COVID-19 Precaution Technique By Real Time Face Mask Detector Using Machine Learning

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Abstract - **This paper will detail how our machine vision/deep learning pipeline will be applied in our two-phase COVID-19 face mask detector. Following that, we will go over the dataset that will be used to train our custom face mask detector. We Will then teach you how to use Keras and TensorFlow to train a face mask detector on our dataset with a Python script. This Python script will be used to train a face mask detector and then the effects will be reviewed. Given the qualified COVID-19 face mask detector, we will go on to introduce two more Python scripts for detecting face masks in real-time video streams. We will conclude this article by looking at the findings of our face mask detector. We will even make some extra recommendations for change.**

During a coronavirus infection, nearly everyone wears a mask to help deter the transmission of the COVID19 virus. In certain contexts, such as group access control, face access control, facial attendance, facial security checks at train stations, and so on, this almost renders traditional facial recognition technology ineffective. As a result, it is critical to enhance the identification accuracy of emerging facial recognition technologies on masked faces. The majority of current advanced facial recognition techniques are focused on deep learning and include a vast number of face samples.

keywords: ***Face mask detector ,Convolutional Neural Networks ,Dataset ,openCV, Keras and Tensorflow***

I. INTRODUCTION

The development of face recognition in image processing has become a very common obstacle. Various algorithms using a convolution architecture have been used to make the algorithm as accurate as possible. Using the convolution algorithm made it feasible to obtain tiny pixel feature. The goal is to design a binary face classifier that can recognize every face present in the frame regardless of its orientation. We present a method for generating accurate face segmentation masks from any input image of any size. Starting from an For feature extraction from an RGB image of any dimension, the method employs predefined training weights from the VGG-16 architecture. To semantically segment the faces in this picture, completely folded networks are used for training. The gradient descent method is used for preparation, and the binomial cross entropy equation is used as the loss function. The FCN image is analyzed in order to eliminate unnecessary noise and to prevent any incorrect forecasts Furthermore, the proposed model has shown excellent performance in recognising non-frontal faces. In addition, it can recognise multiple face masks in a single frame. Experiments were carried out on the human data collection, with an average pixel level precision of 93.884 percent for the segmented face masks.

Problem Statement

Main aim of the project here is to predict people wearing masks or not wearing them, given an image or a video. It is an object detection and classification problem with two different classes(Mask and Without Mask). Another challenge is to train object recognition models that can identify the position of masked faces in an image as well as the position of unmasked faces in the image. These detectors need to be noise-resistant and have as little space as possible to pick up false positives for masks as they can have serious consequences. Ideally, they should be fast enough to perform well in real-world applications. We hope to be able to focus on this in future rounds of the competition.

II. LITERATURE SURVEY

"Safe social evacuation based on deep learning and mask recognition in public places to comply with COVID19 safety guidelines." Wearing masks and maintaining safe social distancing are two additional safety regulations. These regulations must be publicly followed to prevent the spread of the virus. [1]. In order to create a safe environment that is conducive to public safety, we propose an effective computerized method that focuses on real-time real-time monitoring of people to track public activities and activities by opening the model Raspberry Pi4, thereby detecting public places Safe social distance and masks. Use the camera to detect violations. After detecting the violation, Raspberry Pi4 sends an alert to the control center of the state police headquarters and sends out a signal. In the system proposed here, the latest deep learning algorithms are mixed with engineering geometry to create a powerful modal window covering the three aspects of detection, tracking and verification. System D benefits society by saving time and helping reduce the spread of coronavirus. This can be effectively implemented under the current situation, in which case, closing the place can facilitate the inspection of people in public gathering places, shopping centers, etc. Automatic inspection reduces the workload of inspecting population and can be used anywhere. Automated Inspection helped reduce manpower and look after the public. This can also be used in any places

"Mask Face Recognition Application and Data Set" (2020) During the corona-virus outbreak, nearly everyone uses a mask to efficiently deter the transmission of the COVID19 virus. [2] This makes traditional face recognition technology almost ineffective in many situations, such as community access control, face access control, face assistance, face control in train stations, etc. Therefore, it improves the existing face recognition technology. Recognition performance is very important. Most modern advanced face recognition methods rely on deep learning based on a large number of face samples. However, there is currently no public record of facial recognition with masks. There are three types of masked face data sets available: MFDD (masked face detection data set), RMFRD (real-world masked face detection data set), and virtual SMFRD (simulated masked face detection data set). The world's largest masked data set in the real world. These data sets can be used free of charge in industrial and scientific fields, and can be developed from them.

"Face Mask Detection Using a Multi-Stage CNN Architecture [3] Several studies have shown that wearing a face mask greatly decreases the risk of viral infection while also providing a sense of security. However, manually tracking the execution of this policy is not feasible. The secret here is technology. We present a Deep Learning-based method for detecting instances of improper use of face masks. Our system is comprised of a dual stage Convolutional Neural Network (CNN) architecture capable of recognising masked and unmasked faces and can be combined with pre-installed CCTV cameras.This would aid in the tracking of safety breaches, the promotion of the use of face masks, and the development of a healthy working environment.

Using LLE-CNN to detect occluded faces in nature is challenging for two main factors: 1) lack of a large data set of the occluded face, and 2) the lack of facial features in the occluded area. To solve these two problems, this article introduces a dataset called MAFA, which contains 30,812 images and 35,807 masked faces on the Internet. [4] The faces in the data set have different degrees and orientations of occlusion, and at least a part of each face is masked. Based on this data set, we propose LLE-CNN for masked face detection, which consists of three main modules. ...The module begins by combining two previously trained CNNs to remove possible facial regions from the input image and then shows them using high-dimensional descriptors. Then, using a local linear embedding (LLE) algorithm and a dictionary trained on a large number of synthetic normal faces, masked faces, and non-faces, activate the embedding module to transform those descriptors into similarity-based descriptors. Many missing facial features can be preserved to a large extent in this manner, and the effect of noisy prompts introduced by different masks can be significantly reduced.A verification module is included to define the possible region of the face and refine its location by conducting the classification and regression of the t problem on a single CNN at the same time. The experimental findings in the MAFA dataset indicate that the proposed method's efficiency has increased by at least 15.6 percent over the last 6 generations.

"Extended R-CNN mask-based face recognition and segmentation" (2020)[5] Deep convolutional neural networks have recently been used successfully for facial recognition. Although significant progress has been made, most existing recognition methods only use a rectangular frame to locate each face, and the rectangular frame cannot segment each face from the background image at the same time. To overcome this shortcoming, we propose a detection and segmentation technique based on an improved R-CNN mask (called G-Mask), which includes face detection and intra-frame segmentation to obtain more detailed face information. To boost identification accuracy, the proposed approach employs ResNet-101 to retrieve the feature used as the bounding box failure function. The G-Mask approach introduced in this paper outperforms Faster R-CNN, Mask R-CNN, and multi-task Cascade CNN in FDDB, AFW, and WIDER FACE experiments.

"Use HOG function and SVM classifier to improve face recognition speed" [6] proposed HOG function and a face recognition algorithm based on SVM classifier. This algorithm is compared with the standard PCA algorithm based on characteristic function. The results show that the algorithm improves the face recognition rate in the ORL database by 8.75%. The proposed algorithm was also tested on seven other face data sets. The results show that the algorithm is better than the PCA algorithm on all data sets.

"Detection of COVID-19 masks using deep learning and machine vision"[7] (2020). The corona virus epidemic has led to an extraordinary level of global scientific cooperation.Machine learning and deep learning are used to fuel artificial intelligence (AI), can help researchers and clinicians evaluate large amounts of data to predict the spread of COVID-19, act as an early warning mechanism for a potential pandemic, and monitor people at risk classification.To identify and predict new diseases, funds for advanced technology such as artificial intelligence, the Internet of Things, big data, and machine learning are needed. In order to better understand the infection rate and quickly track and identify infections, the ability of artificial intelligence to respond to the Covid-19 pandemic is challenging. Many countries/regions need citizens to wear masks in public. In certain countries, these regulations and legislation tend to double the number of cases and injuries. However, monitoring large groups of people has become increasingly difficult. The surveillance process includes identifying anyone who is not wearing a mask. Here, we propose a masked face recognition model based on image processing and deep learning.The suggested model can be integrated into security cameras to deter the dissemination of COVID-19 and identify disguised individuals without masks. This approach combines deep learning with traditional machine learning approaches (using opencv, tensorflow and Keras). We use obscene deep transfer for feature extraction and combine it with three classic machine learning algorithms. We compared the two to find the most suitable algorithm that can provide the highest accuracy and complete the learning and recognition process in the shortest time.

III. METHODOLOGY

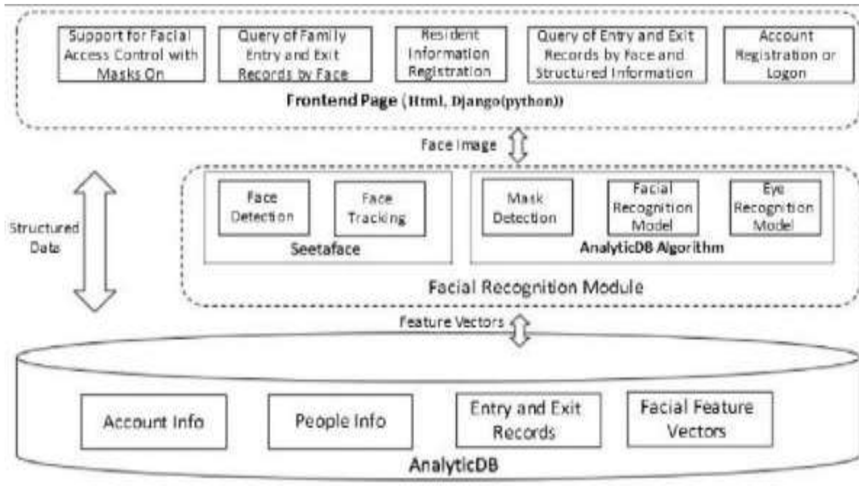

Fig 3.1 Architecture design

An architecture diagram in fig 3.1 is a schematic description of a collection of ideas that comprise an architecture, such as materials, elements, and premises. Various architecture diagrams such as security architecture diagram, software architecture diagram, architecture diagram, system architecture diagram. Architecture is nothing but a set of concepts for structure. The concepts at four levels of abstraction are often visualized.

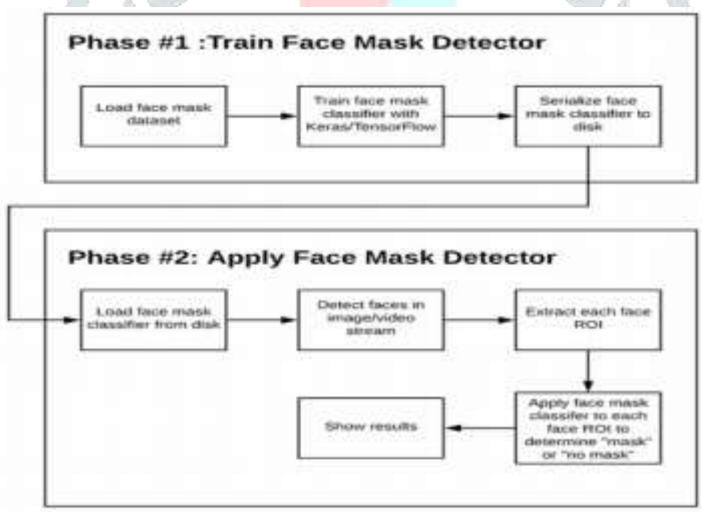

Fig 3.1.1 Proposed system

Our proposed system consists of two parts:

- Training Face Mask Detector .
- Apply Face Mask Detector

Fig. 3.1.1 The architecture of our proposed device is represented (the input image is from the data collection. There are two main steps:

Phase1: Training the mask detector: The face detector is the first step in the system. This stage receives the original RGB image as input. Both faces in the image are extracted and produced with their bounding box coordinates by the face detector.

Accurate face recognition process is very important to our architecture. Data, time, and computational resources are all limited. For these factors, we used a pre-trained model from a broad data set to make generalisation simpler and identification more stable.

Phase2 :Apply Face Mask Classifier :

The mask classifier is the system's second element.In this step, since the RMFRD image is aligned with the face of an Asian person, the ROI processed by the staging block is processed and classified. Flickr Faces HQ (FFHQ) records also include images with uncovered faces. However, as mentioned above, these images is heavily skewed in favour of Asian faces. Therefore, we decided not to use these images. The author (Karras et al., 2019) used for unobstructed images. Images with abusive masks or hands covering ears are still included in our dataset, and are labelled as exposed faces.

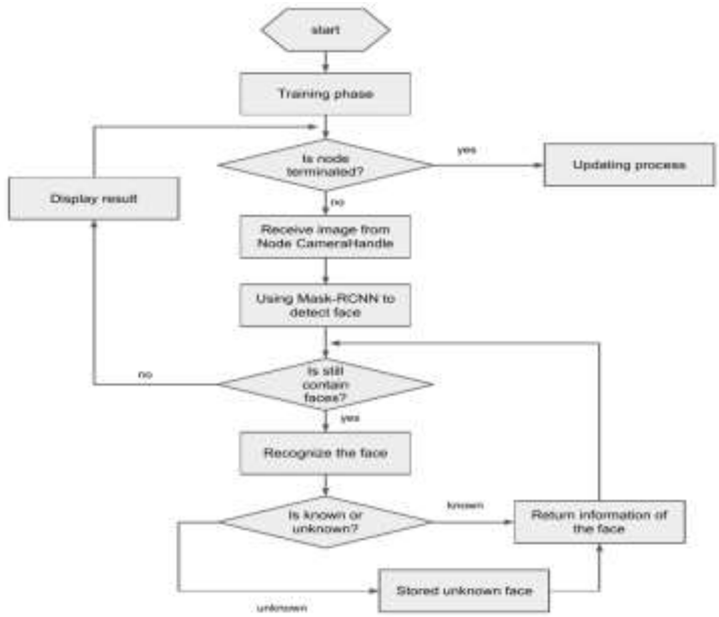

Fig 3.2 Flow chart

The data flow diagram from Fig 3.2 The mapping of the interaction between the system and the external agent acting as a data source and sink. In the context diagram, the system interaction with the outside world is modeled only based on the data flow across the system boundary. A unique process that provides no signs of its internal organization.

IV. IMPLEMENTATION

- Data Visualization : The collected images in the dataset are visualized and labelled either with mask or without mask.
- Data Augmentation : Here, we augment our dataset to include more images for training.
- Splitting the Data : We split our data set into a training set in which our ML model will be trained and the test set with which the model will be tested.
- Building a Model : In the next step we build our CNN model which contains many hidden layers such as MaxPooling2D, Flatten, Dropout and Dense.
- Training the Model : In this step we fit our images in the training set and the test set to our model which was built using Keras library.
- Labelling the Information : Here, we label two possibilities of our result. ‘0’ for without a mask and ‘1’ for a mask. We are also setting the boundary rectangle using RGB values.[Red for without a mask and Green for a mask].

- Importing a Face detection program : Here, we are using the Haar Feature-based Cascade Classifiers for detecting the face.
- Detecting Face Mask : Using the Cascade Classifier we run an infinite loop to detect a face, with which the model can predict possibilities of two cases.
- Alert System : Depending on the prediction, the alert system initiates to send appropriate notifications.

We make use of face mask detection algorithm which simplifies the data set from maser to in masked. The user is shown with a login page which show the credentials such as login and password.The details is stored in database who ever logs in the system. After the login page python script with its later run and connected with the camera. A boundary is drawn against the user face. The dimensions are mention in the code identifies the an object and detect whether a person is wearing a mask or not.

HARDWARE REQUIREMENTS:

- Laptop with Intel i5 Processor and 500GB Hard disk.

SOFTWARE REQUIREMENTS:

- Dataset with images of people with mask and without mask.
- Python3 IDE
- Deep Learning Modules like Tensorflow & Keras.
- Machine Learning Modules like Numpy, Pandas and Sci-Kit Learn
- Web Framework: Django
- Browser to run Application.
- Android Studio.

SOFTWARE INTERFACES:

- Editor- PyCharm
- Language-Python.

V. RESULT

Fig 5.1 login page

The fig 5.1 represents a login page which show the credentials such as login and password. User has to put username and password.

Fig 5.2 Register page

Then it displays you have successfully registered. If he has already account ,registered then he can sign-in .If he is new user he has to sign up.

Fig 5.3 index page

This fig 5.3 shows the image of face detector we have on and off button. When we click on button it on's the camera.

Fig 5.4 masked face

This figure 5.4 shows the masked face ,the person is wearing mask is detected.

Fig 5.5 Unmasked face

The figure 5.5 shows that person not wearing mask is detected.

Fig 5.6 People wearing mask and no mask

In the above figure 5.6 it shows people wearing and not wearing mask. The system detects the image whether it is masked or unmasked.

VI. ANALYSIS

Comparing the existing system and the methods used, advantages and disadvantages are listed below. The methodology used in the proposed system is more efficient, compared to the existing system.

ADVANTAGES:

Whether or not a person is wearing a mask, a person going forward may be clearly identified. The pace of access and identification of pre-determined data, but it also operates on real-time data. Using our approach makes it simple to train both pre-recorded and real-time data with excellent accuracy. It divides data into two categories and displays the resulting data instantaneously depending on whether the subject is wearing a mask or not.

DISADVANTAGES:

The downside is that if a person has limited RAM and storage, they may not be able to save one day data owing to capacity constraints. It is also affected by the processor's speed. Because of the high amount of data to be processed, the result may be impeded, resulting in poor performance and a delayed outcome. Due to inclement weather, the user may be unable to obtain results. This contains both strong thunderstorm rain and massive snowfall. Small changes in the data might result in significant changes in the optimal form of the decision tree. Most crucially, it is dependent on the camera used to collect the data. If the camera quality is poor, the outcome may suffer. A high-quality camera necessitates additional cost and upkeep.

VII. CONCLUSION AND FUTURE SCOPE

CONCLUSION

The COVID-19 outbreak has forced most countries to impose the obligation to wear masks. Therefore, manually observing masks in crowded places is an important task, which is why researchers are interested in automated mask recognition systems. The COVID-19 mask detector explains in detail how to implement a computer vision/deep learning pipeline. During the corona virus outbreak, nearly everyone wears a mask to help deter the transmission of the COVID19 virus. As a result, traditional facial recognition technology is almost useless. In certain circumstances, such as B, Community access control, face access control, face assistance, train station security control, and so on.After that, the dataset used to train the custom mask detector is reviewed. Using Keras and TensorFlow, train a Python script for the mask detector in our dataset. This Python script will be used to train and demonstrate the mask detector's effects. COVID-19 now includes two more Python scripts for recognising masks in real-time video streams .In this way, we can distinguish between those who are wearing masks and others who are not.

FUTURE SCOPE

The mask recognition platform uses an artificial network to determine whether the user is not wearing a mask. The app can connect to existing or new IP mask recognition cameras to detect people without a mask. App users can also add faces and phone numbers. Warn them when they are not wearing masks. Deep learning from a vast variety of facial samples underpins the majority of today's modern facial recognition techniques.

VIII. REFERENCES

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