FACE MASK DETECTION

Introduction: -

Hope, you might have got the idea about the topic. Yes, it is the face mask detection.

As we all knew that past few years were very tough due to COVID which enables make use of face masks mandatory not us but for our beloved ones also. So, to make sure everyone is wearing face mask or not I had developed a Deep Learning Model using Transfer Learning with base model of MobileNet & over that I use ANN to train my images.

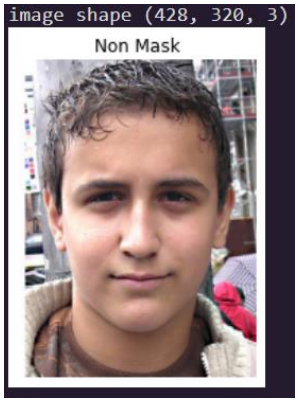
MobileNet model is designed to be used in mobile applications, and it is TensorFlow's first mobile computer vision model. It uses **depth wise separable convolutions** & significantly **reduces the number of parameters** when compared to the network with regular convolutions with the same depth in the nets. This results in lightweight deep neural networks.

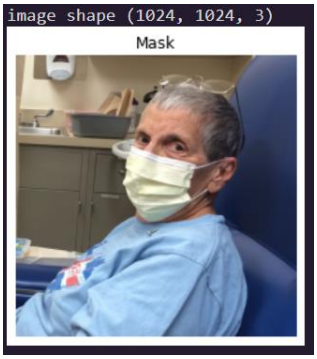
Importance: -

- It lowers the chances of coronavirus entering our respiratory system through droplets that are present in the air.
- It is a measure to combat infection.
- It helps to make sure that no infection should perceive inside through our nose.
- Many more

Dataset: -

Dataset was taken from a opensource most popular website Kaggle. It has 3 directories train, test & validate each having 2 classes tagged as Mask & Non Mask having 300, 50 & 153 files respectively.





Methodology: -

As discussed above I had used MobileNet for training the images as it is very much fast and the weights that is provided by the model are best in class for facial images.

Below is the list of layers that are being used in MobileNet model,

Table 1. MobileNet Body Architecture

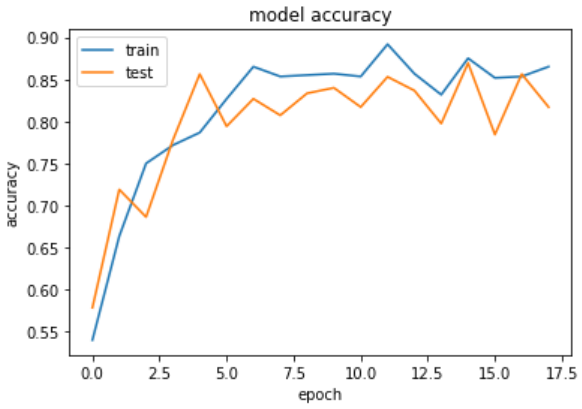
Type / Stride	Filter Shape	Input Size
Conv / s2	$3 \times 3 \times 3 \times 32$	$224 \times 224 \times 3$
Conv dw / s1	$3 \times 3 \times 32$ dw	$112 \times 112 \times 32$
Conv / s1	$1 \times 1 \times 32 \times 64$	$112 \times 112 \times 32$
Conv dw / s2	$3 \times 3 \times 64$ dw	$112 \times 112 \times 64$
Conv / s1	$1 \times 1 \times 64 \times 128$	$56 \times 56 \times 64$
Conv dw / s1	$3 \times 3 \times 128$ dw	$56 \times 56 \times 128$
Conv / s1	$1 \times 1 \times 128 \times 128$	$56 \times 56 \times 128$
Conv dw / s2	$3 \times 3 \times 128$ dw	$56 \times 56 \times 128$
Conv / s1	$1 \times 1 \times 128 \times 256$	$28 \times 28 \times 128$
Conv dw / s1	$3 \times 3 \times 256$ dw	$28 \times 28 \times 256$
Conv / s1	$1 \times 1 \times 256 \times 256$	$28 \times 28 \times 256$
Conv dw / s2	$3 \times 3 \times 256$ dw	$28 \times 28 \times 256$
Conv / s1	$1 \times 1 \times 256 \times 512$	$14 \times 14 \times 256$
$5\times$ Conv dw / s1	$3 \times 3 \times 512$ dw	$14 \times 14 \times 512$
Conv / s1	$1 \times 1 \times 512 \times 512$	$14 \times 14 \times 512$
Conv dw / s2	$3 \times 3 \times 512$ dw	$14 \times 14 \times 512$
Conv / s1	$1 \times 1 \times 512 \times 1024$	$7 \times 7 \times 512$
Conv dw / s2	$3 \times 3 \times 1024$ dw	$7 \times 7 \times 1024$
Conv / s1	$1 \times 1 \times 1024 \times 1024$	$7 \times 7 \times 1024$
Avg Pool / s1	Pool 7×7	$7 \times 7 \times 1024$
FC / s1	1024×1000	$1 \times 1 \times 1024$
Softmax / s1	Classifier	$1 \times 1 \times 1000$

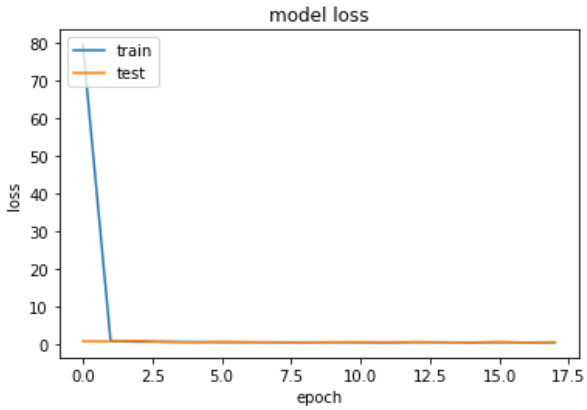
```
base_model = tf.keras.applications.MobileNet(input_shape=[224,224,3], weights = "imagenet", include_top=False)

base_model.trainable = False

# for layer in base_model.layers[30:]:
#   layer.trainable = False


model = Flatten()(base_model.output)
model = Dense(units=256, activation="relu")(model)
model = Dense(units=64, activation="relu")(model)
prediction_layer = Dense(units=1, activation="sigmoid")(model)

model = Model(inputs = base_model.input, outputs = prediction_layer)
model.compile(optimizer='SGD',loss='binary_crossentropy',metrics=['accuracy'])
```

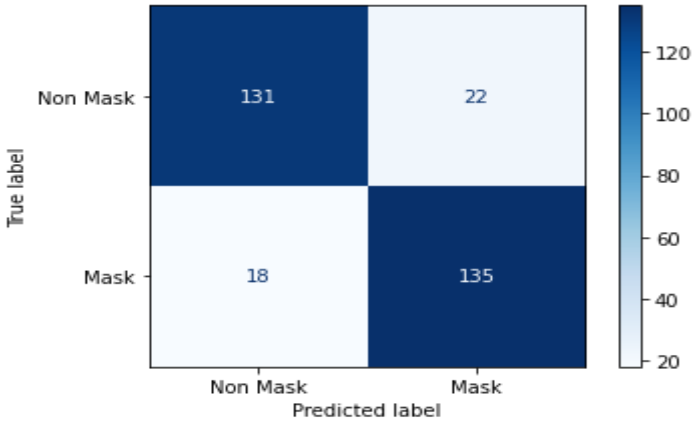
Epochs – 15, Validation Split – 10% Batch Size – 32

Statistics: -

These are the graphs evaluated from the model while training.







Conclusion: -

- It will provide a way to detect masks on the faces of persons.
- We can implement this model on various crowdy areas that to detect non mask persons and deny their permission to access that area.
- We can implement it on IOT based vehicle as well that when a person goes outside vehicle will only be able to start if person is wearing mask.