

Face Mask Detection Overview:

For the face mask detection task, three different object detection models in the TensorFlow object detection model were trained and tested on the face mask dataset to compare their accuracy and choose the best model for face mask detection. Table 1 shows the models and their accuracies.

#	Model	Image Size	Accuracy
1	Faster R-CNN Inception ResNet V2	800*1333	99.8%
2	Faster R-CNN Inception ResNet V2	640*640	81.8%
3	Faster R-CNN ResNet 152 V1	640*640	95%

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1	Faster R-CNN Inception ResNet V2	800*1333	99.8%
2	Faster R-CNN Inception ResNet V2	640*640	81.8%
3	Faster R-CNN ResNet 152 V1	640*640	95%

The Faster R-CNN Inception ResNet V2 800*1333 was selected due to its highest accuracy, i.e., 99.8%.

Faster R CNN Model:

The Faster R-CNN includes the Region Proposal Network (RPN) and the Fast R-CNN as the detector network. The input image is passed through the Convolutional Neural Networks (CNN) Backbone to extract the features. The RPN then suggests bounding boxes that are used in the Region of Interest (ROI) pooling layer to perform pooling on the image's features.

MobileNetV2 model:

The MobileNet V2 model is designed and modeled using python libraries namely Tensorflow, Keras, and OpenCV. The model we used is the MobileNetV2 of a convolutional neural network. The method of using MobileNetV2 is called using

Transfer Learning. Transfer learning is using some pre-trained models to train your present model and get the prediction which saves time and makes using training the different models easy. We tune the model with the hyperparameters: learning rate, number of epochs, and batch size. The model is trained with a dataset of images with two classes, with mask and without a mask. The dataset has 1913 images with mask class and 1918 images without mask class.

Accuracy:

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Command Prompt
super(Adam, self).__init__(name, **kwargs)
[INFO] training head...
Epoch 1/20
2021-12-09 15:09:05.316155: W tensorflow/core/framework/cpu_allocator_impl.cc:82 Allocation of 154140672 exceeds 10% of free system memory.
2021-12-09 15:09:05.382348: W tensorflow/core/framework/cpu_allocator_impl.cc:82 Allocation of 156905472 exceeds 10% of free system memory.
95/95 [.....] - ETA: 6:38 - loss: 0.9484 - accuracy: 0.6875
2021-12-09 15:09:06.168173: W tensorflow/core/framework/cpu_allocator_impl.cc:82 Allocation of 156905472 exceeds 10% of free system memory.
2021-12-09 15:09:06.224682: W tensorflow/core/framework/cpu_allocator_impl.cc:82 Allocation of 156905472 exceeds 10% of free system memory.
95/95 [.....] - ETA: 1:23 - loss: 1.0186 - accuracy: 0.5156
2021-12-09 15:09:07.062245: W tensorflow/core/framework/cpu_allocator_impl.cc:82 Allocation of 156905472 exceeds 10% of free system memory.
95/95 [.....] - 101s 1s/step - loss: 0.4455 - accuracy: 0.8398 - val_loss: 0.1740 - val_accuracy: 0.9857
Epoch 2/20
95/95 [.....] - 96s 1s/step - loss: 0.1655 - accuracy: 0.9628 - val_loss: 0.0880 - val_accuracy: 0.9922
Epoch 3/20
95/95 [.....] - 119s 1s/step - loss: 0.1884 - accuracy: 0.9743 - val_loss: 0.0627 - val_accuracy: 0.9935
Epoch 4/20
95/95 [.....] - 115s 1s/step - loss: 0.0846 - accuracy: 0.9763 - val_loss: 0.0586 - val_accuracy: 0.9922
Epoch 5/20
95/95 [.....] - 136s 1s/step - loss: 0.0755 - accuracy: 0.9796 - val_loss: 0.0449 - val_accuracy: 0.9922
Epoch 6/20
95/95 [.....] - 139s 1s/step - loss: 0.0683 - accuracy: 0.9789 - val_loss: 0.0397 - val_accuracy: 0.9922
Epoch 7/20
95/95 [.....] - 153s 2s/step - loss: 0.0577 - accuracy: 0.9845 - val_loss: 0.0374 - val_accuracy: 0.9922
Epoch 8/20
95/95 [.....] - 96s 1s/step - loss: 0.0483 - accuracy: 0.9865 - val_loss: 0.0356 - val_accuracy: 0.9922
Epoch 9/20
95/95 [.....] - 138s 1s/step - loss: 0.0433 - accuracy: 0.9904 - val_loss: 0.0364 - val_accuracy: 0.9922
Epoch 10/20
95/95 [.....] - 128s 1s/step - loss: 0.0499 - accuracy: 0.9838 - val_loss: 0.0339 - val_accuracy: 0.9922
Epoch 11/20
95/95 [.....] - 93s 977ms/step - loss: 0.0424 - accuracy: 0.9858 - val_loss: 0.0307 - val_accuracy: 0.9909
Epoch 12/20
95/95 [.....] - 118s 1s/step - loss: 0.0354 - accuracy: 0.9911 - val_loss: 0.0383 - val_accuracy: 0.9922
Epoch 13/20
95/95 [.....] - 97s 1s/step - loss: 0.0376 - accuracy: 0.9901 - val_loss: 0.0283 - val_accuracy: 0.9909
Epoch 14/20
95/95 [.....] - 95s 995ms/step - loss: 0.0328 - accuracy: 0.9895 - val_loss: 0.0315 - val_accuracy: 0.9922
Epoch 15/20
95/95 [.....] - 95s 998ms/step - loss: 0.0321 - accuracy: 0.9911 - val_loss: 0.0260 - val_accuracy: 0.9935
Epoch 16/20
95/95 [.....] - 96s 1s/step - loss: 0.0279 - accuracy: 0.9927 - val_loss: 0.0258 - val_accuracy: 0.9935
Epoch 17/20
95/95 [.....] - 95s 1s/step - loss: 0.0278 - accuracy: 0.9911 - val_loss: 0.0252 - val_accuracy: 0.9935
Epoch 18/20
95/95 [.....] - 97s 1s/step - loss: 0.0271 - accuracy: 0.9927 - val_loss: 0.0263 - val_accuracy: 0.9922
Epoch 19/20
95/95 [.....] - 96s 1s/step - loss: 0.0285 - accuracy: 0.9911 - val_loss: 0.0250 - val_accuracy: 0.9922
Epoch 20/20
95/95 [.....] - 98s 1s/step - loss: 0.0333 - accuracy: 0.9898 - val_loss: 0.0242 - val_accuracy: 0.9935
```

