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Face Mask Detection

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ABSTRACT: -

The COVID-19 pandemic has wreaked havoc on our daily lives, affecting global trade and transportation. Protecting one's face with a mask has become the new normal. Many public service providers will need clients to wear masks correctly in the near future in order to use their services. As a result, detecting face masks has become a critical responsibility in aiding worldwide society. This paper proposes a simplified approach to accomplishing this goal utilizing TensorFlow, Keras, and OpenCV, as well as some fundamental Machine Learning packages. The proposed approach accurately detects the face from the camera and then determines whether or not it is wearing a mask. It can also detect a face and a mask in motion as a surveillance task performance. Whether or not a mask is present, the procedure employs two separate datasets to deliver a result.

Key-Words: - Covid, ML

Introduction

Coronavirus illness 2019 (COVID-19) has infected over 20 million individuals worldwide, resulting in over 0.7 million deaths, according to the World Health Organization's official Situation Report – 205. COVID-19 patients have reported a wide range of symptoms, ranging from mild signs to major sickness.One of them is respiratory issues such as shortness of breath or difficulty breathing. COVID-19 infection can cause major consequences in elderly patients with lung disease, as they appear to be at a higher risk. 229E, HKU1, OC43, and NL63 are some of the most prevalent human coronaviruses that infect people all over the world. Viruses like 2019-nCoV, SARS-CoV, and MERS-CoV infect animals and evolve into human coronaviruses before infecting humans.Face mask detection is identifying the location of a person's face and then assessing whether or not they are wearing a mask.

Face mask detection uses the system camera to verify a person's real-time image and then generates the results. Face identification is the process of categorizing and differentiating a certain group of items, namely faces. It has a wide range of applications, including autonomous driving, education, and spying. The core Machine Learning (ML) packages such as TensorFlow, Keras, and OpenCV are used in this research to propose a simplified solution to suit the aforesaid objective.

Problem Formulation

The large-scale losses that have been observed around the world as a result of the COVID-19 epidemic have been frightening and have resulted in a great deal of property and lives loss. The pandemic struck unexpectedly, and people and governments were unable to adequately prepare in advance to lessen the epidemic's effects. This virus is extremely lethal and has resulted in several deaths that may have been avoided with appropriate preventative measures.As a result, wearing a mask allows for effective prevention and transmission of the virus, which can be a key component in stopping infections in their tracks.To ensure that the mask rule is obeyed, an automatic technique that can give a highly accurate intelligent system for mask recognition via image processing is required, and this is where face mask detection comes into play. A person's face must be processed through a camera to determine whether or not they are wearing a mask.

Following the COVID-19 pandemic, the suggested model includes the following objectives:- To enforce the obligation for wearing masks in public areas.

- To create an effective working model for accurate mask detection.
- To use image processing techniques to detect the presence of a mask on a person's face.
- To create an effective computer vision-based system for real-time automated monitoring of people in public locations in order to detect face masks.

Solution Proposed:-

Whether people are wearing their mask in a crowded environment or not, the program prefers to fix the problem based on mask. It can be used by a variety of organizations to keep the government's pandemic protocols up to date.This program may be used to identify people who are not adhering to protocols and to take strong action against them. Its use at various public sector access points can aid in the detection of those who are not wearing masks.When the mask is not identified, it outputs a red box, and when the mask is recognized, it outputs a green box.

Fig.1 shows the Data Flow diagram of the model

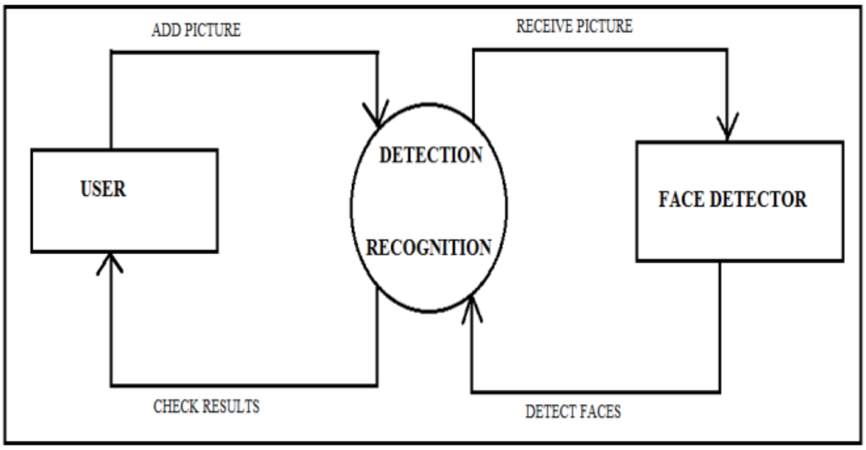

Figure 1 Data flow diagram

Fig.2 show the different phases of the model and training.

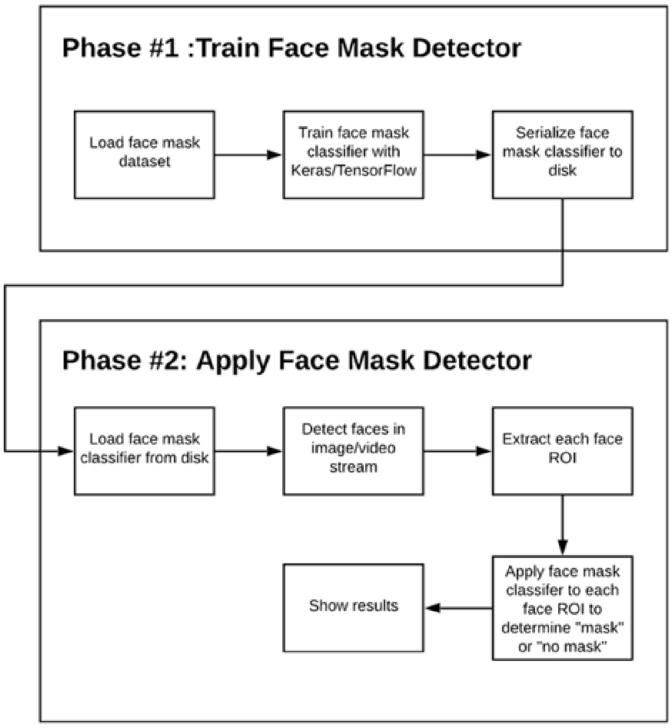

Figure 2 Phases of the model

Fig.3 show the use case diagram from user as well as from software end.

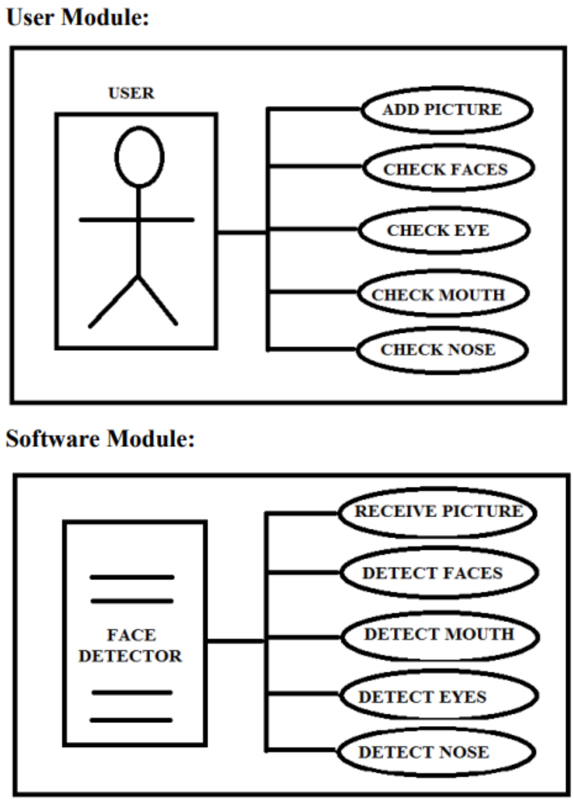

Figure 3 Use Case diagram

Literature Review

A face is detected from an image that has various attributes in the face detection method. Facial detection research necessitates expression recognition, face tracking, and position estimation, according to. The objective is to recognize the face in a single photograph. Face identification is a tough task due to the fact that faces alter in size, shape, color, and other characteristics and are not immutable. It becomes a difficult task when an opaque image is obstructed by something not facing the camera, and so on. According to the authors, occlusive face detection has two key challenges: 1) A large number of datasets comprising both masked and unmasked faces are unavailable. 2) Facial expressions are not allowed in the covered area. Several misplaced expressions can be recovered and the dominance of facial cues can be minimized to a large amount using the locally linear embedding (LLE) technique and dictionaries trained on an enormous pool of masked faces, synthetic banal faces. According to a study published in, convolutional neural networks (CNNs) in computer vision have a tight size constraint for the input image. To overcome the inhibition, the common approach is to reorganize the images before fitting them into the network.

The task's key problem is to correctly detect the face from the image and then determine whether or not it has a mask on it. The proposed approach should be able to detect a face and a mask in motion in order to execute surveillance activities.
Face detection is a process with a wide range of applications, including face tracking, pose estimation, and compression. Face detection is a two-class problem in which we must determine whether or not there is a face in a photograph. This method can be thought of as a simplistic solution to the problem of facial recognition.

Adaboost: Adaboost is a linear combination approach for building a powerful classifier. Adaboost is a machine learning technique that stands for Adaptive Boosting. It's a meta-algorithm that can be used to improve the performance of a variety of other learning algorithms. Adaboost is adaptive in the sense that it adjusts succeeding classifiers to favor examples misclassified by earlier classifiers. In each of a series of rounds, Adaboost produces and invokes a new weak classifier. From a collection of training photos. Face detection and face location can both be accomplished with this technology. A standard face (such as frontal) can be used in this manner. The advantages of this method include the ease with which the algorithm can be implemented and the ease with which the facial locations, such as the nose, eyes, and mouth, may be determined using correlation values.

Methodology

A cascade classifier and a pre-trained CNN with two 2D convolution layers coupled to layers of dense neurons are used in the suggested technique. The face mask detection algorithm is as follows: Detection of Face Masks

A. Information Processing

Data preparation entails converting data from one format to another that is more user-friendly, desirable, and meaningful. It can take any shape, including tables, photographs, movies, graphs, and so on. These ordered data are part of an information model or composition that represents relationships between various entities. Using OpenCV, the suggested approach handles with image and video data.

To change the color space, we utilize the function cv2.cvtColor(input image, flag). The type of conversion is determined by the flag. The flag cv2.COLOR BGR2GRAY is utilized for gray conversion in this situation.

A fixed-size input image is required for deep CNNs. As a result, all of the photos in the collection must have the same size. The grayscale image is enlarged to 100 × 100 pixels using cv2.resize().

B. Reshaping an Image

A three-dimensional tensor is used as the input during image relegation, with each channel having a prominent unique pixel. All of the photos must be the same size and belong to the 3D feature tensor. However, neither pictures nor their related feature tensors are usually coextensive. Most CNNs can only accept photos that have been fine-tuned. This causes a slew of issues during data gathering and model implementation. This constraint can be overcome by rearranging the input images before supplementing them into the network.

The photos have been adjusted to bring the pixel range between 0 and 1 closer together. Then, using data=np.reshape(data,(data.shape[0], img size,img size,1), they are converted to four-dimensional arrays, with 1 indicating the Grayscale picture. The data is converted to categorical labels since the last layer of the neural network has two outputs – with mask and without mask, i.e. it has categorical representation.

Result & Discussions

The model generates a result based on image processing; image processing is carried out using datasets provided. Each dataset contains two types of data: images with masks and images without masks. The face of the person in front of the camera is recorded, and the appropriate result is obtained. It displays a green box with output mask present if the individual is wearing a mask, and a red box with output mask not present if the person is not wearing a mask.

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Conclusion

This method will be effective in monitoring the use of face masks at workplaces in this pandemic crisis, where the entire world wishes to return to normal routine. We can detect a mask on someone's face and enable them to enter the workplace thanks to the creation of this system. This approach also contributes to public healthcare by assisting in the preservation of the environment. This system can be utilized in public locations with embedded technology to ensure that public safety requirements are followed in airports, train stations, offices, schools, and public places.

- Efficient Image capturing.
- Efficient Dataset training through CNN.
- Successful face mask Detection.
- Maintaining alert status.

Furthermore, the project can be used on mobile devices, which can be added to the project's future scope. As soon as the project is up and running, the camera will begin to monitor whether the individual is wearing a mask or not, using the algorithm provided to examine the face and produce a result. If a mask is present, it will display a green box with a message mask, otherwise it will display a red box with no message mask.

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