HOSPITAL CYPHER-A SMART SURVEILLANCE APPROACH

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ABSTRACT:

As we all know, there is a pandemic (i.e., COVID19) that is rapidly expanding and threatening the lives of everyone on the planet. The pandemic has had an effect on nearly every industry. We saw the health-care sector's inadequate handling of the pandemic's infection rate after the pandemic. Despite the fact that both the government and the general public are taking several precautionary measures to prevent the dissemination of this virus, such as wearing masks and keeping social distance, there is still a subset of individuals who are irresponsible enough to disregard the precautions and become COVID19 victims and after being admitted to COVID centres for treatment, the majority of patients are seen escaping the centres, increasing the infection risk. As a result, there is a lot of scepticism about the surveillance's competence in the health sector. Given all of the mishaps that have occurred as a result of inadequate monitoring, this research paper explains a solution in which surveillance is completely automated, allowing us to concentrate on other aspects. This Research Paper comes up with a idea that allows us to spot compromised patients who are attempting to escape by engaging with the appropriate authorities. Not just that, but we also detect individuals who do not follow the COVID safety protocols (like wearing masks). The identification is carried out by CCTV cameras that have our software installed in them. Before recognizing, their data has been stored in the database. Here, we explain how our algorithm detects the identity of an individual attempting to leave the hospital and also determines whether or not the person is wearing a mask.

Keywords: OpenCV, face recognition, Face mask detection

1. INTRODUCTION:

COVID-19 is a recently discovered coronavirus that causes a respiratory related infectious disease. The majority of patients infected with the COVID-19 virus will have mild to moderate respiratory symptoms and will recover without needing any special care. People who are of 65 and older, as well as those who are suffering from chronic diseases are at a higher risk of developing serious illness or even worse, they can die. Even after seeing the atrocities, people are reckless and do not take precautions. Worse, as they get sick, they do not observe quarantine and either prefer to walk openly or escape if left captive.

When it comes to ideas, Face mask detection is a technique for determining whether or not a person or patient is wearing a mask. Detecting any object from any image is somewhat close. To begin, CCTV cameras are used to capture real-time videos of various viewpoints in hospitals. Facial images are taken from the video, and these images are used to identify the mask on the face. When the architecture detects across the network that individuals are not wearing masks, the information is immediately transmitted to the appropriate authority, which will take the appropriate

measures. Owing to an increase in the number of corona virus cases around the world, wearing a face mask in public has become a must. Scientists have discovered that wearing a face mask would limit the speed at which the infection spreads from one person to another. Because of the exponential increase in the number of cases of COVID-19, the World Health Organization called it a global pandemic in 2020. Near touch was the primary mode of transmission for this virus.

Which is why Artificial Intelligence based on Machine Learning and Deep Learning can be very useful in combating the Corona Virus in a variety of ways. Machine learning has the ability to analyse large amounts of data in order to predict the disruption caused by covid-19. As a result, the health-care industry must develop artificial intelligence-based monitoring technologies. Monitoring a wide number of individuals is impossible, which is why automating the procedure entails detecting people who are not wearing masks using a face mask identification device and detecting people who are attempting to escape using image recognition.

2. LITERATURE REVIEW:

Since the outbreak of the Covid-19 pandemic, substantial improvement in the fields of image recognition and computer vision has been made in the identification of face masks. A research on using a facemask to limit COVID-19 development is implemented in using Artificial Intelligence (AI). According to the report, masks that are properly fitted effectively stop droplets from spreading while coughing or sneezing. Airborne contaminants and viruses may be retained by masks that aren't perfectly fitted. In addition, the government of Telangana (India) uses face recognition to trace the violators of masks at public sites in order to ensure that the people are protected.

For two-group classification problems, a support vector machine (SVM) is a supervised machine learning model that uses classification algorithms. SVM models will categorise new data after being given sets of named training data for each type.

Face detection is described as a technique that can be used for a multitude of activities such as face tracking, pose estimation, and compression. The following step is feature extraction, which entails extracting specific facial features from the details. These characteristics could have specific facial areas, differences, angles, or measurements that are either person related (e.g., eye spacing) or not. Other uses of this phase include facial attribute detection and emotion recognition.

Finally, the face is identified by the machine. The machine will record an identity from a database in an identification task. A comparative process, a classification algorithm, and an accuracy test are all used in this phase.

We used both face and mask identification in this paper to prevent violations of Covid-19 protections and to avoid compromised defectors from escaping out of Covid-19 centres by embedding the software into monitoring devices such as closed-circuit television (CCTV). If any defectors or individuals breaking the rules are discovered, their records will be sent to the proper authorities.

3. TECHNOLOGIES USED TO BUILD APPLICATION

1. Python
2. Open cv
3. Fire base
4. Telegram
5. Machine learning and deep learning algorithm's

FACE MASK DETECTION:

Here we create a face mask recognition module and it's built by using SVC and SVM which are machine learning algorithms and OpenCV. This model is compatible with CCTV or security cameras, allowing for the monitoring of whether or not individuals are wearing face masks. Machine learning with OpenCV are the main components of this model. We'll do this in three steps: first, we'll capture face data with and without masks, then we'll train the data using machine learning, and finally, we'll make predictions using live data from surveillance cameras. This module primarily focuses on the identification of facial masks, and the following are the steps We took to incorporate it:

Step 1: Collect the face data with and without mask.

Step 2: Train Data using machine learning.

Step 3: Then do the prediction using live data.

Collection of face data	→	Train Data	→	Prediction and output
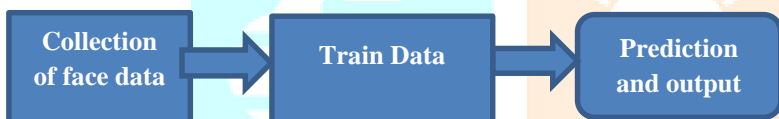
To accomplish all the three steps, we have used frameworks such as OpenCV, NumPy, Matplotlib, Voila Jones object detection framework, SVM (Support Vector Machine), SVC (Support Vector Classification), PCA (Principal component analysis).

MACHINE LEARNING:

It is an analysis of computational algorithms that refine themselves automatically as a result of practice. It also seems to be a crucial component of artificial intelligence. Machine learning algorithms are built on the basis of a mathematical model that is based on sample data, also known as training data. It's used to make assumptions or forecasts without relying on external programming. The Machine learning algorithms are used or play a significant role in a wide range of applications, such as email filtration and computer vision, since developing a new algorithm for each particular use is challenging or impossible. Computational statistics is closely similar to machine learning and both are concerned with the use of computers to make forecasts. The area of machine learning benefits greatly from the study of mathematical optimization because it provides tools

and theory. Data mining is a similar discipline that focuses on exploratory data processing using unsupervised learning. It is also recognized as predictive analytics because we see its applications in market issues all around the globe. Machine learning methods are grouped into three categories based on the quality of the signal or input available to the learning system, which are as follows:

Supervised Learning: When inputs are interpreted in the machine with the aid of examples and their intended outputs, which will be provided by a teacher, the main emphasis is on figuring out a general rule that connects inputs and outputs

Unsupervised Learning: Unsupervised learning occurs where the learning algorithm is not assigned labels and is left to explore the constructs in the given inputs on its own. It may also be considered a target in and of itself since it identifies secret trends in data or serves as a means to an end.

Reinforcement Learning: When a computer program deals with or encounters a dynamic obstacle or is placed in a dynamic environment, such as driving a car or playing a game against an enemy. It navigates the problem space and receives guidance in this type of environment, which is known as reinforcement learning.

DEEP LEARNING:

Deep Learning is a technique that primarily focuses on learning feature hierarchies of features from higher levels to a hierarchy built with a combination of features present at the lower level. It is an automated mechanism that allows the feature of learning at several layers of abstraction, allowing a machine to learn complex functions that explicitly map the input with the output from the data available, and is partly reliant on human-crafted features. Deep learning algorithms are very interested in exploiting unknown structures in the input distribution in order to find a better representation, which is feasible at multiple levels with learned features of higher levels identified in terms of lower levels.

To allow a computer to learn complex concepts by breaking them down into smaller chunks, using this hierarchy as a guide. If we were to draw a graph that illustrates how these ideas are created or constructed on top of one another, the graph would be dense and have a lot of layers. As a result, this method is referred to as AI deep learning. Deep learning excels in the realm of problems where not only the inputs but also the outputs are analogue. It means that they are not in smaller amounts since they are in tabular format, but they are images of pixel data, audio files, or text documents. Deep Learning enables a variety of computational models to be created, each of which is made up of multiple layers of processing that aid in the learning of data representations at multiple levels of abstraction.

OPEN CV:

It is a Library for computer vision that is open source (OpenCV), It is an opensource framework that is focused on computer vision and a machine learning software library. The key goal of developing OpenCV was to provide a shared infrastructure for computer vision applications, as well as to speed up the use of machine perception in consumer products. It is really convenient for companies to use this facility to change the codes since it is BSD-licensed.

The libraries contain over 2500 algorithms, as well as an extensive collection of both machine learning and classic and state-of-the-art computer vision algorithms. The algorithms present in this are capable of detecting and recognizing faces as well as identifying objects. It can also detect human actions in videos, track the movements of the camera, and track moving objects. It then begins its work by extracting 3d models of the objects and then begins producing clouds of 3d points from the cameras. It currently has a population of over 45 thousand members and an estimated number of downloads of over 17 million. This is a library that is heavily used not only by businesses, but also by study organizations and government agencies. It is now used by major corporations such as Google, IBM, and Honda. It also has a large number of users in the startup world, who use Open CV extensively.

Open CV supports a variety of languages, including C++, Python, Java, and MATLAB interfaces, allowing it to run on Windows, Linux, Android, and Mac. Open CV is entirely based or built on real-time vision applications, and it makes use of MMX and SSE instructions when they are usable. Open CV's native language is C++, which has a help and template interface that fits well for STL containers.

FACE RECOGNITION:

We will use a framework which helps in facial detection and recognition i.e., Face_Recognition Framework which is built on deep learning and is based on facial embedding, and this method will be highly accurate and capable of recognizing the face in real-time. In this module, we'll talk about how the deep learning-based facial recognition module works. To begin, we must first install all of the libraries that are needed to perform face recognition they are face_recognition, cmake, dlib and opencv2. In this module, we'll use facial recognition to recognize people in both photographs and videos. As we've shown, our facial recognition modules will be able to process real-time images as well.

WORK OF DEEP LEARNING IN FACE RECOGNITION MODULE:

Deep metric learning is what we call it when we use deep learning for recognition tasks. If anyone has some prior knowledge of deep learning, they will understand that we are simply going to train a network that will recognise a single input image as input and then process it to produce an output that is categorised or named for that image. Deep metric learning is also a little different
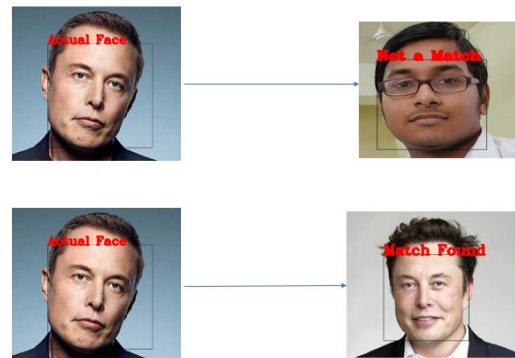
in concept. We are not only concerned with the output of a single image, but also with the output of the real-valued function vector. If we use a dlib facial recognition network, the performance function vector would be 128-d, which means we'll have a set of 128 real-valued numbers of images to measure the face. Triplets are used for the training purpose of network. A phase known as triplet training is included in the deep

metric learning method of facial recognition. It is made up of three distinct photographs, two of which feature the same face. Each face's 128d vector is created by a Neural Network. The neural network weights to design those vectors that are closer by distance metric for those two faces that are of the same entity.

We first provide two images of the same person to the network, then the third image is the face of some random person from the data collection that is not the same person as the other two images. The network that builds the 128-d quantification for each image quantifies the face. As can be shown, the basic principle is to tweak the weights of the neural networks of the faces so that the 128 d measurements are closer together. Face detection with Python and OpenCV requires the addition of a few libraries, one of which is dlib. It is the library that includes the implementation of deep metric learning, which is useful in the creation of face embedding, which is useful in the actual recognition process.

Examining the performance of our module reveals the composition of our module, which first includes the face pictures, which are in six characters dependent on their respective names. Then there are three face pictures, two of which are of the same person and one of which is random for checking things that aren't in the dataset. The output, on the other hand, is the location where we can save our stored facial recognition images.

USE OF OPEN CV AND DEEP LEARNING IN ENCODING THE FACE:

The first step in the process of recognising faces in available photographs and videos is to count the faces in the training package. It's important to remember that we're not really training the network here because it's already been trained in the dataset.

Although training a network from scratch or fine-tuning the weights of existing models is certainly feasible, it is likely to be overkill for several projects. To train any network from scratch, you'll still need a large number of videos. Instead of using this network, it is much easier to use a pre-trained network, which we can then use to create 128 d embeddings for each and every face in our dataset, after which we can simply use

the k-neural network model plus the votes to get the distinction and make the final face classification.

USE OF FIREBASE:

If we use cloud storage for firebase, we will be able to instantly and conveniently import data from the cloud storage. The key advantages of cloud computing are that we have unrestricted storage without a minimum object size, it can be viewed from anywhere in the world, and it is very resilient. If we use the object lifecycle to configure our files, it will automatically transition to lower-cost storage classes. It also has the option of multiple automatic redundancy, which improves the second split response time and allows you to configure how and where you store data. It is extremely effective at transmitting data to the cloud. We may also make some kind of reference by appending child paths to the root of the cloud storage. By calling the specific process, we can conveniently retrieve the data using the URL for any file. We must customise the cloud storage bucket for cross origin access in order to retrieve any data directly in the window. There are several possibilities for encountering errors when downloading, which may indicate that the appropriate file does not exist or that you do not have authorization to download that file, and we can effectively manage such errors using proper methods.

USE OF TELEGRAM:

Telegram is an online messaging platform just like WhatsApp which is used to send or forward text, photo, audio and video messages. Here we are using telegram to intimate concerned security department about the two cases they are:

1) If CCTV camera detects a person's face and finds out that the person is not wearing a mask and is not a covid patient. Then the system sends a photo of a person and a text message saying "the person is not wearing a mask" and asks the authority to warn.

2) If it detects a person who is not wearing a mask and matches with covid patient database then it sends image and a text message saying" the person is a covid patient". so that it would help the concerned security department to capture the person and avoid further spread of infection.

4. APPLICATION METHODOLOGY:

Hospital cipher is an artificial intelligence and a backend-based application which is built by using machine learning and deep learning models and telegram is used for sending data to the concerned security department and to store facial data (image of a covid patient face) we used firebase. The application working goes as follows:

LOGIN AND SIGNUP BY HOSPITAL STAFF:

In this module the application asks user to either login or signup for the staff. If a person is newly recruited then it asks for signup or the person can login directly and application takes person to homepage.

HOMEPAGE:

Homepage module is divided into two sub modules they are:

1) Surveillance
2) Patient Registration

Covid Patient Registration:

This module is used to register and save covid positive patients face in firebase and later which are used to compare with patients who are passing ward or at exit of hospital so that we can avoid the situation of escaping of covid patient which might help in control of infection.

Firebase:

Firebase is a google platform which is used to store and retrieve data, authentication etc. Here we use firebase to save and retrieve images of patient's face who are covid positive patient which helps in comparing face of patients who are at exit of the hospital or trying to go to hazardous ward and helps in avoiding the escape of covid positive patient.

Telegram:

Telegram is a messaging platform used to send images and photos online. Here we use this to send photo of patients face and text message with it and sent to security department.

SURVEILLANCE:

Surveillance is again divided into two modules they are:

1)Face Mask Detection:

We implemented face mask detection module using machine learning models like SVM for prediction and OpenCV for image processing. The module works by first checking a patient face photo whether the patient is wearing a mask or not.

i) If a person is a wearing a mask, then the system application does nothing and allows to go through the door or any ward.

ii) If patient is not wearing a mask and patient and application finds out that patient is not a covid patient using face recognition. Patient's photo with a message is sent to security department saying that "the patient is not wearing mask" through telegram.

iii) If patient is not wearing a mask and is a covid patient then a message with photo of patient's face saying" The person is covid positive" through telegram to concerned security department.

Data Flow Diagram of Application:
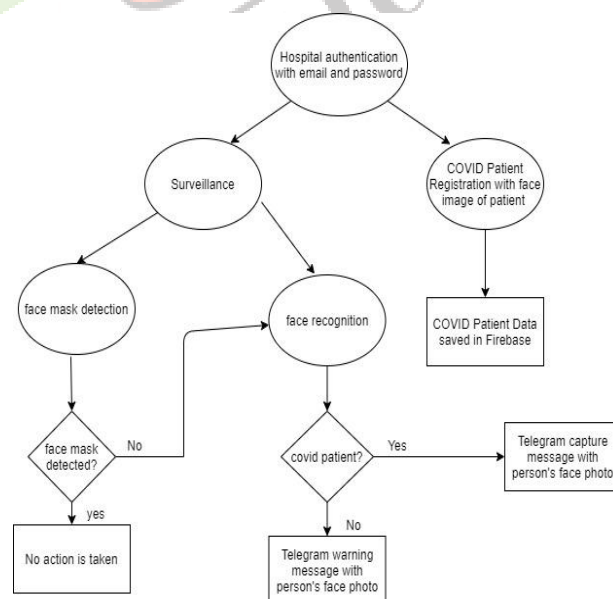
2)Face Recognition:

Face recognition is a module that is built using face recognition, OpenCV frameworks to recognise

patient's face which would help to find out the person is covid positive or not.

1) First cctv cameras capture patients face and then converts the face into greyscale and to face encodings and compares it to the all-stored face photo encodings and if it finds a match then it sends a photo of a patient face with message saying" person is a covid patient" through telegram to security department.

2) If a captured face of a patient is not matching with the covid face photo encodings present in covid database then it doesn't send any warning message to security department and lets the person to pass through door.

5. CONCLUSION:

We've looked at how a series of algorithms built into a surveillance system might identify or detect human faces by comparing them to previously recorded data. We mainly focused on two activities here. To begin, we detect and recognise faces in real time by having the person's data like person's face image already stored in the database. Second, it can detect whether or not a person is wearing a mask in real time while a monitoring system is used to record the image. These approaches are classified in this article, and we also addressed the advantages and disadvantages of the techniques used. Picture detection, computer vision, pattern recognition, and, most importantly, the neural network has all become active areas of study in the process of machine face recognition. There is now a plethora of face recognition systems on the market, each with its own set of benefits and drawbacks. It is up to us to decide which system to choose, which should be based on unique criteria. During this pandemic we have heard that few covid patients have escaped the hospital in fear of disease which has actually led to increase in spread of infection. In order to reduce these types of incidents or escape of a person we can use this system application to reduce these types of incidents which might help in decrease in spread of infection and due to increase advancement of AI and its availability has helps in building AI based applications very easily and with low-cost budget.

6. FUTURE SCOPE:

Artificial Intelligence is one of the most popular technologies we have today. AI making a lot of progress in scientific sector. It can handle a large of amounts of data and processes it quicker and accurate than human minds. It is already making breakthroughs in every field by machine and deep learning algorithms the AI gets better and more durable over time. The example to support the statement is this **EVE** which is a Artificial Intelligence robot it found out an ingredient of tooth paste that can cure a dangerous disease like malaria.

1. In general, it is a monitoring programme that can be used in realms such as health care to detect defectors or avoid safety policy violations.

2. Electronic attendance markers in MNCs, classrooms, and colleges for attendance purposes, and it can be used to catch offenders if detected under any surveillance system alarming the civil service authority, and much more.

3. This application with more optimisation in future does better in home security and surveillance which is not implemented at present times.

As far as the future is concerned, it will improve by being very precise, and with the right amount of experience, it can be more optimising, giving us the best results.

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