FACE MASK DETECTION USING DEEP LEARNING

Dr. B. Thulasi[1], Sk. Shammi Munnisa[2], K. Sai Preethi[3], P. Anila[4], B. Naveena [5]
[1]Associate Professor, Computer Science and Engineering
[2,3,4,5] IV B.Tech, Department of Computer Science and Engineering, Vignan's Nirula Institute of Technology & Science for Women, Guntur-522009, Andhra Pradesh, India.

ABSTRACT:

Corona Virus (coronavirus) According to the World Health Organization, the COVID-19 pandemic is producing a global health crisis, and the most effective prevention strategy is wearing a face mask in public places (WHO). The COVID-19 epidemic compelled governments all over the world to implement lockdowns in order to limit virus transmission. According to reports, wearing a facemask at work significantly minimizes the chance of transmission. Using Python, OpenCV, Tensor Flow, and Keras, we will use the dataset to create a COVID-19 face mask detector with computer vision. We will employ a live video stream in our suggested system, and the output will be an alert if someone is not wearing a mask. Our goal is to use computer vision and deep learning to determine whether or not the individual in the image/video stream is wearing a face mask.

Keywords: Deep Learning, Computer Vision, OpenCV, Keras

INTRODUCTION

Due of the worldwide COVID-19 corona virus outbreak, the wearing of face masks in public is becoming more popular. People used to wear masks to protect their health from air pollution before Covid-19. Other people hide their feelings in public to hide their faces, while others are self-conscious about their appearance. COVID- 19 infected almost five million people in 188 countries in less than six months. The virus spreads through close contact, as well as in congested and overcrowded environments. With the use of modern technologies like artificial intelligence, IoT, Big data, and Machine learning, we can combat and forecast new diseases. To gain a better understanding of how infection rates could be reduced using our method. With the use of modern technologies like artificial intelligence, IoT, Big data, and Machine learning, we can combat and forecast new diseases. To gain a better understanding of how infection rates could be reduced using our method. Many countries have regulations requiring people to wear face masks in public. These guidelines and laws were created in response to the rapid increase in cases and deaths in several places. In public spaces, however, monitoring big gatherings of individuals is getting more challenging. As a result, we'll automate the face detection procedure. We present a computer vision and deep learning-based facemask detection model in this paper. The proposed model can be used in conjunction with surveillance cameras to prevent COVID-19 transmission by detecting people who aren't wearing face masks. With Open cv, Tensor flow, and Keras, the model combines deep learning and traditional machine learning techniques. In the process of training and detection, we will attain the best accuracy while using the least amount of time.

LITERATURE SURVEY

Coronavirus had a significant influence on numerous sectors of the world, including industrial, transportation, and agriculture [1]. As a result of this impact, the world was forced to halt all activities and impose stringent guidelines for social distance and wearing a face mask on a priority basis [2]. The current approach requires manual monitoring to determine whether or not someone is wearing a mask. Many educational institutes have manual surveillance while students enter the

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building, which guards used to do manually [3]. Cops are attempting to do so in public areas and are issuing warnings. There are few drawbacks to this method, such as the fact that it takes manpower to monitor. There's a good chance of personnel in charge of monitoring will be affected by the virus. When it comes to detecting face masks, manual monitoring might sometimes produce inaccurate results.

PROPOSED METHODOLOGY

We will discuss our two-phase Covid-19 face mask detector in this project, as well as implementation of our computer vision/deep learning pipeline. From there we will review the dataset that is used to train our custom face mask detector using keras and tensor flow. We will write python script in order to train a face mask detector and review the results. Given the trained Covid-19 face mask detector, we will proceed to implement two more additional scripts used to detect face mask in real-time video streams [4].

Face Mask Detector- Object detection is accomplished using a Single Shot Detector architecture. Face mask detectors can be used in a variety of settings, including shopping malls, airports, and other high-traffic areas, to monitor the public and prevent disease spread by determining who is following basic norms and who is not. Deep learning was used to model a face mask detector. We used Pytorch to process a computationally efficient system, making it easier to extract data sets. For greater performance, we employ CNN architecture. We can install it in any camera [5].

DESINING SYSTEM

The most important requirement for completing this project is to use the Python programming language, as well as Deep learning, Machine learning, Computer vision, and Python libraries. The backbone of the system is Mobile Net, which may be used for both high and low computation scenarios. In our proposed system, we use the CNN algorithm. Implementation: There are four modules in all.

Collecting Datasets: We collect a large number of data sets, both with and without face masks. We can get great accuracy by gathering a large number of photos.

Extracting Datasets: Using mobile pytorch mask and no mask sets, we can extract the features.

Models Training: Models will be trained with openCV and Keras (python library).

Facemask Detection: We can detect facemasks in pre-processed images as well as in real-time video. If they wear masks, it will let them in, if they don't, it will sound a buzzer to remind them to wear masks to prevent virus spread [6].

LIBRARIES INCLUDED

OpenCV

OpenCV is a library that may be used to create real-time computer applications. It focuses mostly on analysis, with features such as image processing, video recording, and object and face detection.

We utilize the OpenCV package to run endless loops with our webcam, which uses cascade classifications to recognize faces. Over 2000 advanced and optimized algorithms for computer vision-based machine learning are available in the collection. Face identification and recognition, object detection, identifying human movements in video, tracking camera activities, tracking objects, and obtaining 3D images are all possible with these techniques.

Tensor flow

To pursue research, Tensor flow, an interface for expressing machine learning algorithms, is used to implement ML systems into fabrication across a variety of computer science areas, including sentiment analysis, voice recognition, geographic information extraction, computer vision, text summarization, information retrieval, computational drug discovery, and flaw detection. Tensor flow

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is used at the backend of the proposed model's Sequential CNN architecture (which consists of numerous layers). It's also used in data processing to restructure the data(picture).

Keras

Keras provide essential reflections and building units for the design and transfer of machine leaning arrangements at a high iteration rate. The cross-platform and Scalability characteristics of TensorFlow are extensively utilize. Keras primary data structures are layers and models. Keras is utilized to implement all of the layers in the CNN model. It aids in the compilation of the overall model, as well as the conversion of the class vector to the binary class matrix in data processing.

Algorithm

A Convolutional Neural Network (ConvNet/CNN) is a deep learning algorithm capable of absorbing an input image, assigning priority (Learning weights and biases) to various aspects/objects within the image, and discriminate one from the other. The amount of pre-processing required by a ConvNet is much less than that required by other classification methods as shown in Figure 1.

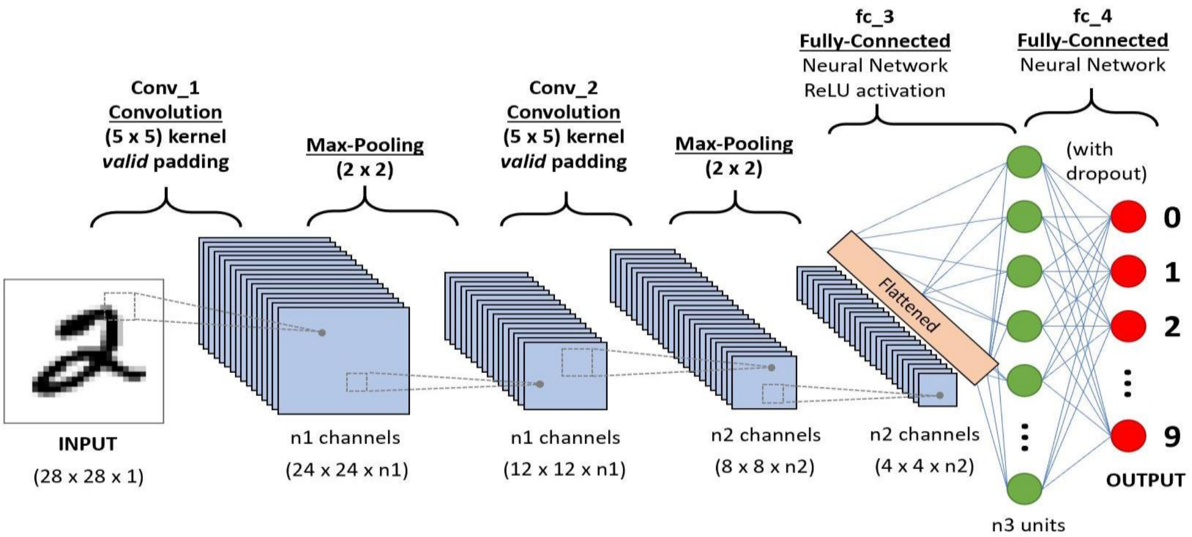

Fig 1: CNN algorithm using sequential model in keras.

SYSTEM ARCHITECTURE

Two-phase COVID-19 face mask detector

In order to coach a custom face mask detector, we'd like to interrupt our project into two distinct phases as shown in Figure 2.

Training the face mask detector-

Here we'll concentrate on loading our face mask detection dataset from disk, training a model (using Keras/TensorFlow) on this dataset, and then serializing the face mask detector to disk. (Keras is an open-source software library that gives a python interface for artificial neural networks. TensorFlow has a user interface called Keras).

Applying face mask detector-

We may load the mask detector, run face detector, and categorize each face as with mask or without mask once the face mask detector has been trained. Our goal is to train a bespoke deep learning model to detect whether someone is wearing a mask or not.

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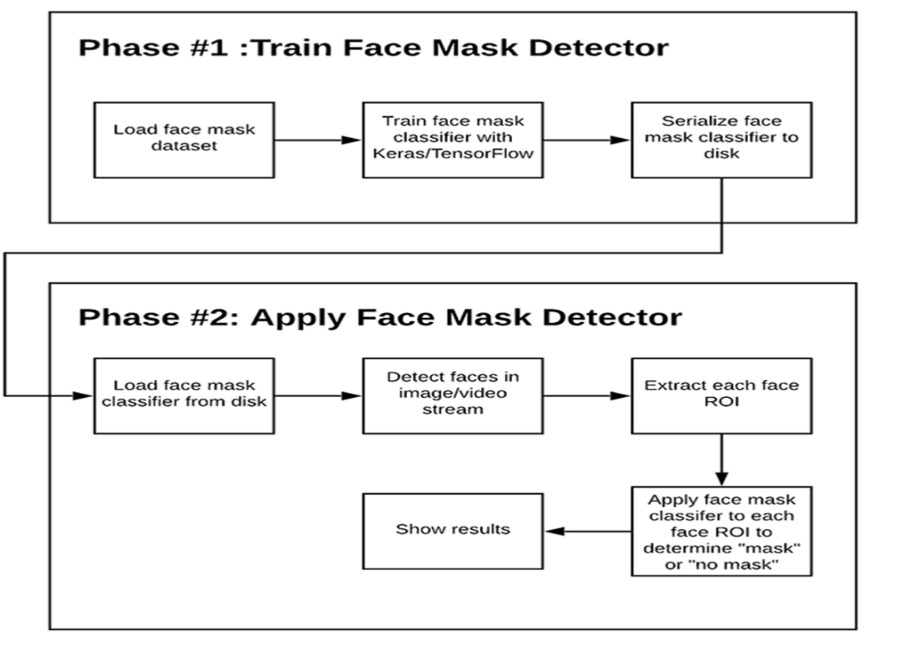

Fig 2: System Architecture of the model.

EXPERIMENTAL RESULT

A total of 1509 photographs are separated into two labels in our facemask detection dataset: with mask: 755 images and without mask: 754 images. At the training phase the below data gets generated as shown in Figure 3.

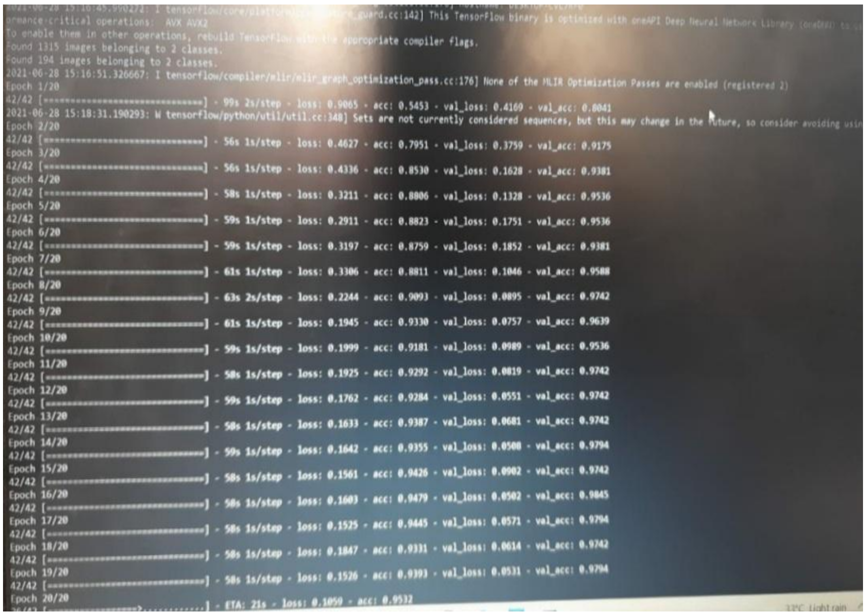

Figure 3: Data gets generated

Here when we test our data it checks whether the person wore a mask or not as our output. It comes under the results “with mask” or “without mask” as shown in Figure 4.

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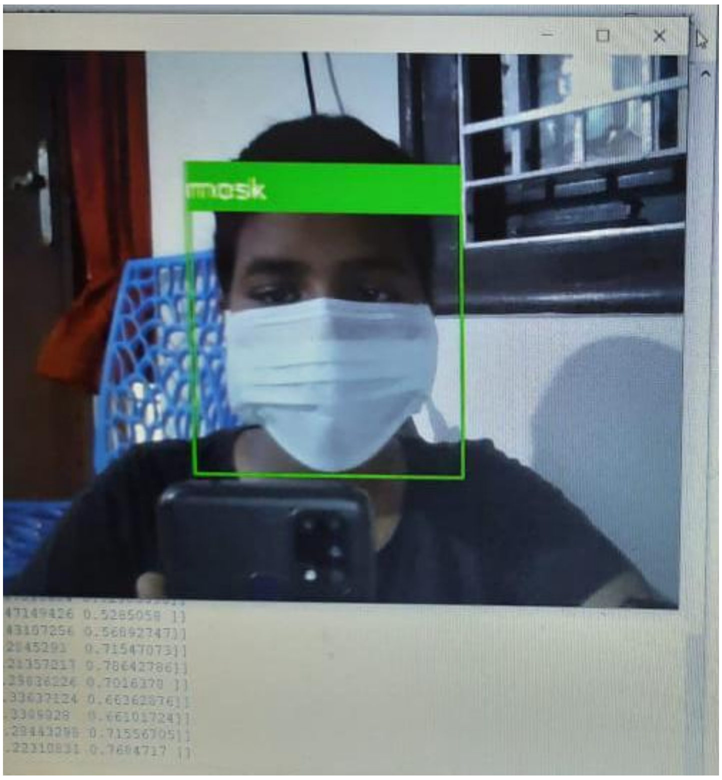

Fig 4: System detects face mask

If the person is detected with out a mask then the output will be as follows in the Figure 5.

Fig 5: System detects a face with out mask

Accuracy Graph

The accuracy is determined to be 95% after the training, when the training and validation sets are compared. The accuracy is shown in the Figure 6.

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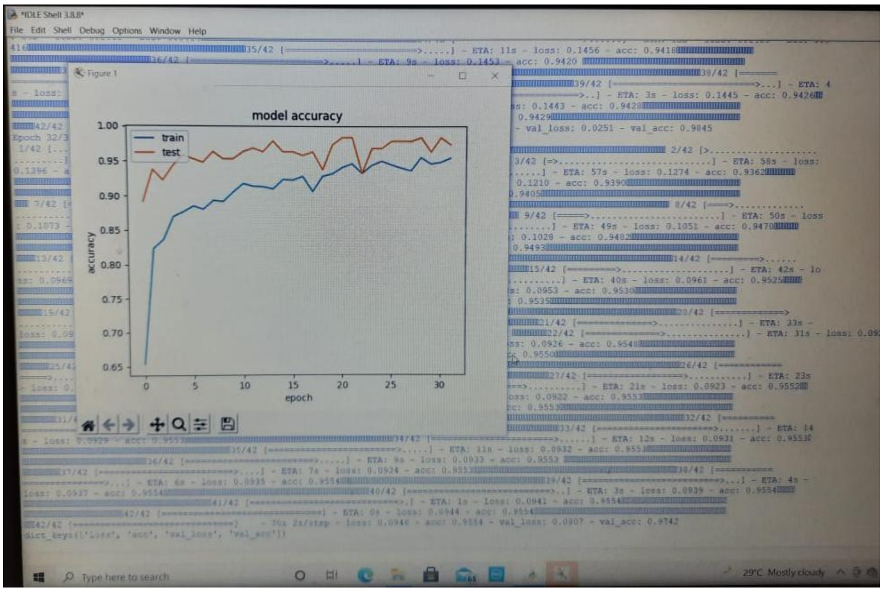

Fig 6: Accuracy of the model

CONCLUSION

The development of face mask detection technology that can detect if someone is wearing a mask and allow them, admission would be extremely beneficial to society. The model's precision will be reached, and model optimization will be a continual process, resulting in a very accurate solution. Through this system, we can protect people from virus transmission.

FUTURE ENHANCEMENTS

The method has attained a reasonable level of accuracy using basic machine learning tools and simplified techniques. It can be used for a wide range of purposes. Given the Covid-19 situation, wearing a mask may become mandatory in the near future. Many government agencies will require clients to wear masks correctly in order to use their services. The implemented model will make a significant contribution to the public health care system. It could be extended in the future to detect whether or not a person is wearing the mask properly. The model should be enhanced further to recognize whether the mask is virus-prone or not, i.e. whether it's N95 or not, it's surgical.

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