Social Distance and face mask Identification System

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Abstract: According to records obtained thru the World Health Organization, the global pandemic of COVID-19 has extensively impacted the area and has now infected extra than eight million people worldwide. Wearing face masks and following stable social distancing are of the stepped forward safety protocols that need to be found in public places to prevent the spread of the virus. To create stable environment that contributes to public safety, we advocate an inexperienced laptop vision-based absolutely approach cantered on the real-time automatic monitoring of people to come across every stable social distancing and face masks in public places thru on violations via the camera. After detection of the breach, the software sends an alert signal to the control center at state police headquarters and moreover gives the alarm to the overall public. In this proposed application modern day deep mastering algorithms had been blended with geometric strategies for building a robust modal that covers three elements of detection, monitoring, and validation. Thus, the proposed system favors society via saving time and lets in in decreasing the unfold of hassle similar to the corona virus. It can be implemented efficiently with within the modern situation at the same time as lockdown is eased to study parents in public gatherings, shopping malls, etc. Automated inspection reduces manpower to study the overall public and moreover can be applied in any place.

Index Terms - **Deep Learning, Computer Vision, Convolutional Neural Networks (CNNs), Transfer Learning, public Safety, OpenCV, Tensorflow.**

I. INTRODUCTION

The spread of COVID-19 Pandemic Disease has created a most critical global health catastrophe in the world that has had a deep impact on humanity and the way we apprehend our global and our regular lives. In December 2019 the spread of immoderate acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a modern-day immoderate infectious respiratory illness emerged in Wuhan, China, and has infected 7,711 people and 100 and seventy cautioned deaths in China in advance than coronavirus modified into declared a global pandemic, modified into named through manner of the World Health Organization as COVID-19 (coronavirus illness 2019). According to the World Health Organization (WHO as of July 12, 2020) report, the present-day outbreak of COVID-19, has infected over 13,039,853 people and additional than 571,659 deaths in more than 200 global places spherical the world, carrying mortality of approximately $3\cdot7\%$, compared with a mortality charge of plenty much less than 1% from influenza. A novel coronavirus has led to person-to-person transmission but in an extended manner, as we know, the transmission of the radical coronavirus causing coronavirus illness 2019 (COVID-19) additionally may be from an asymptomatic provider without covid symptoms. Till now there may been no report about any clinically general antiviral remedy or vaccines which may be effective in the direction of COVID-19. It has spread rapidly around the world, bringing massive health, economic, environmental, and social worrying conditions to the complete human population. At the moment, WHO recommends that people have to be placed face masks to avoid the risk of virus transmission and recommends that a social distance of at least 2m be maintained amongst humans to prevent the person-to-person spread of illness. Furthermore, many public provider carriers require customers to use the provider most effectively withinside the occasion that they placed on masks and observe steady social distancing. Therefore, face mask detection and steady social distance monitoring have become critical pc vision duties to help the global society. This paper describes

strategies to prevent the spread of the virus through manner of monitoring in real time if a person is following steady social distancing and carrying face masks in public places.

II. LITERATURE REVIEW

1) In [1] the paper Prateek Khandelwal and is capable of come across the crime, which leads to real-time voice alerts. It is an efficient and cost-effective approach for AI to create a safe environment on the factory floor. Includes a strong social distancing activity algorithm. It uses MoibleNetV2 because the core model for person detection and haar cascade for face detection. To detect if people are following social distancing, Euclidean distance is calculated. The version is capable of efficaciously classify the face images, although the face is in part hidden through the door. The version does now no longer have the capacity to locate faces on the camera, the peak of that's more than that of 10-ft.

2) In [3] the paper uses deep studying strategies so as to check if someone is carrying a masks or not. It functions a three-elegance classification, i.e., the individual that turned into carrying a masks, or a not-quite-worn a masks or no masks, has been discovered. The mask is to work, with pix and a live video stream. The Id is used for at least the complexity of the structure, and gives you right now results, and you can, therefore, can be used withinside the CCTV footage.. Limitations include the limited availability of data. The paper has been applied as a way to efficiently classify the face images, if the face is blurred, due to the bad top notch of the camera, or must be, withinside the dark of night time time the model isn't good.

3) In [4] In this paper, it's far proposed that a machine this is capable of restriction the unfold of COVID-19, and that those who do now no longer put on a mask, in a clever city, wherein the general public regions are monitored with the aid of using CCTV cameras. If a trouble or anomaly is detected, this is, the authority will be informed, by the network. A deep studying structure primarily based totally on CNN, that is educated on a dataset composed of pics of humans with and with out using masks, which might be accumulated from numerous sources. The maximum crucial architectural schooling finished a 98.7% curacy on the unseen test data. It is the device that stands withinside the face of problems in it, categorisation of the face are blanketed with the aid of using a unmarried hand, as it nearly looks as if the individual is sporting a mask. A person without a face mask, or is riding in a vehicle, it was unable to find the person who will be in these kinds of situations. In large, densely populated urban areas, it is extremely difficult to distinguish between every person's face.

4) In [5] functions of the face are in carrier of a vision-primarily based totally computerized machine to come across and apprehend the subjects. A unique location, from the face of stays a hard project nevertheless. A face is successfully detected so long as its top and width are not more than fourfold the distance among the eyes. Here, time assessment isn't always considered.

5) In [7] a hybrid version with an in-depth, and a traditional gadget getting to know for face detection. The facts consist of a mask and without mask, with images. It uses OpenCV to do this in real-time face detection on a stay stream, and with the assist of a website. The goal is to decide whether or not the individual withinside the video, they may be carrying a masks, all with the assist of pc imaginative and prescient and deep getting to know. The structure includes a MobileNet backbone. This paper makes use of a massive statistics set, it will require greater time period to the teach the statistics.

6) In [8] paper has proposed a face masks detection the use of photograph processing that's one of the high-accuracy and green face masks detectors. This proposed gadget specifically includes 3 stages: 1. Image pre-processing, 2. Face detection and crop, 3. Face masks classifier. The version may not be capable of discover perplexing snap shots with out a face masks.

III. PROJECT SCOPE

This method was developed with an efficient way for the people who are not wearing a face mask and not maintaining social distance and notified to officials by email. As a future enhancement, we can predict/detect the time at which it gets crowded and the heat map can be plotted in an accurate way.

IV. MOTIVATION

The proposed project favors society by saving time and enabling decreasing the unfolding of the corona virus. It may be carried out successfully in contemporary scenarios whilst lockdown is eased to investigate men and women in public gatherings, purchasing malls, etc. Automated inspection reduces manpower to investigate the general public and additionally may be utilized in any place.

V. ALGORITHM

Step 1.   Enter Credential in the Login page.

Step 2.   If it indicates incorrect username and password.

Step 3.   Accept the Term and condition then click on Register.

Step 4.   After Registration, all the information which was filled on sign up page stored on mysql database.

Step 5.   Try again the Login page fill credential details.

Step 6.   After efficaciously login, picks regarded on window on in which where people wearing mask or maintaining their distance as per guidelines.

Step 7.   In other, social distance get execute where distance between crowd or people showed.

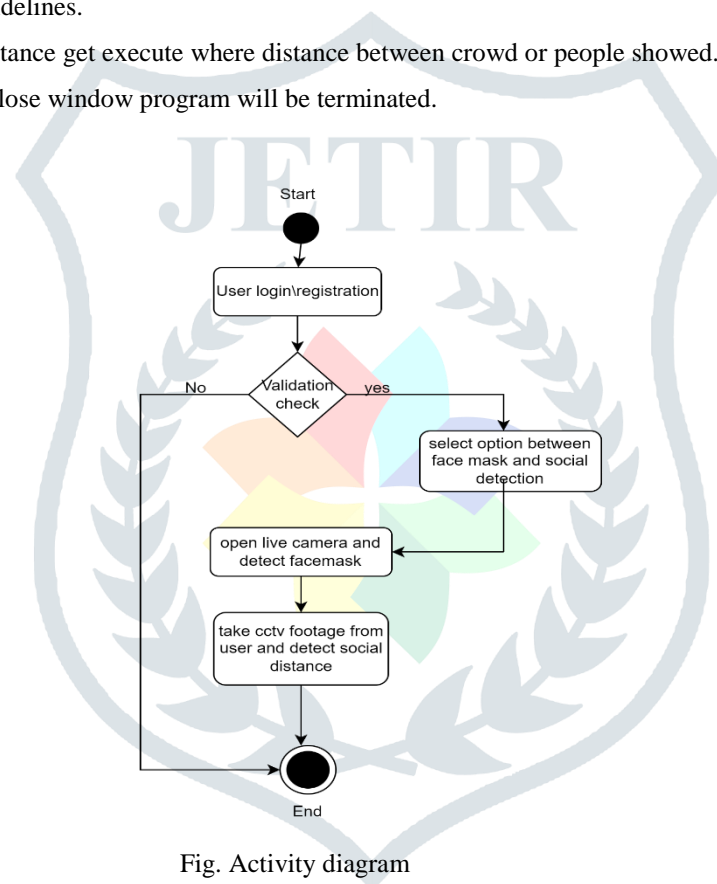Step 8.   Hence once user close window program will be terminated.

Fig. Activity diagram

Above is the chart of how the application will work just as algorithm which is little bit tells us about inner function that are not cover in chart.

VI. METHODOLGY

Face Mask Detection

This undertaking makes use of TensorFlow and Keras to teach a CNN version for detecting face masks.TensorFlow and Keras TensorFlow is an open-supply platform this is used for Machine Learning, created through the Google Brain team. It is explicitly used for complicated numerical computation, that packs collectively a group of system studying and deep studying fashions and algorithms. It can be used for hundreds of programs which includes classifying handwritten digits, object detection, picture recognition, herbal language processing (Natraj, 2019) through education and jogging deep neural networks. Keras which acts as an interface for TensorFlow is an open-supply library that offers a green manner of enforcing neural networks. It includes beneficial features including activation features, and optimizers.
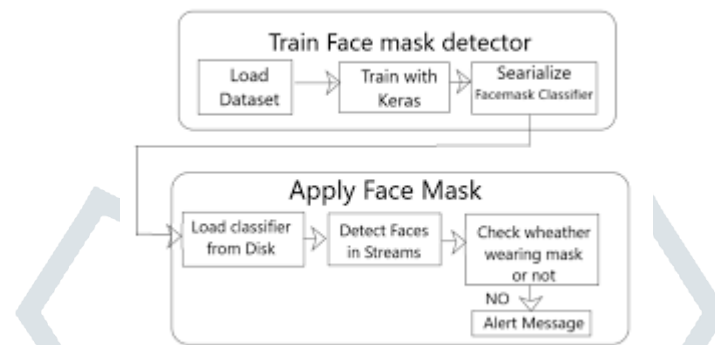

Fig. Face mask detector

How Does TensorFlow Work?

With the assist of TensorFlow, builders can create dataflow graphs that are systems that display how statistics passes thru the graph, or a chain of nodes. Think of every node as a mathematical operation and every aspect representing a multidimensional statistics array or a tensor. This may be effortlessly applied in python in which those nodes and tensors act as objects. However, the mathematical operations are carried out in C++ binaries which indicates a highest quality performance. Python looks after directing the site visitors and combines them to paintings collectively as a unit. TensorFlow may be run on more than one structures consisting of in a cloud, a nearby machine, CPUs or GPUs, iOS, and Android devices. It also can be run on Google's custom TensorFlow Processing Unit (TPUs). The skilled fashions may be run on any machine for predicting results. TensorFlow 2.O which become launched in October 2019 made many enormous adjustments from person feedback. It works extra effectively and is extra handy with easy Keras API for schooling fashions and higher performance. With the assist of TensorFlow Lite, it's miles feasible to educate fashions on an extensive kind of devices.

Convolutional Neural Network (CNN)

A convolutional neural network (CNN) is a type of artificial neural network used primarily for image recognition and processing, due to its ability to recognize patterns in images. A CNN is a powerful tool but requires millions of labelled data points for training. CNNs must be trained with high-power processors, such as a GPU or an NPU, if they are to produce results quickly enough to be useful.

To reiterate from the Neural Networks Learn Hub article, neural networks are a subset of machine learning, and they are at the heart of deep learning algorithms. They are comprised of node layers, containing an input layer, one or more hidden layers, and an output layer. Each node connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.

While we primarily focused on feedforward networks in that article, there are various types of neural nets, which are used for different use cases and data types. For example, recurrent neural networks are commonly used for natural language processing and speech recognition whereas convolutional neural networks (ConvNets or CNNs) are more often utilized for classification and computer vision tasks. Prior to CNNs, manual, time-consuming feature extraction methods were used to identify objects in images. However, convolutional neural networks now provide a more scalable approach to image classification and object recognition tasks, leveraging principles from linear algebra, specifically matrix multiplication, to identify patterns within an image. That said, they can be computationally demanding, requiring graphical processing units (GPUs) to train models.

How do convolutional neural networks work?

Convolutional neural networks are distinguished from other neural networks by their superior performance with image, speech, or audio signal inputs. They have three main types of layers, which are:

     a.   Convolutional layer

     b.   Pooling layer

     c.   Fully-connected (FC) layer

The convolutional layer is the first layer of a convolutional network. While convolutional layers can be followed by additional convolutional layers or pooling layers, the fully-connected layer is the final layer. With each layer, the CNN increases in its complexity, identifying greater portions of the image. Earlier layers focus on simple features, such as colors and edges. As the image data progresses through the layers of the CNN, it starts to recognize larger elements or shapes of the object until it finally identifies the intended object.
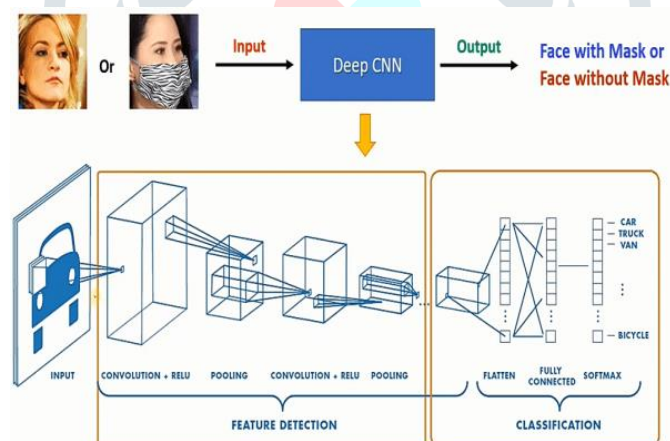

Fig. CNN architectural

About MySQL Workbench

Adding facts managing talents on your utility or internet site could make it extra person-pleasant and allow you to save data acquired from users. MySQL, a unfastened software program utility, allows you construct programs that control facts tables. After placing it up, you may manipulate passwords, do not forget person settings or even show merchandise on the market on a Web page. In MySQL, the MySQL Workbench enables productive operation of MySQL.
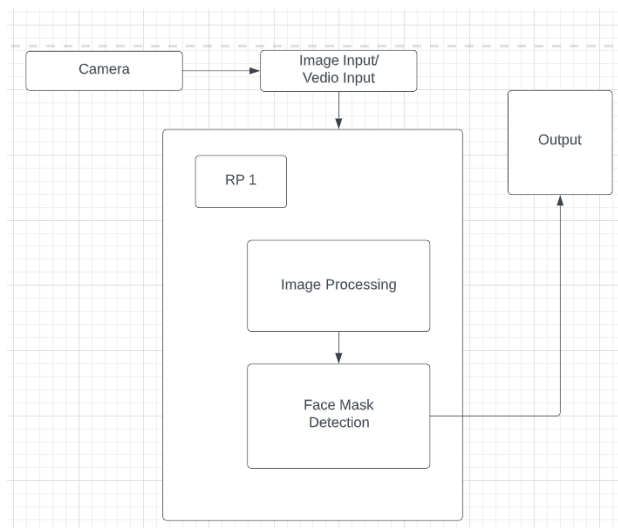
VII. SYSTEM ARCHITECTURE

Fig.3 System Architecture

VIII. RESULT

The idea was creating an easy usable and friendly GUI using tkinter. Whatever email ID / username or positive identification (which has hold on in database) will offer access to any process. If user don't have any account then they need to "Create New Account" at Sign Up page.
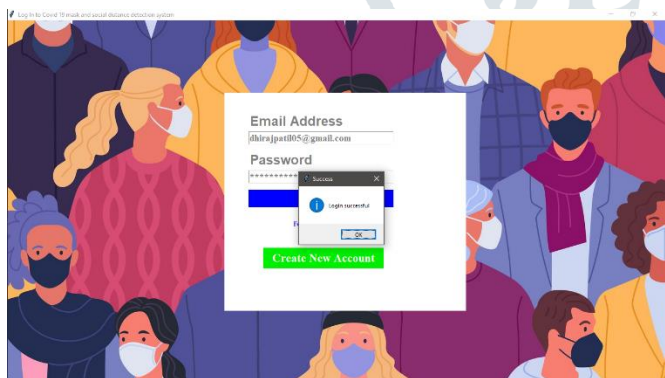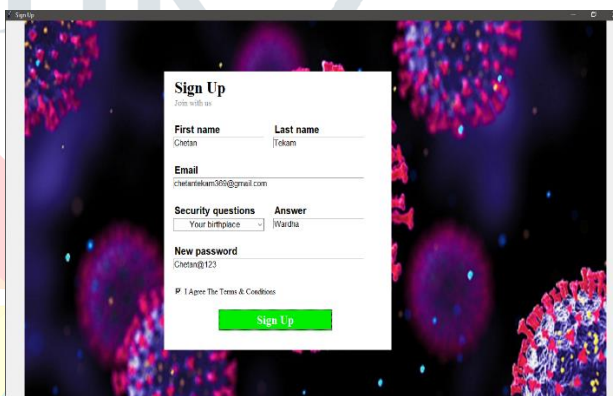

Fig. Login Page

Fig. Sign Up Page

After achieved with Sign up consumer facts will stored at database in MySQL Workbench. After attempting login efficaciously domestic web page will pop up wherein consumer get choices.
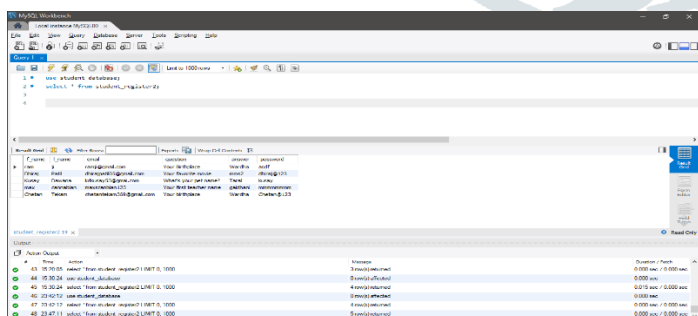

Fig. Database page

Fig. Home Page

After deciding on Social distancing recorded video output will display it is effect

Fig. Social Distancing Implementation

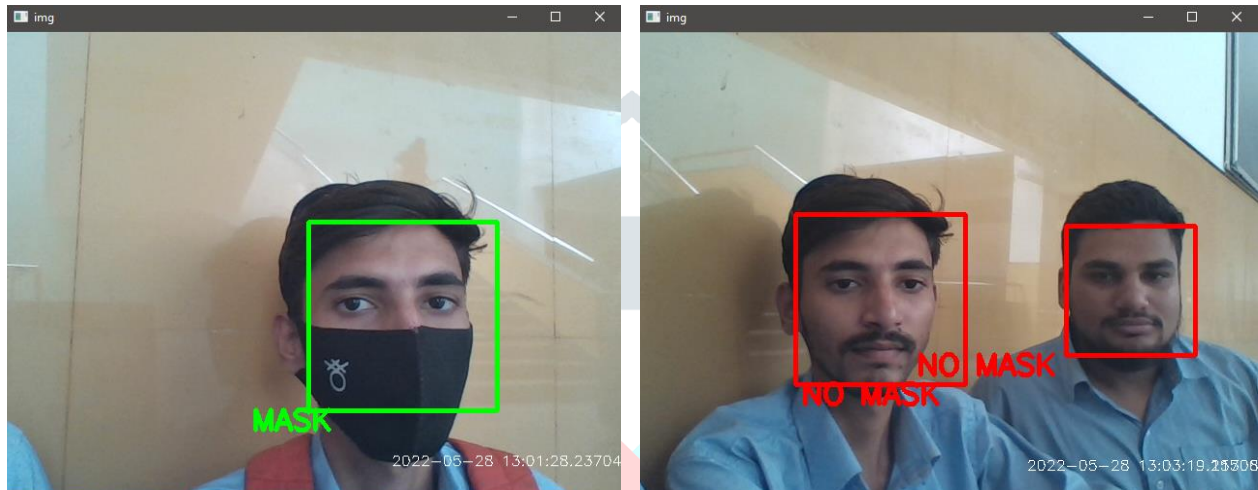After deciding on Facemask detection output comes like this:

Fig. Facemask Detection Implementaion

IX. CONCLUSION

This project has developed to come up with an efficient way for detecting and notifying officials when a person does not follow the COVID 19 safety protocols in a workplace, business establishments etc. In this work, we have trained a model for face mask detection using the proposed CNN architecture comprises two convolutional layers followed by regular activation function and a max pooling layer.

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