International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 10, Issue 7 [July. 2021] PP: 07-11

Facemask Detection Using Transfer Learning of MobilenetV2

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Abstract- *The world is currently facing a huge health crisis because of pandemic COVID-19. The governments of different countries around the world are struggling to control the transmission of the coronavirus. It is very difficult to monitor people especially at crowded areas. So, we propose a deep learning model that detects persons who is wearing a mask or not. The proposed deep learning model is constructed using transfer learning. In this model image augmentation techniques are used to enhance the performance of the model as they increase the diversity of the training data. The same work can further be improved by using large volumes of data and can also be extended to classify the type of mask, and deploy a facial recognition system, used at various workplaces to support person identification while wearing the mask.*

Date of Submıssıon: 18-07-2021 Date of Acceptance: 03-08-2021

I. INTRODUCTION

In the view of wide spread of corona virus around the world,many of the world leading health organization has declared this as an world pandemic and the only way to take control over the spread is to take precautionary measures to the virus.The mask being the main precaution to the spread of virus,every government declared that facemask is an necessary when people come out to public places.prior to covid,ony few people used to wear mask for the sake of air pollution and some medical professionals used to wear mask while practicing at hospitals.According to present report there are more that 177million people are effected to this virus and most of them are affected because of their presence in the crowded placeses in their recent times.An intiative was started by the france government,they started using AI tools in the security cameras in the local metro trains and some public places,to check weather people are wearing mask are not.Artificial Intelligence techniques like Machine learning and Deep learning can be used to prevent the spread of virus.We have seen the previous prediction models based on machine learning and deep learning to predict various diseases.

The main goal of this work to develop an deep learning model using transfer learning that can predict if a person is with mask or without mask.We are using Mobilenetv2 as our transferlearning model.

II. LITERATURE REVIEW

Various machine learning and deep learning models have been in introduced to identify an object and to detect faces but here we are building a model that can detect a person wearing a mask or not. Chhaya Gupta and Nasib Singh Gill[1] designed a face mask detection model using CNN sequential layer,they built their own basic model with some pooling,dense,dropout and output layers

they were able to produce an accuracy of 91% but their model unable to detect person wearing a mask in some cases.In [2], authors perform facial detection using a fully convolutional network (FCN)that uses pretrained transfer learning model

(VGG – 16) and also uses binomial cross-entropy as a loss function. The research was focused on greyscale images in the field of face detection.even though VGG-16 is a great model its an high maintainance model. In [3], various pre-trained CNN models have been connected together to identify pneumonia in various patients by using their X-Ray images. They provided an

accuracy of 93% for training data and 82% for validation data.Hussain and Balushi [4] used VGG16 architecture for the recognition and classification of facial emotions. Their VGG16 model is trained on the KDEF database and achieved an accuracy of 88%.Rodriguez et al. [5] proposed a system for the automatic detection of surgical mask when they were entering in operating rooms. The main objective of this system is to trigger alarms when a staff is not wearing a mask.This model attained an accuracy of 95%.

There are many model have been researched on facial recognisation and object identification but there are very limited when its come to models based on facemask detection,so we want to further contribute our study in this feild,we proposed these face mask dectection model using transfer learning of mobilenetv2.

III. METHODOLOGY

In this present model we used an Simulated Masked face dataset,where most of the images with mask have been edited so that they look similar to the person who wears mask.It consists of 1376 images which are again sub divided into sub folders withmask and withoutmask folders.The dataset is very limited because these type of data sets deals with the privacy of an individual in the other hand deep leaning models are needed to be trained with huge amount of data sets for better prediction,so we tried to over sample the training data set with the

Image augmentation

fig[1].images without mask

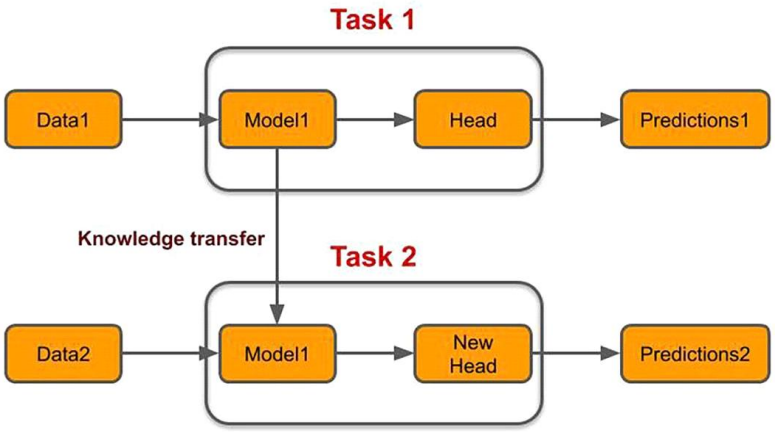
fig[2].images with mask

Image Augmentation: Image Augmentation: image augmentation is an technique which used to increase the size of an dataset with an rapid amount simply modifing the data in the dataset into different angels and adding them into the dataset.Some of the operations of the
Image Augmentation are bluring,rotating,flipping,shearing,zooming.

fig[3]. Image Augmentation

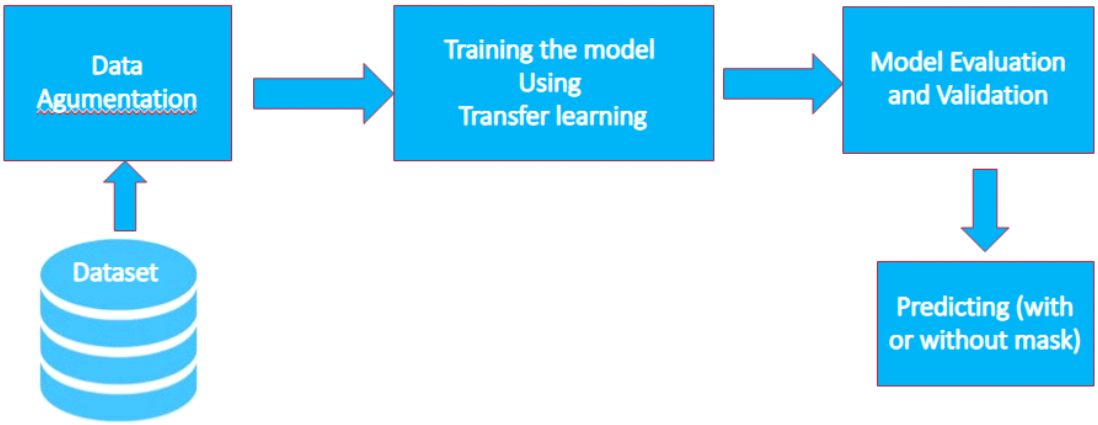
Training model: Deep neural networks are the most used for image classification because of their better performance than other algorithms. But training a deep neural network is costly because it requires high computational power and other resources, and it is time-consuming. In order to make the network to train faster

and cost-effective, deep learning-based transfer learning is evolved. Transfer learning allows to transfer the trained knowledge of the neural network in terms of parametric weights to the new model. Transfer learning boosts the performance of the new model even when it is trained on a small dataset which is common in our case.



fig[4].Transfer learning architecture

In this model we utilized mobilenetV2 as our transfer learning model because of its low size and its high accuracy when its compared to a model like VGG16 which is of 8 times larger than mobilenetV2 differs with an accuracy of 1% and making the mobilenetv2 as the base model added 5 layers that are added are an average pooling layer with a pool size equal to 7 x 7, a flattening layer, followed by a dense layer of 128 neurons with ReLU activation function and dropout rate of 0.5, and finally a decisive dense layer with two neurons and softmax activation function is added to classify whether a person is wearing mask.
finally this model is trained for 20 epochs at a bach size of 12.

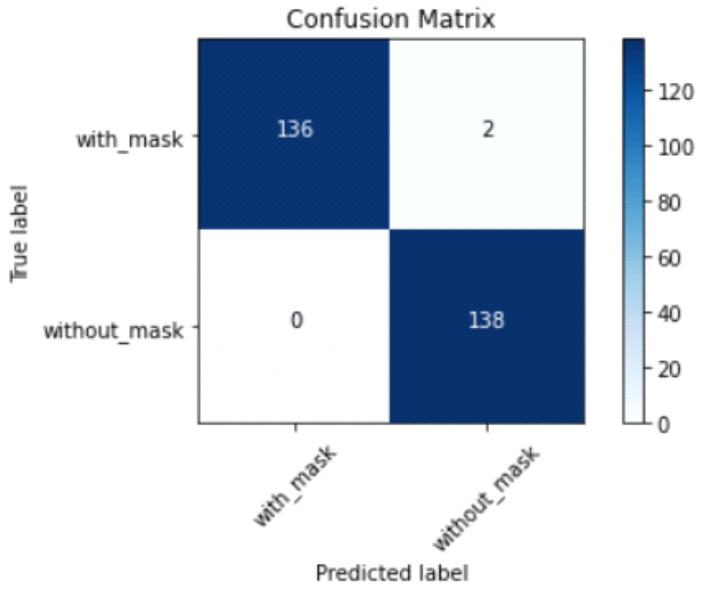


figure[5].Schematic representation of the model

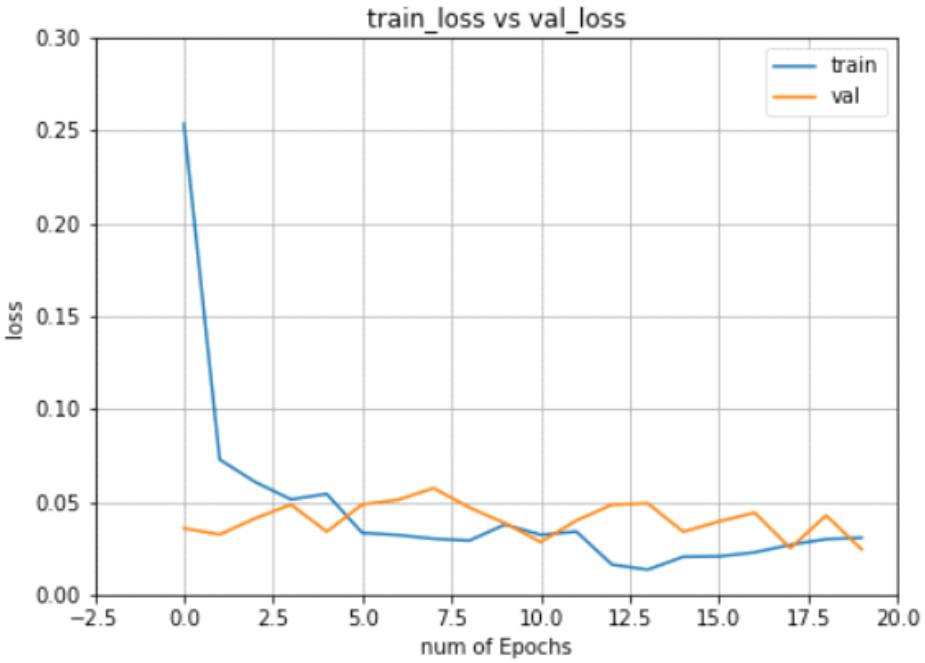
IV. RESULT

The performance of the model during the testing and training face have been represented using an confusion matrix and some plotings of train loss, train accuracy and val loss, val accuracy.The model has been trained multiple times and it as produced an highest accuracy of 99% and giving an average of 98.even one of the popular model like VGG16,Resnet produces the similar accuray with a high run power and size.

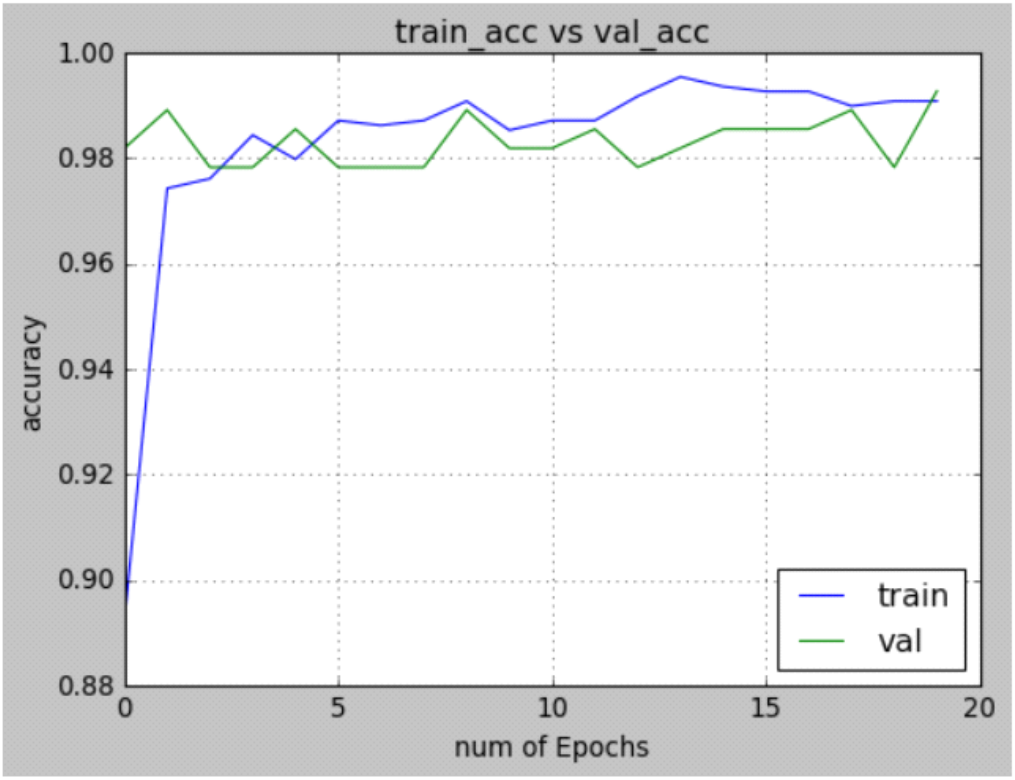
```
Confusion matrix, without normalization
[[136   2]
 [  0 138]]
```



fig[6].Confusion matrix for validation dataset



fig[7].train_loss vs val_loss graph



fig[8].train_acc vs val_acc graph

V. CONCLUSION

The world is facing a huge health crisis because of pandemic COVID-19. The governments of different countries around the world are struggling to control the transmission of the coronavirus. It is very difficult to observe crowds at these places. So, we propose a deep learning model that detects persons who are not wearing a mask. This proposed deep learning model is constructed using transfer learning. In this model image augmentation techniques are used to enhance the performance of the model as they increase the diversity of the training data. The same model can further be improved by using large volumes of data and can also be extended to classify the type of mask, and implement a facial recognition system, deployed at various workplaces to support person identification while wearing the mask.

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