BAN 676

Deep Learning Project

Gender & Mask Detection in Real Time Video Stream
(Web application – Exceed Expectations)

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1.Web App Implementation

In this project, the test data for the gender and facemask detection models are the live stream images of the people with either mask or no mask. We will be creating the web application file where the gender and facemask detection models are loaded, and the logic is executed using streamlit module to run the models on a web application.

Gender Detection Model Execution

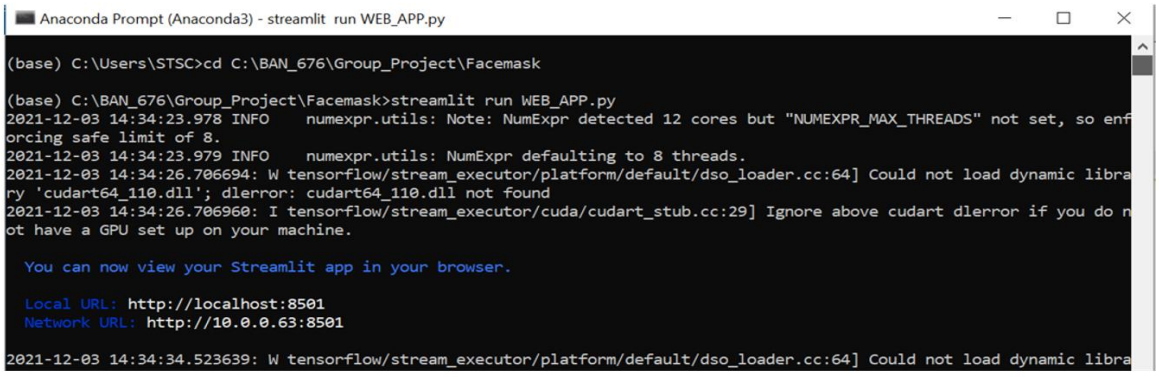
We load the gender detection model using *load_model* from keras module. Then, we initiate the web camera using *CV2* library. Once the webcam is opened, we read the Frames from the webcam. Using the Detect Face method in Open CV library we fetch the Confidence score and frames.

As the camera runs, it captures a series of images in frames per second which are the test images for the model loaded. Once the face is spotted, the coordinates of the frame in rectangular design is developed using the pixel of 255 for Green channel and 0's for red and blue.

With the frame now cropped, the resulting image is resized to size of 96, which was also the uniform size in the Gender detection python code to train the model with the test data. The image is divided by maximum pixel size of 255 to get a probability distribution between 0 to 1.

Having achieved the above target, image is converted to vector helping the model predict the gender and return a 1D data. Using NumPy library's argmax function we get the confidence value and use that value as an index to get Gender from the Label list. To display on UI, we use the Streamlit library, which creates below on web application:

- Title of the Project (Gender & Facemask Detection in Real Time Video Stream)
- Header (Loading the Gender Detector CNN model...)
- Sub header (Model Loaded: gender_detection.model)
- Command to run the Web application File on Command Prompt



Once the gender retrieved, the confidence score is used to display the accuracy of the prediction and displayed on the screen along with gender prediction on the rectangular frame of the Person on live video stream.

The CV2 library closes the webcam and then we display the Output depending on gender :

```
Hello Sir!!
```

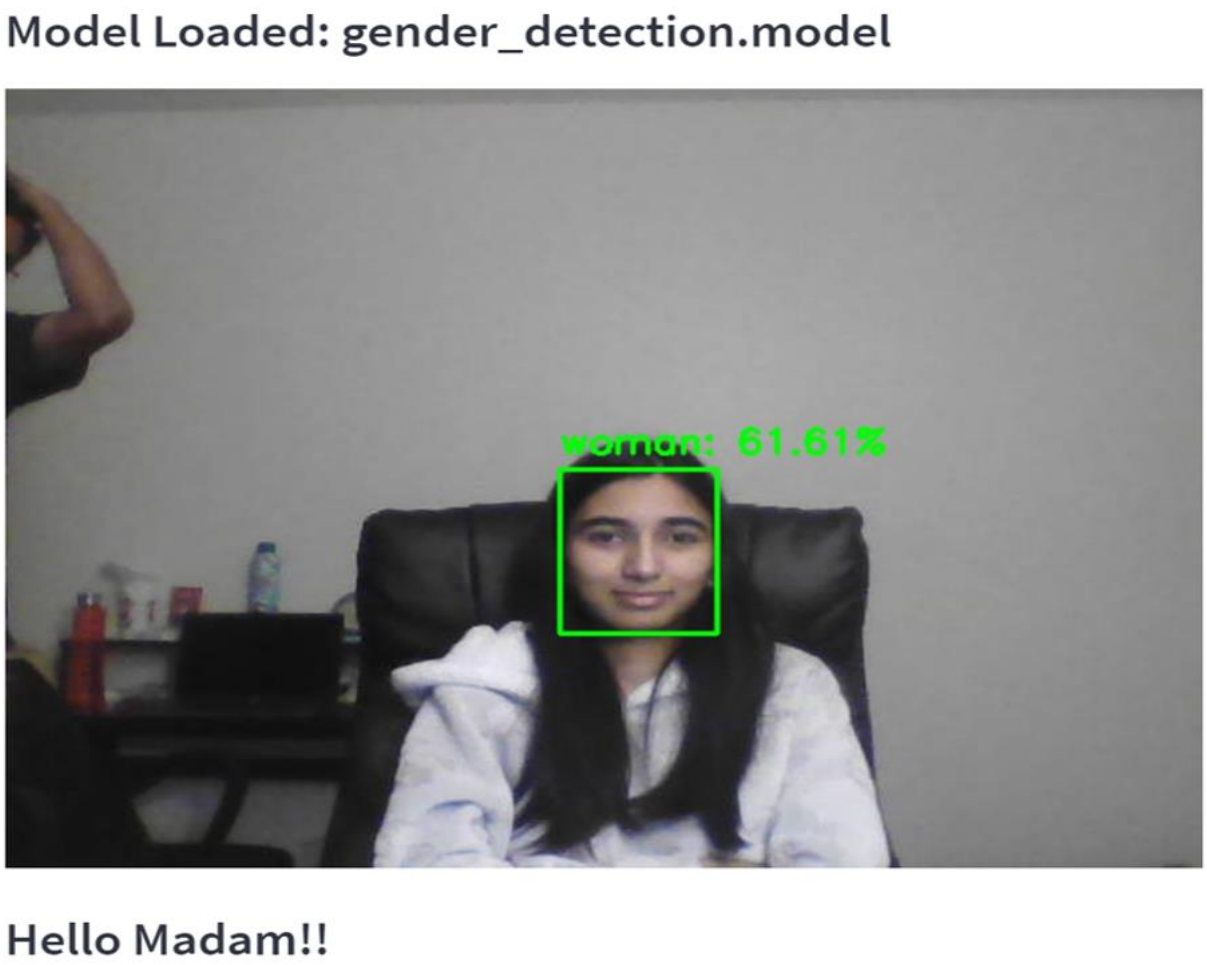
Or

```
Hello Madam!
```

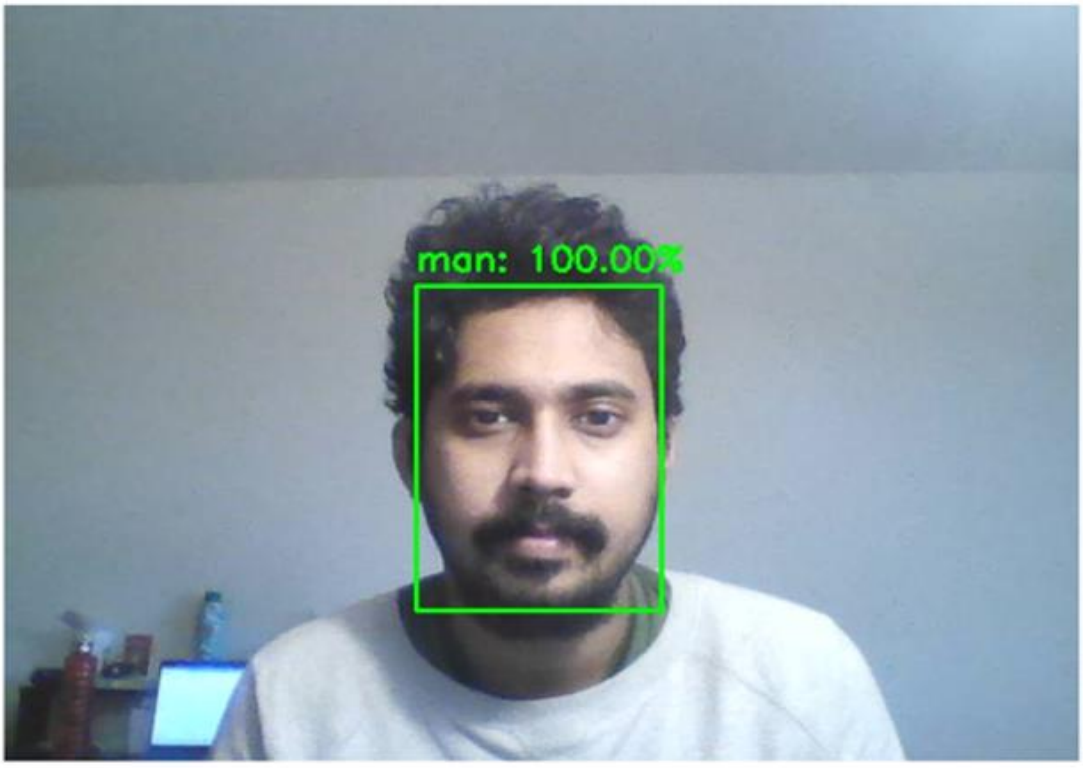
2.Gender Detection Output

Gender :Woman

1. Predicting Gender: Woman and Respective Message



Gender: Man



Facemask Detection Model Execution

After gender prediction, we load the trained facemask detection model using keras module and face detect module using the ReadNet method of the Dnn module from the CV2 library. Since the web camera is on, we capture the stream of images in frames per second of the same person with either mask on or mask off.

Using the frame, face detected and mask related data, we create Blob from image using the dense Neural network .The face detection shapes are formed and with those detections we extract the probability. Once the confidence is greater than 0.5, we retrieve the bounding box of that image and plot the coordinates. Using the coordinates, frame is modified to:

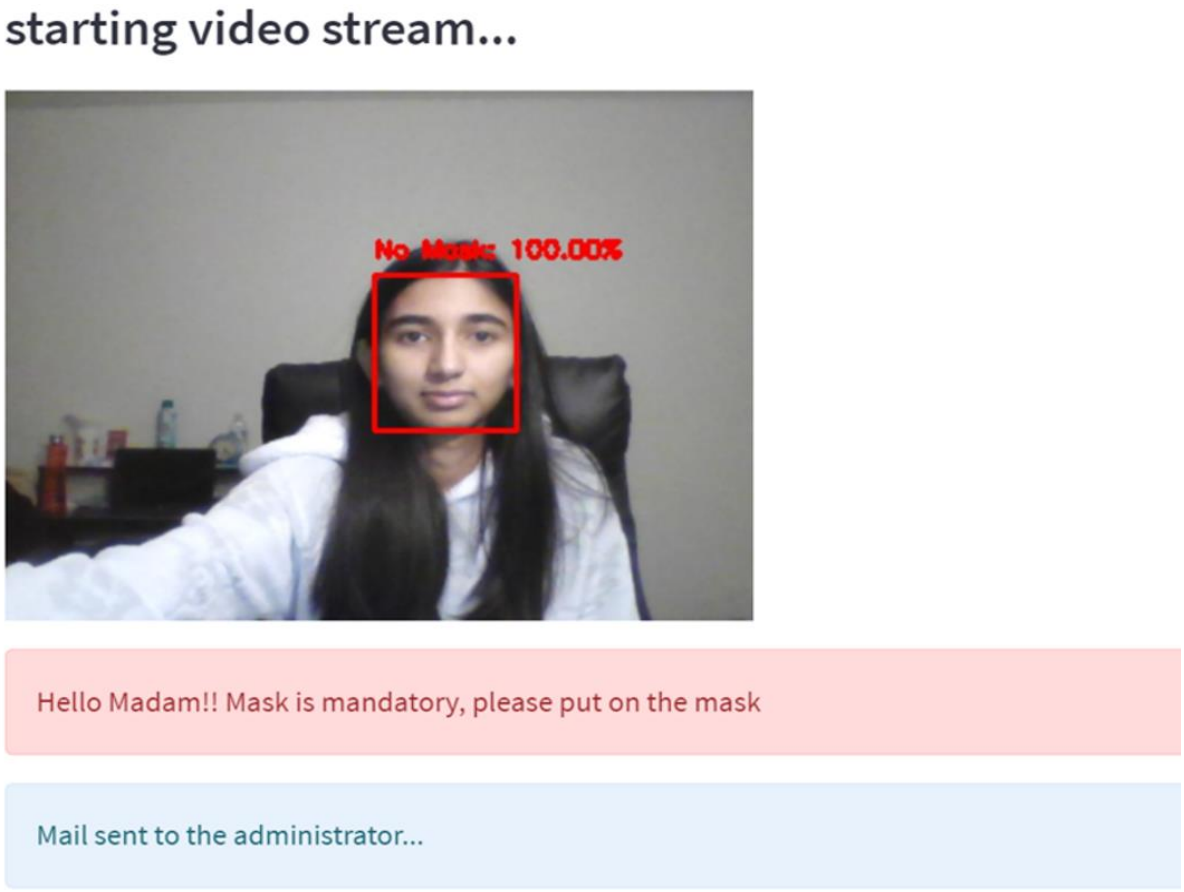
- Convert to Image with RGB channel from BGR channel
- Colorize the image
- Resize the image to 224 sizes , same as the data trained in Face Mask Detection Model
- The vector is built for the final image

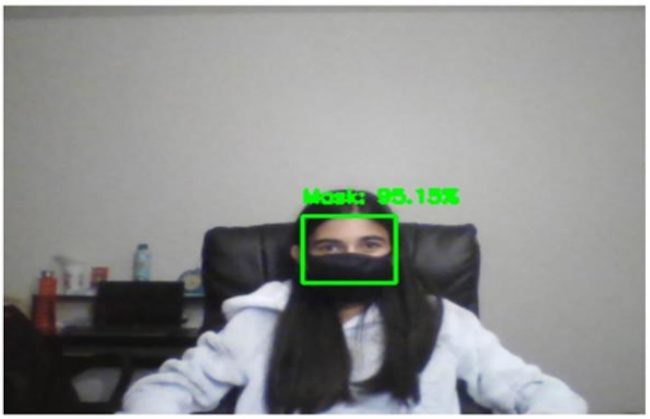
The face mask model predicts the output and uses batch size to get optimized result. The resulting score is checked find which of the two classes i.e., “Mask” or “Without Mask” have highest value in the label list. The rectangle is built for the user on the live web stream and the accuracy score, and the message of face mask prediction is displayed.

3.Face Mask Detection Output

Gender: Woman

Now, if the person is not wearing any mask, we display the message on a web application saying that the mask is mandatory and send an alert email to the ‘administrator’ that no mask is detected. We used *smtplib* library from python to achieve this functionality.





Hello Madam!! Mask is mandatory, please put on the mask

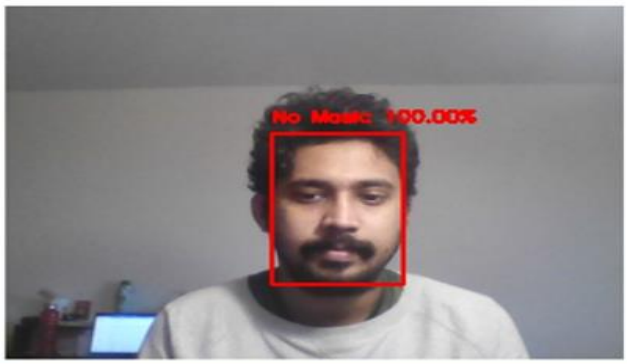
Mail sent to the administrator...

Hello Madam!! You are good to go

However, if the person is detected wearing a mask, we display the success result on the web application screen. This program will keep on running unless the administrator stops the execution of the program.

Gender: Man

The same functionality runs when gender is man and necessary communication are accordingly dealt with. When there is no mask, we get:



Hello Sir!! Mask is mandatory, please put on the mask

Mail sent to the administrator...

If mask is detected:

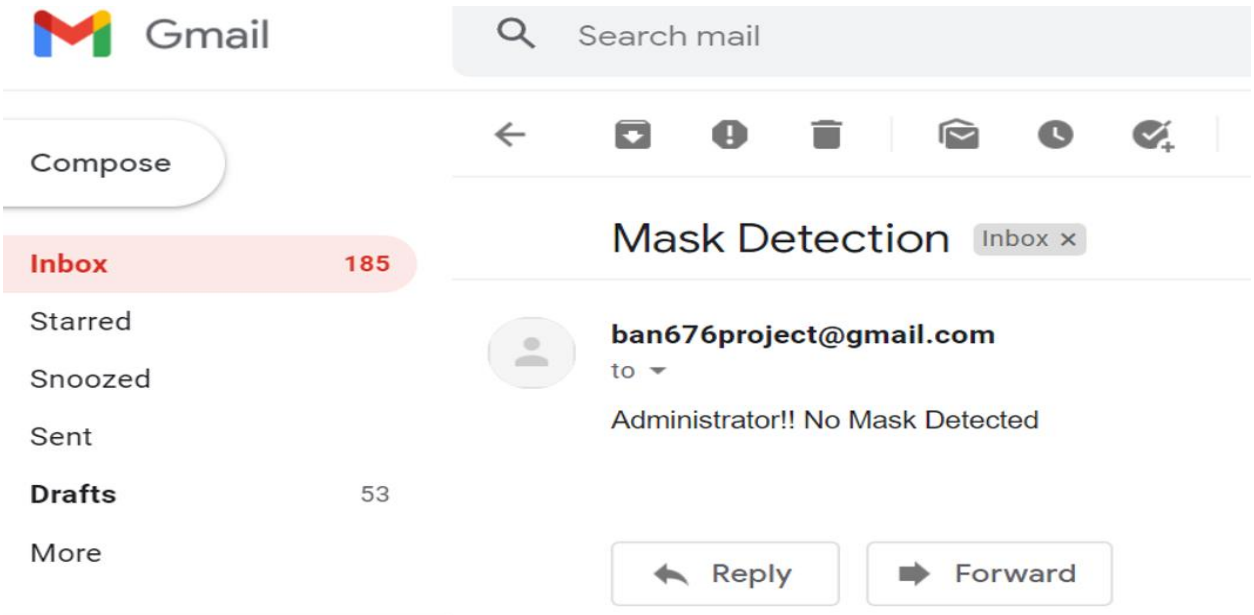
Hello Sir!! Mask is mandatory, please put on the mask

Mail sent to the administrator...

Hello Sir!! You are good to go

Email Feature

An email is sent out to administrator using SMTP library, apart from informing the end user:



4.References

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   Author : Srivignesh R
   URL: https://www.analyticsvidhya.com/blog/2021/06/build-web-app-instantly-for-machine-learning-using-streamlit/

2. **Getting started with Python's powerful Streamlit framework with a simple example**
   Author: Sayan Das
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3. **OpenCV Tutorial in Python**
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