International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 2 ǁ 2022 ǁ PP. 48-52

Face Mask Detection System

Ms. Vidhi Songhela[1], Mr. Gautam Nayak[2], Mr. Yash Rupareliya[3], Asst. Prof. JayvirSinh Kher[4]
[1,2,3,4]*Computer Science and Engineering, Parul University, Vadodara, Gujarat, India*

Abstract*— The corona virus COVID-19 pandemic is causing a global health crisis so the effective protection methods is wearing a face mask in public areas according to the World Health Organization (WHO). The COVID-19 pandemic forced governments across the world to impose lockdowns to prevent virus transmissions. Reports indicate that wearing facemasks while at work clearly reduces the risk of transmission. We will use the dataset to build a COVID-19 face mask detector with deep learning using Python, OpenCV, and Tensor Flow and Keras. In our proposed system we will use live video stream and finally in output it gives alert when someone not wearing mask. Our goal is to identify whether the person on image/video stream is wearing a face mask or not with the help of computer vision and deep learning.*
Index Terms*— Key Words: Corona virus disease 2019, Face mask detection, CNN, deep learning*

Date of Submission: 02-02-2022 Date of acceptance: 16-02-2022

I. INTRODUCTION

The world is still recovering from the widespread of COVID-19, and a vaccine for it's cure has yet to be discovered. To lessen the economic burden of the epidemic, several countries have allowed a restricted number of economic activities to restart once the number of new cases has decreased. Covid-19 has fallen below a particular threshold. Concerns about worker safety have surfaced in the new post-Covid-19 climate as these countries cautiously recommence their economic activity. It is recommended that people wear masks and keep a distance of at least 1 metre between them to limit the risk of infection. Deep learning has gotten a lot of interest in the field of object detection, and it's been used to produce a face mask identification tool that can tell if someone is wearing a mask or not. This can be done by studying real-time streaming from the Camera and evaluating the categorization findings. A training data set is required for deep learning applications. This is the dataset that was used to train the model to execute various tasks. As a result, detecting face masks has become a very important and difficult task. Face recognition without a mask is simpler, but face recognition for a normal face can be efficient for feature extraction than a masked face. Many facial characteristics, such as the nose, lips, and chin, are missing from the covered face. In the medical industry, wearing a mask minimizes the danger of being exposed to an infected person, whether or not they exhibit symptoms.

COMPONENTS

The components used in this project can't be specific, since this project is a prototype for all computers. As such, certain
prerequisites are as follows:

A. Hardware

1) PC/Laptop

2) Webcam

For the image to be detected, a webcam is required. The sensitivity of the mouse is proportional to the camera's resolution. A better user experience is ensured if the camera's resolution is high enough. The camera is used to capture real-time photos whenever the computer is turned on. The system will choose the appropriate action based on gestures and finger motions.

B. Software

Python 3.5 in Google Colab is used for data pre-processing, model training and prediction

• Operating System: windows 7 and above or Linux based OS or MAC OS

• Coding Language **:** Python.

II. METHODOLOGY

System design:

The major requirement for implementing this project using python programming language along with Deep learning ,Machine learning , Computer vision and also with python libraries. The architecture consists of

Mobile Net as the backbone, it can be used for high and low computation scenarios.We are using CNN Algorithm in our proposed system.

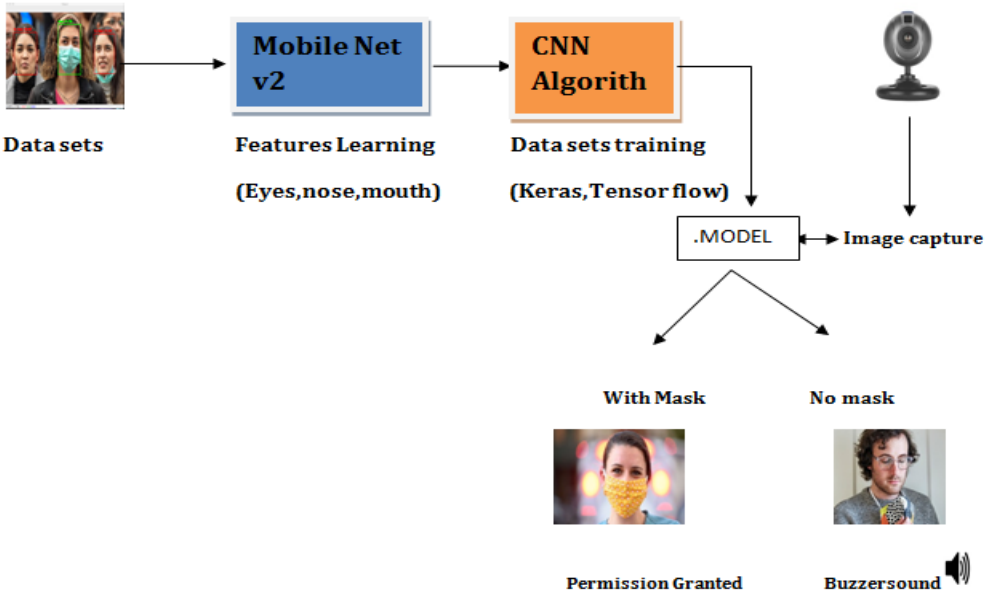

Fig 1. System Design

Implementation:
We have four modules
1. Datasets Collecting : We collect no of data sets with face mask and without masks. we can get high accuracy depends on collecting the number of images .
2. Datasets Extracting: We can extract the features using mobile net v2 of mask and no mask sets
3. Models Training: We will train the the model using open cv,keras (python library).
4. Facemask Detection : We can detect Pre-processing image and also detect via live video . If people wear mask, it will permit them, if not then it will give the alert to wear mask to prevent them from virus transmission.

Proposed system:
1. This system is capable to train the dataset of both persons wearing masks and without wearing masks.
2. After training the model the system can predicting whether the person is wearing the mask or not.

DEEP LEARNING:
- Deep learning is an artificial intelligence function that mimics the human brain's processing of data to detect objects, recognise speech, translate languages, and make judgments.
- 'Deep learning' is a term that refers to AI can learn without the need for human intervention, using both organised and unlabeled data

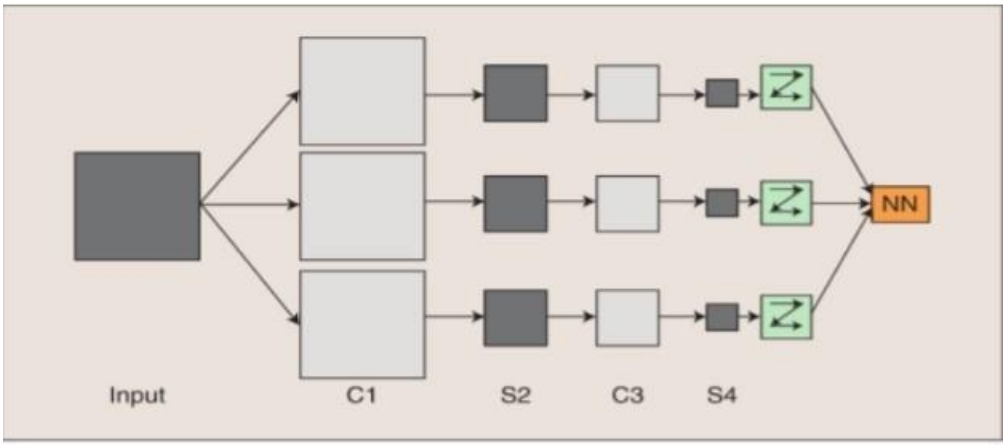

Fig 2. Deep learning model

Face mask detection is done using Convolution Neural Networks, a Deep Learning approach (CNN). The connectivity pattern between neurons in convolutional networks is similar to the organisation of the visual cortex, which was inspired by biological processes. In comparison to other image classification methods, CNNs require very little pre-processing. CNN is a type of multilayer neural network that is applied to 2-dimensional arrays (typically pictures) and is based on spatially localised neural input. CNN For pattern recognition, create "patterns of patterns." Patches from previous layers are combined in each layer. Convolutional Networks are multistage topologies with numerous stages that can be trained. Enter a Each stage produces feature maps, which are collections of arrays. Each feature map on the output represents a single feature taken from all input locations. A filter bank layer, a non-linearity layer, and a feature pooling layer make up each stage. A ConvNet is made up of three layers in which each one is followed by a classification module. Basic structure of CNN, where it consists of two C1,C3 are convolution layers and two S2,S4 are pooled/sampled layers. In a filter bank, a trainable filter (kernel) connects the input feature map to the output feature map. Convolutional layers perform a convolution on the input before forwarding the output to the next layer. The convolution simulates a singleneuron's reaction to visual input.

CNN MODEL

1. The Tensorflow framework and the Opencv library were used to create this CNN model, which is widely utilised in real-time applications..
2. This concept can also be used to create a full-fledged software that scans everyone entering a public meeting.

STEPS

Data Visualization.
Data Augmentation.
Splitting the data.
Labeling the Information.
Importing the Face detection.
Detecting the Faces with and without Masks.

Data Visualization

Let's start by visualising the total number of photographs in both categories in our dataset. We can observe that the ‘yes' class has 690 photographs while the ‘no' class has 686 photos.

Data Augmentation

In the next step, we augment our dataset to include more number of images for our training. In this step of data augmentation, we rotate and flip each of the images in our dataset.

Splitting the data

In this step, we split our data into the training set which will contain the images on which the CNN model will be trained and the test set with the images on which our model will be tested.

Building the Model
In the next step, we build our Sequential CNN model with various layers such as Conv2D, MaxPooling2D, Flatten, Dropout and Dense.

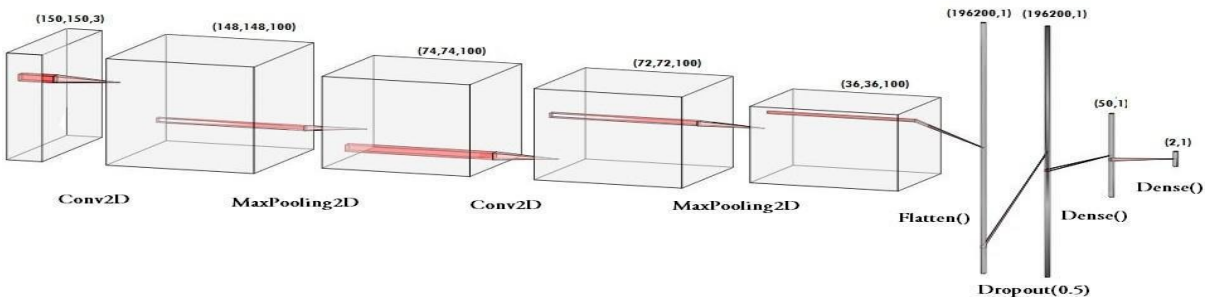

Fig 3. Pre training the CNN Model

Training the CNN model
It is an important step where the images fit in the training set and to the test set for sequential model by using keras library.This model is trained for 30 epochs(iterations).For high accuracy we have to use more number of epochs in its training there it occurs over-fitting.

Labeling the Information
After building the model, we label two probabilities for our results. [‘0’ as ‘without_mask’ and ‘1’ as ‘with_mask’]. I am also setting the boundary rectangle color using the RGB values.

Importing the Face detection Program
After this, we intend to use it to detect if we are wearing a face mask using our PC’s webcam. For this, first, we need to implement face detection. In this, I am using the Haar Featurebased Cascade Classifiers for detecting the features of the face.

Detecting the Faces with and without Masks
In the last step, we use the OpenCV library to run an infinite loop to use our web camera in which we detect the face using the Cascade Classifier.

Experiential Results

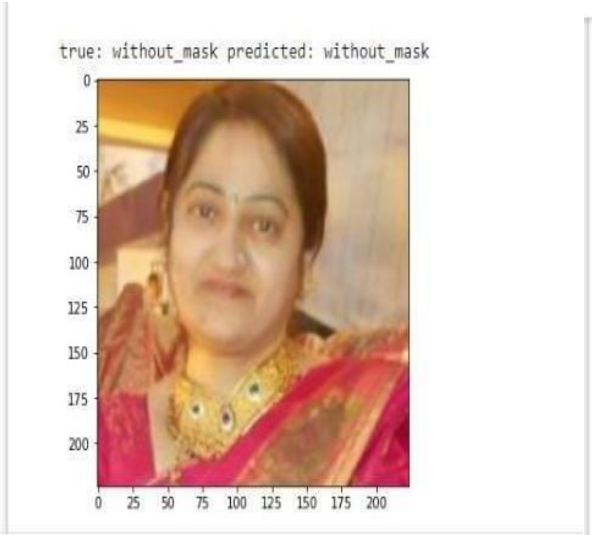

Fig 4. Figure with no mask

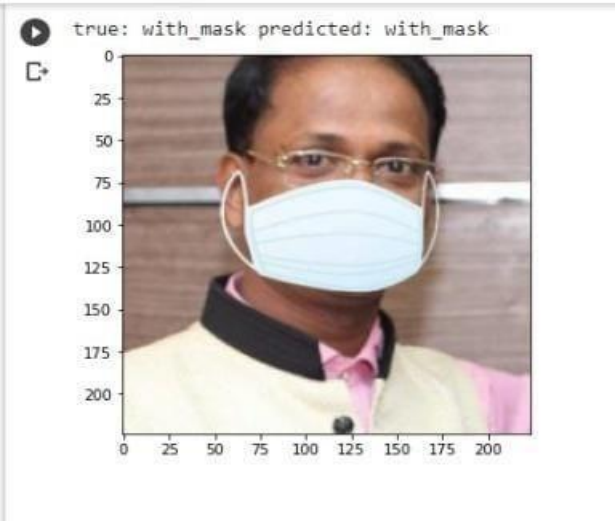

Fig 5. Figure with mask

Real time output

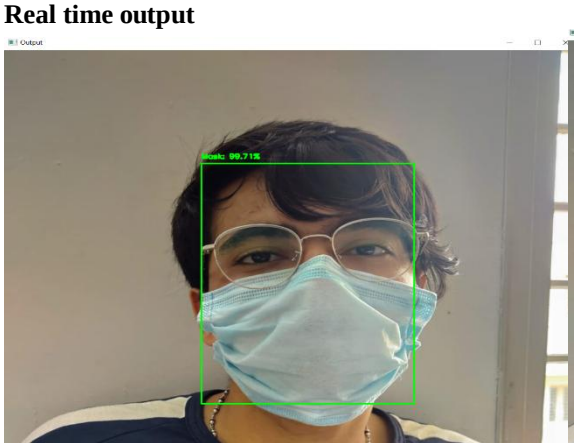

Fig 6. REAL TIME output detected as with mask

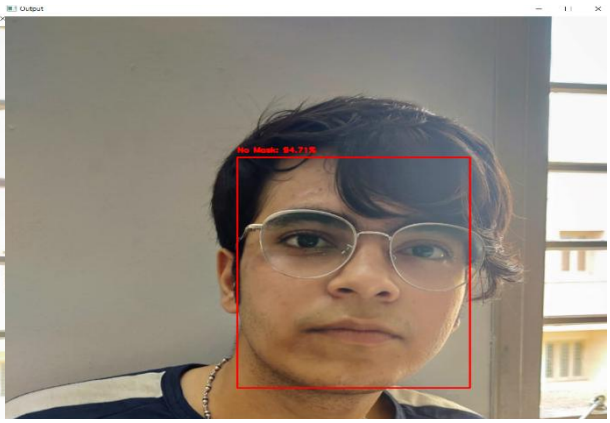

Fig 7. Real TIME output as no mask

BENEFITS

- Manual Monitoring is very difficult for officers to check whether the peoples are wearing mask or not. So in our technique, We are using web cam to detect peoples faces and to prevent from virus transmission.
- It has fast and high accuracy
- This system can be implemented in ATMs, Banks etc
- We can keep peoples safe from our technique.
- It provides buzzer sound to wear mask.

III. CONCLUSIONS

As the technology are blooming with emerging trends the availability so we have novel face mask detector which can possibly contribute to public healthcare. The architecture consists of Mobile Net as the backbone it can be used for high and low computation scenarios. In order to extract more robust features, we utilize transfer learning to adopt weights from a similar task face detection, which is trained on a very large dataset. We used OpenCV, tensor flow, and NN to detect whether people were wearing face masks or not. The models were tested with images and real-time video streams. The accuracy of the model is achieved and, the optimization of the model is a continuous process and we are building a highly accurate solution by tuning the hyper parameters. This specific model could be used as a use case for edge analytics. Furthermore, the proposed method achieves state-of-the-art results on a public face mask dataset. By the development of face mask-detection we can detect if the person is wearing a face mask and allow their entry would be of great help to the society

REFERENCES

[1]. M. S. Ejaz and M. R. Islam, "Masked Face Recognition Using Convolutional Neural Network," 2019 International Conference on Sustainable Technologies for Industry 4.0 (STI), 2019, pp. 1-6, doi: 10.1109/STI47673.2019.9068044.

[2]. M. R. Bhuiyan, S. A. Khushbu and M. S. Islam, "A Deep Learning Based Assistive System to Classify COVID-19 Face Mask for Human Safety with YOLOv3," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT).

[3]. M. M. Rahman, M. M. H. Manik, M. M. Islam, S. Mahmud and J. -H. Kim, "An Automated System to Limit COVID-19 Using Facial Mask Detection in Smart City Network," 2020 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), 2020.

[4]. Raza Ali, Saniya Adeel,Akhyar Ahmed Face Mask Detector July 2020.

[5]. Toshanlalmeenpal Ashutosh Balakrishnan Amitverma, Face mask detection using semantic segmentation 2019,4th international conference on 4th International computing, communications and security(ICCCS)