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# Facial Mask Detection

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## ABSTRACT

Face Detection has evolved as a very popular problem in Image processing and Computer Vision. Many new algorithms are being devised using convolutional architectures to make the algorithm as accurate as possible. These convolutional architectures have made it possible to extract small details. We aim to design a binary face classifier which can detect any face present in the frame of its alignment. Beginning from the RGB image of any size, the method uses an grayscale image from camera. Training is performed through Fully Convolutional Networks to semantically segment out the faces present in that image. Gradient Descent is used for training while Binomial Cross Entropy is used as a loss function. Further the output image from the FCN is processed to remove the unwanted noise and avoid the false predictions if any and make bounding box around the faces. Face Mask Detection system built with OpenCV, Keras/TensorFlow using Deep Learning and Computer Vision concepts in order to detect face masks in static images as well as in real-time videostreams.

**Keywords**: Computer Vision, OLED, Convolutional Networks, OpenCv, Deep Learning.

## I. INTRODUCTION

A new strain which has not previously been identified in humans is novel coronavirus (nCoV). Coronaviruses (CoV) are a wide group of viruses which cause illness that range from colds to deadly infections like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The first infected patient of coronavirus has been found in December 2019. From that period, COVID-19 has become a pandemic all over the world. People all over the world are facing challenging situations due to this pandemic. Many precautionary measures have been taken to fight against coronavirus. Among them cleaning hands, maintaining a safe distance, wearing a mask, refraining from touching eyes, nose, and mouth are the main, where wearing a mask is the simplest one. A face mask detection is a technique to find out whether someone is wearing a mask or not. It is similar to detect any object from a scene. Many systems have been introduced for object detection. Deep learning techniques are highly used in medical applications. Recently, deep learning architectures have shown a remarkable role in object detection. These architectures can be incorporated in detecting the mask on a face. Moreover, a smart city means an urban area that consists of many IoT sensors to collect data. These collected data are then used to perform different operations across the city. This includes monitoring traffic, utilities, water supply network, and many more. Recently, the growth of COVID-19 can be reduced by detecting the facial mask in a smart city network. This paper aims at designing a system to find out whether a person is using a mask or not and informing the corresponding authority in a smart city network. Firstly, CCTV cameras are used to capture real-time video footage of different public places in the city. From that video footage, facial images are extracted and these images are used to identify the mask on the face. The learning algorithm Convolutional Neural Network (CNN) is used for feature extraction from the images then these features are learned by multiple hidden layers. Whenever the architecture identifies people without face mask this information is transferred through the city network to the corresponding authority to take necessary actions. The proposed system appraised promising output on data collected from different sources. We also represented a system that can ensure proper enforcement of the law on people who are not following basic health guidelines in this pandemicsituation.

## II. PROBLEMSTATEMENT

COVID-19 which was started in 2019 in Wuhan city of China has affected more than 100 countries in a matter of no time. People all over the world are vulnerable to its consequences in future. It is imperative to develop a control system that will detect the corona virus. Which will help to stop the spread of COVID-19

## III. METHODOLOGY

- We proposed an automated smart framework for screening persons who are not using a face mask in thispaper
- **Image Preprocessing:** In the preprocessing step, the image is transformed into a grayscale image because the RGB color image contains so much redundant information that is not necessary for face mask detection. RGB color image stored 24 bit for each pixel of the image. On the other hand, the grayscale image stored 8 bit for each pixelanditcontainedsufficientinformationforclassification.Then,wereshapedtheimagesinto(64×64)shapeto maintain uniformity of the input images to thearchitecture

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- **DatasetCollection:** Datafromtwodifferentsourcesarecollectedfortrainingandtestingthemodel.Wecollecteda total of 858 images of people with masks and 681 images of people without a mask. For training purposes, 80% images of each class are used and the rest of the images are utilized for testingpurposes.
- **Architecture Development:** The learning model is based on CNN which is very useful for pattern recognition from images.The network comprises an input layer, several hidden layers and an output layer. The hidden layers consistof multiple convolution layers that learn suitable filters for important feature extraction from the givensamples

## IV. PROPOSEDWORK

This system represents to reduce the spread of coronavirus by informing the authority about the person who is not wearing a facial mask that is a precautionary measure of COVID-19. The motive of the work comes from the people disobeying the rules that are mandatory to stop the spread of coronavirus. The system contains a face mask detection architecture where a deep learning algorithm is used to detect the mask on the face. To train the model, labelled image data are used where the images were facial images with masks and without a mask. The proposed system detects a face mask with an accuracy of 98.7%. The decision of the classification network is transferred to the corresponding authority. The system proposed in this study will act as a valuable tool to strictly impose the use of a facial mask in public places for allpeople.

## BLOCK DIAGRAM

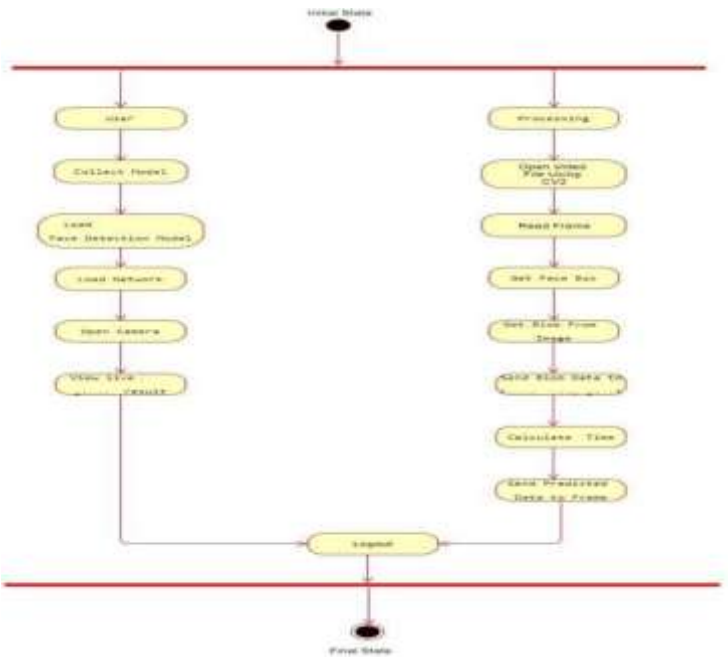

**Fig 1:** BlockDiagram

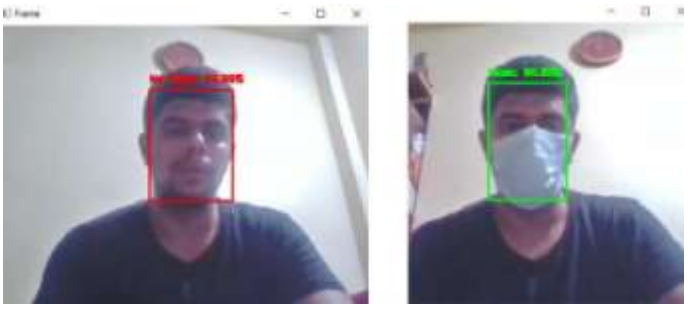

**Fig 2:** ActualOutput

By preserving a reasonable proportion of different classes, the dataset is partitioned into training and testing set. The dataset comprises of 1539 samples in total where 80% is used in training phase and 20% is used in testing phase. The training and testing dataset contains 1231 and 308 images respectively. The developed architecture is trained for 100 epochs since further training results cause overfitting on the training data. Overfitting occurs when a model learns the unwanted patterns of the training samples. Hence, training accuracy increases but test accuracy decreases. Fig. 3 and Fig. 4 show the graphical view of accuracy and loss respectively. The trained model showed 98.7% accuracy and AUC of 0.985 on the unseen testdata.

## V. ADVANTAGES

i) In this project new model is trained using Label Binarizer and mask model iscreated.
ii) Application can be used in live camera andimages.
iii) Helps to Stop Spread of Covid-19Virus

## VI. APPLICATION

i) PublicPlaces
ii) Schools, Collages,Offices

## VII. CONCLUSION

In the proposed face mask detection both the training and development of the image dataset, which was divided into categories of people having masks and people not having masks have been done successfully. The technique of OpenCV neural networks used in this model generated fruitful results. Classification of images was done accurately using the MobilenetV2 image classifier, which is one of the uniqueness of the proposed approach. Many existing researches faced problematic results, while some were able to generate better accuracy with their dataset. The problem of various wrong predictions has been successfully removed from the model as the dataset used was collected from various other sources and images used in the dataset was cleaned manually to increase the accuracy of the results. Admin will get the mail when person who is not wearing a mask has been detected Real-world applications are a much more challenging issue for the upcoming future. The model should hopefully help the concerned authorities in this great pandemic situation which had largely gained roots in most of theworld

## VIII. FUTURE SCOPE

In the future. This model can be embedded on a live CCTV camera to make it work for a large amount of people. This system can be effectively used in Company's, Various public places via a CCTV camera to ensure that everyone is wearing a mask.

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