Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 5, 2021, Pages. 08-15
Received 15 April 2021; Accepted 05 May 2021.

Face Mask and Social Distance Detection Using Deep Learning Techniques

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Abstract.

Liver disease, is the term given to any of the diseases or disorders that lead to the fall or loss of the liver's ability to functionThe liver is second largest organ in human body, and has more than 5,00 separate bodily functions including assistance the blood to clot, cleansing the blood of toxins, to convert food into nutrients, to control hormone levels, fight inflammation and disease, and reproduce again after injury and metabolizecholesterol, glucose and iron and control its levels. it is also produces bile Which contributes to digest fatty foods, liver diseaseincreases affecting about one in ten. Liver disease can be hereditary or caused by a variety of factors that damage the liver, in fact, there are many types disease of liver that can be caused by a virus, damage from drugs or chemicals, obesity, diabetes, or an attack from the immune system, when this is the case. These diseases are classified according to the main cause that led to their occurrence in addition to their effect on Liver, and it can be explained accordingly as follows. (Viral hepatitis,fatty liver disease, liver cancer,) This study focused on one types of viral hepatitis, which is, viral hepatitis B. The main variable was hepcidin hormone, It was measured by the ELISA method according to standard procedures at wavelength: (450nm). ALP enzyme was automated measurement at the same wavelength.This study was aimed to evaluate hepcidin level in patients with hepatitis B Virus and its effect on the level of iron and other Parameters, and to assess the liver function enzyme and other biochemical test in Iraqi patients infected with Hepatitis B addition to Healthy individuals.

Keywords: Corona Virus; Face Mask Detection; R-CNN; Deep Learning.

INTRODUCTION:

In the year 2020, the COVID-19 is the most life-changing task for people all over the world since the year began. Strict measures to be followed to prevent the spread of coronavirus. To protect us from this disease wearing a face mask and following social distancing is one of the best choices. Face mask and social distancing is a challenging task. It has become more and more attention due to the spreading of the coronavirus. Hence many countries following the rule like "No entry without a mask", face masks have been considered as a first step that helps in controlling and spreading the disease. It has become a very important issue for security purposes and COVID-19 prevention. The mask detection method will identify whether the person inside the frame is wearing a face mask or doesn't wear a face mask. Many detections have been developed and being implemented all over the world.

Nowadays face mask reduces the risk from an infected person whether they have been affected by coronavirus or not. Face recognition without a mask is easier but the face with the mask is a critical one to identify the normal face. By wearing a mask our nose, mouth, and chin are absent in the masked face. Social distancing has been considered as a second step to control the spread of contagious diseases. It implies that people should physically maintain distance between themselves from one another, reducing close contact and thereby reducing the spread of the virus. In this project, we are developing face mask detection and social distancing that can distinguish between a face with a mask and a face with no mask. The implementation of the algorithm used in this project is on images, videos, and live video streams.

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LITERATURE REVIEW

Table No: 1. Related Work

AUTHOR & PUBLICATION YEAR	APPROACH	KEY CONSIDERATION	KEY FINDINGS
ArtiMahore et al. & 2018	DWT and LBP	Detection of 3Dmask is based on anti-spoofing.	This system is based on artificial neural networks using a novel approach for generating face masks with an error percentage of 0.75-3.60.
Md. SabbirEjaz et al. & 2019	PCA & Eigen Vector Calculation	Analyzed a person with masked and without masked face with accuracy.	PCA is less accurate for the masked and non-masked faces. A masked face gives a poor recognition rate.
C.Jagadeeswari et al. & 2020	MobileNet V2, ResNet 50, VGG 16, ADAM, SGD	As a result, ADAM optimizer performance is very good and also observed that the MobileNet V2 classifier has the best result with high accuracy.	It is failed to show the test accuracy for SGD, it is approximately equivalent to ADAM.
Mingjie Jiang ET et al. & 2020	ResNet and mobile Net	Here introduces a Retinal Face Mask Detector. It is a One-stage object detector. The dataset contained 7959 images.	It is failed to achieve the accuracy level in Mobile Net when compared to Res Net. On the other side, the Res does not work well in other components.
NizamUd Din et al. & 2020	Deep learning based methods of image editing	This model produces binary segmentation for the region of the mask automatically and it synthesizes the affected region and removes the mask and with minute details.	It had a greater drawback to generate accurate results for removing large objects of complex features, especially in facial images.
Senqiu Chen et al. & 2020	PCA	This transfer learning approach combines the skip-connected structure for better accuracy of the masked face that shows classification in the absence of masked face in the given dataset.	Using PCA, the recognition accuracy with a masked face and without masked, it gives a better perfect recognition rate. The accuracy of recognition drops to less than 70% when the face is used.
S.Srithar, T. Maheswaran, Gitanjali Wadhwa & 2020	RCNN	Social distance using ultrasonic sensor and mask detection using face features	Faster RCNN require high number of epochs to train the system.

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SYSTEM DESIGN

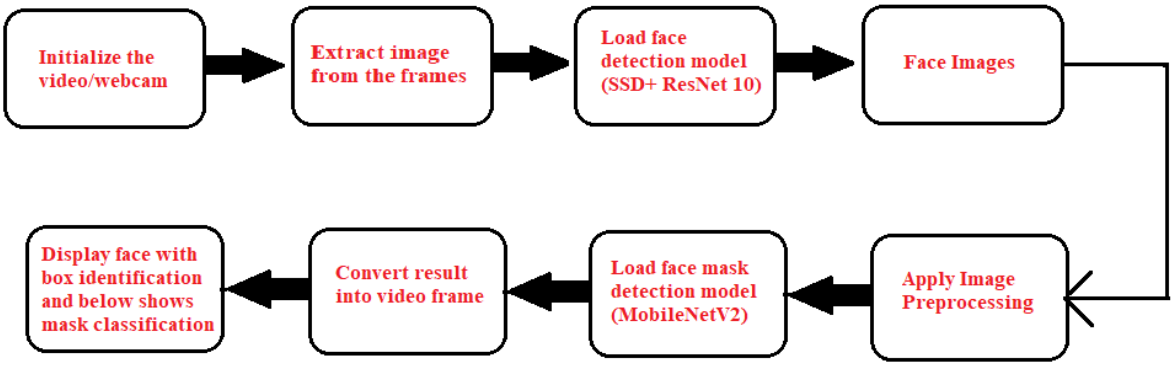

Fig. No:1. Face Mask Detection Process Flow

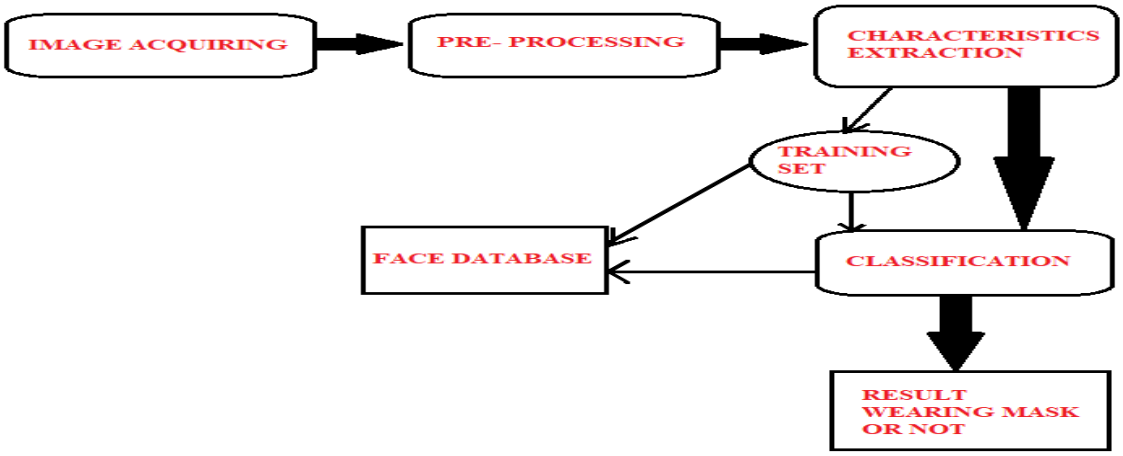

Fig. No: 2. Module Design Phase

SYSTEM IMPLEMENTATION

The proposed work is to detect and classify the face mask and social distancing detection using a Faster R-CNN model in a convolutional neural network.

Image Acquisition

The face mask and social distancing detection images are collected from the Kaggle website.

Labelling an Images

The LabelImg software is used to label the images to create an interface based on graphical user.

XML File With Attributes

The labeled images are saved in PASCAL VOC format XML files. This dataset can be treated as a principle model for a face mask and social distancing images.

Preprocessing Resize

During the preprocessing phase, the original image should be resized without crashing the pixel quality. The noise in the original picture can be eliminated by applying suitable filters. The original picture can be converted into a grayscale image for further processing. The image resizing is experimented with without resampling the original picture.

Contrast Enhancement

Image enhancement is the process of improving the image quality and information content of original data before processing. Contrast manipulations to increase the size of contrast involve changing the range of values in the input image. Contrast gets enhanced by using a function called image to enhance in a python programming tool. Set the contrast rate as 1.5 for an image to process its contrast rate.

Region-Based Convolutional Neural Network

The faster R-CNN network of object detection has majorly two parts: regions of interest and a Fast RCNN

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detector to classify the regions. The Faster R-CNN consists of important layers such as
Convolutional layers,
Feature Maps,
Region proposal network and
ROI Pooling layer.

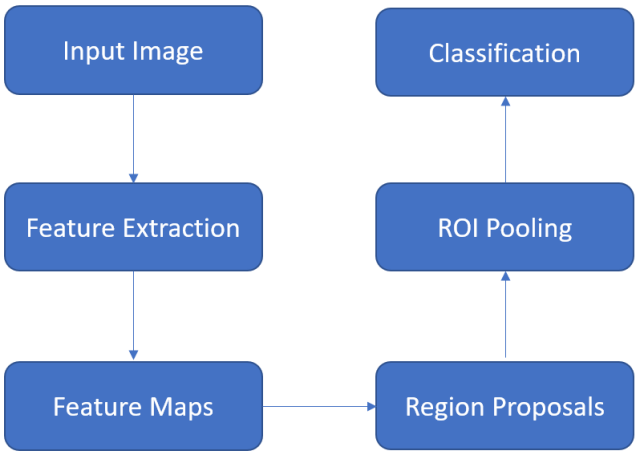

Fig. No: 3. Faster R-CNN Model for Face Mask Training

Convolutional Layer
The convolutional layer is the important major building block of CNN where a set of filters are being used which is useful for detecting the specific feature maps from the input image. It is denoted as a matrix (NxNx3) where NxN denotes the size of the image. The filter is convolved across the width and height of the image of the input in the frame given in it. Various filters are used for the detection of many features that are convolved on the input image and a set of activation functions are computed which is given as the input to the next layer in the CNN.

Stride and Padding
The number of pixels that shift over the input image is known as a stride. When the stride is one, then the filter is moved through one pixel at a time. The result after applying stride and filter is the extraction of feature maps from the image. After striding, the output dimension of the image is reduced. If the same dimension has to be retained, then padding should be done before applying the filter. Padding is the process of appending zero to the input image.

Feature Maps
The feature map is the output region of the previous layer of the image with one filter applied to it. It can use small filters or large filters to compute the output image.

Region Proposal Network(RPN)
The RPN quickly scans every location to assess the further processing necessary steps to be carried out in any region that the image is present. The anchor boxes are just references, they have different ratio aspects and scales so that it can accommodate different types of objects, such as buses, cars, shells, animals. In Faster R-CNN they used k = 9 representing 3 scales and 3 ratios. Each regressor in the RPN only computes 4 offset values w-width, l-length (x,y)-center to the corresponding reference anchor box. The RPN uses a 3x3 window that slides over a high-level convolutional feature map, the effective size of that small window is 177x177 when reprojected back to the input layer, so the RPN is using a lot of contexts when making the proposals. This 3x3 window is resampled to a 256-dimensional vector before feeding into the two fully connected layers, a layer of box regression computes the box offsets, and the box classification layer computes the confidence scores that are related to the probability of objectiveness.

RoI Pooling Layer
ROI pooling layer produces the number of channels as an output that is equal to the number of channels that as an input for the entire layer. The main two operations in the pooling layer are
Average pooling
Maximum pooling

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The maximum pooling will take the maximum value only from the pool and the rest are deleted out but in average pooling, the average of all the pools will be taken without deleting or dropping it. ROI pooling layer takes two inputs:
Convolutional Neural Network generates a feature map after multiple convolutions and multiple pooling layers.
'N' proposals from Region proposal network. Each proposal has five values; the index denotes the first step and the rest four are proposal coordinates.

Bounding Box Regressor
Bounding-box regression is a technique that helps in refining or predicting localization boxes in approaches of object detection. Bounding-box regressors are trained to regress from either of the proposed regions. At first, the model splits the image in the input to grid cells. Each grid cell envisages a bounding box that involves the center coordinates the x, y, the width, and height of an image. The implementation is done by using various processes. Initially, whenever an image is taken (i.e as an input) it extracts the feature from the image. Then with the help of feature maps, it creates the projected region proposals, and finally with the help of the pooling layer the output gets displayed.

RESULTS AND DISCUSSION

Detecting whether the person wears a mask or not, we have developed a model so that it detects with the help of some features. These features like nose, mouth, and chin will be absent if a person wears a mask. It then shows the result as 'Mask'.

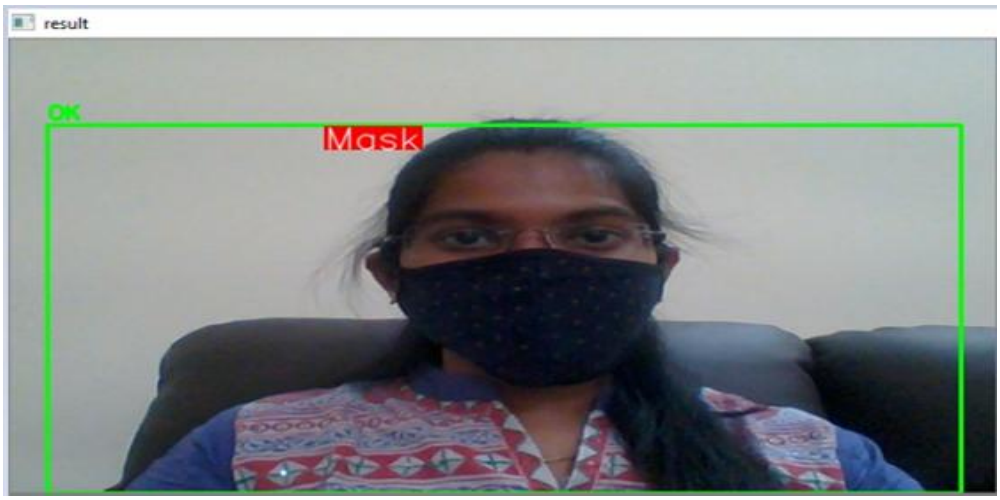

Fig. No: 4. RCNN model With Mask

To provide better accuracy we have developed a model that even when a person closes his/ her nose and mouth with the help of the hands it predicts and detects whether the person wears a mask or not. It then shows the output as 'No_Mask'. It shows the accuracy of the model.

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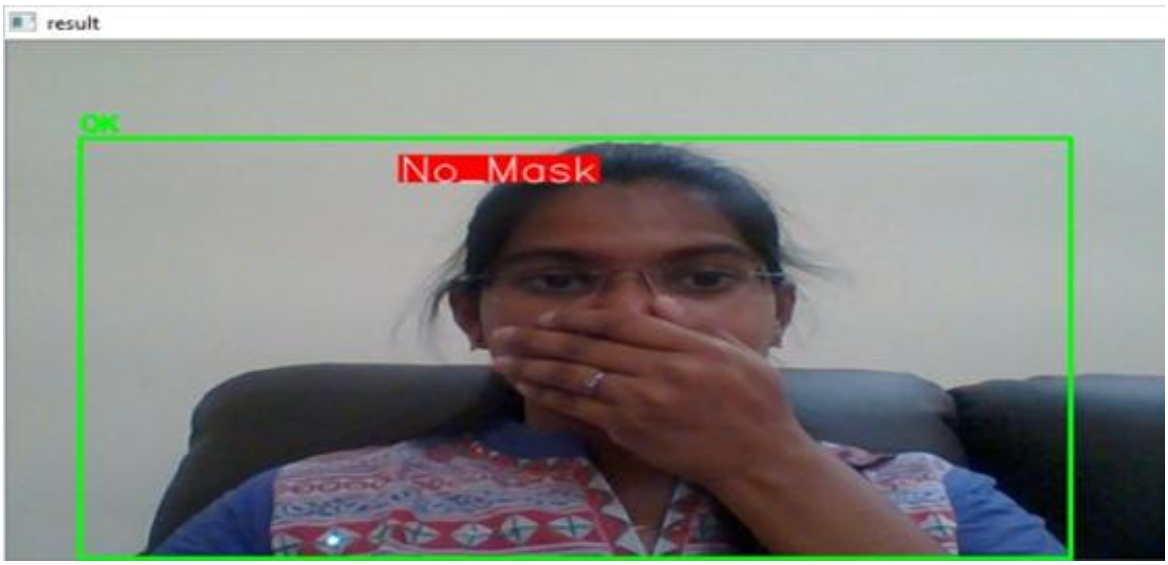

Fig. No: 5. RCNN model Without Mask

If a person doesn't wear a face mask, features like nose, mouth, and chin will be present. This means that the person doesn't wear and shows the result as 'No_Mask'. This is done with the help datasets which we have trained the system using deep learning technology.

Fig. No: 6. RCNN model Without Mask

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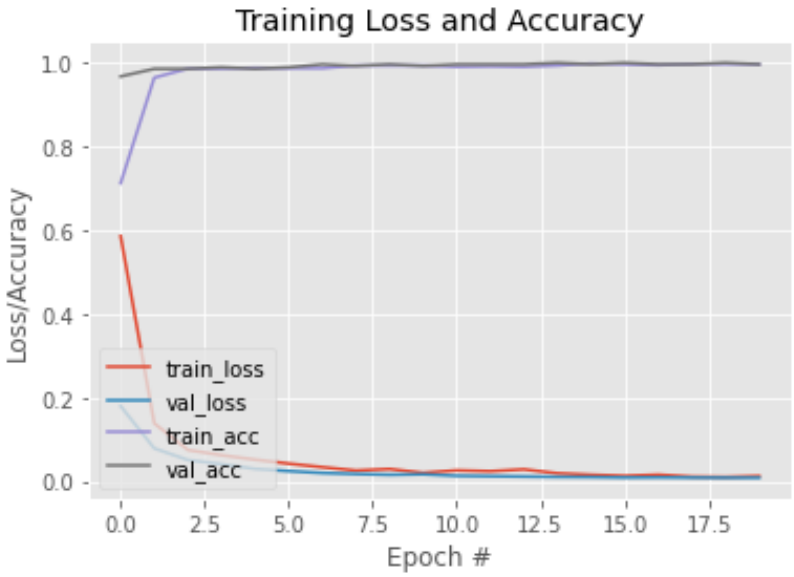

Fig. No: 7. Number of Epoch Vs. Loss/Accuracy

CONCLUSION

Artificial Intelligent (AI) and Machine Learning (ML) are developed various models for a face mask and social distancing detection. In this article, we discussed various methods that are used for face mask detection. As we know nowadays face mask detection is a very serious task due to this coronavirus. The applications of detecting face masks are used for the prevention of spreading Corona Virus. By using a Deep Convolutional Neural Network Algorithm, we can easily detect the face mask. But the face mask detection and non-masked face detection accuracy provided high variations.

FUTURE WORK

Face recognition applications have been in use for the last twenty years. Nowadays machines can automatically verify and identify information that helps for secure and also in better transactions, for surveillance purposes and in tasks that involve security, and for access control to buildings. A prototype system for automatic Helmet Detection, Face detection, and Face Recognition is successfully implemented and tested. The system is modeled in a way that if a person tries to cover his/her face, it gives an alarm as a voice note for warning. If suppose face is not recognized them the alarm will give the warning message to the authorized person.

CONFLICTS OF INTEREST:

The author have declared no conflicts of interest

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