recall. The larger area under thecurve shows both high precision rate and high recall rate.

CONFUSION MATRIX:

Accuracy = TP + TN / TP + TN + FP + FN Misclassification = FP + FN / TP + TN + FP + FNPrecision = TP / TP + FP

Sensitivity aka Recall = TP / TP + FNSpecificity =TN / TN + FP

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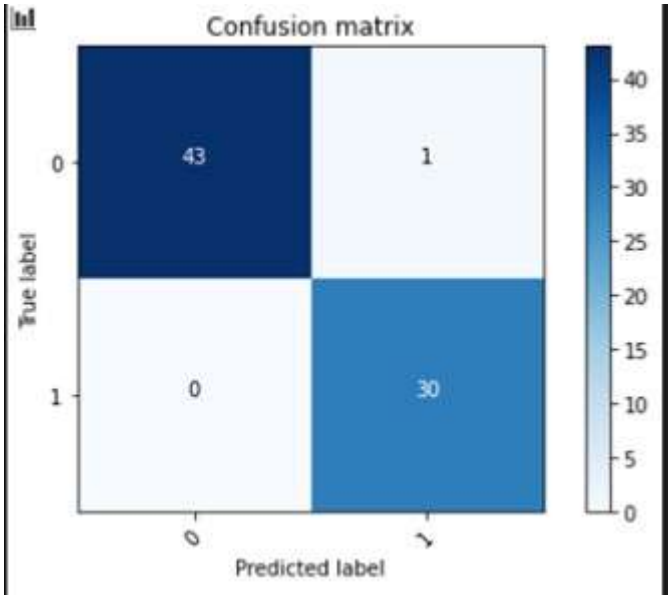

	Actual -- True/False	
Predicted -- Positive/Negative	True Positive	False Positive (Type I)
	False Negative (Type II)	True Negative

ACCURACY	88%
MISCLASSIFICATION	12%
PRECISION	45%
SENSITIVE	90%
SPECIFICATION	88%

IV. CONCLUSION:

As the novel corona virus impact is more dangerous towards the human and also few animals this technology will help us to reduce the spread/transmission of the deadly virus.

This technology is blooming with emerging trends the availability so we have face mask detector which can help to the public health care by detecting the people with and without masks.

The architecture is created in such a way that it can be used for high and low computation scenarios. This face mask detection tool is trained on CNN model and also used open computer vision Tensor Flow and python to detect whether person is wearing a mask or not wearing a mask. The tool was test the image and real- time video stream.

The accuracy of model is achieved and, the optimization of the model iscontinuous process but may not be hundred percent accurate.

FUTURE ENHANCEMENT:

We can increase the potential of the application for detecting theperson in low light places.

We can detect different masks such as cloth, N95 and surgical masksthrough our application.

We can add a segment of counting the number of people who are wearing the masks and other who are not wearing a mask and the totalpeople present in the video.

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