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Face Mask Detection Using Machine Learning

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ABSTRACT
The Covid-19 pandemic is causing a general clinical benefits crisis. The Covid-19 contamination is as yet causing demolition all around the planet. This disease basically spreads through drops delivered by a Covid-19 infected individual, representing a gamble to other people. Each country has a colossal number of people who are suffering and dying. Wearing a mask over your face is one strategy for hindering this. Various associations and affiliations ought to change and defend a polluted person by distinguishing anyone who doesn't wear a mask. Regardless, considering the way that the number of clients or clients outperforms the number of laborers, checking becomes inconvenient.
Without really trying to hide, the bet of transmission is generally conspicuous. According to the World Health Organization, wearing a facial mask in open areas is likely the best method for getting it far from defilement (WHO).
In this endeavor, we propose a procedure for recognizing facial masks on people by using image-taking care and OpenCV. A proliferating box drawn over the singular's face shows in the event that the individual is wearing a mask. In case an individual is wearing a cloak, the outcome screen will show "Mask." If the individual isn't wearing a shroud, the outcome screen will show "No Mask."

General Terms
Pattern Recognition, Security, Algorithms ,Machine Learning.
Keywords
Coronavirus, Covid-19, Machine Learning, Face Mask Detection, Convolutional Neural Network, Machine Learning,.

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I. INTRODUCTION

Coronavirus immensely affected individuals' lives. A great many individuals passed on because of the pandemic, and crores more were impacted. Practically all business foundations, schooling, the economy, religion, transportation, the travel industry, work, amusement, food security, and different ventures were affected in a bad way. Starting in 2016, 5.56 crores of individuals had been affected with the Covid, and 10.3 lakh had passed on because of it, as indicated by the WHO (World Health Organization). In November of 2020, This is equivalent to the Plague, which killed almost 60% of Europe's population in the fourteen century. Meanwhile, almost 14 days for the infection to fill in the body of its host and influence them, and meanwhile, it spreads to nearly every individual who comes into contact with that individual. Therefore, following the spread of Covid-19 is incredibly troublesome.

Coronavirus essentially spreads through drops created by an affected individual's sniffling. This spreads the infection to anybody who comes into direct contact (in range of 1 meter) with an individual contaminated with the Covid. Thus, the infection spreads rapidly among the overall population. With the lifting of cross-country lockdowns, following and controlling the infection has become significantly more troublesome. Facial coverings are a successful strategy for forestalling infection spread. Wearing facial coverings is 96% viable in forestalling infection spread. State-run administrations all around the world have forced severe

guidelines expecting everybody to wear covers while going out. In any case, certain individuals might decline to wear covers, making it troublesome.

There are no productive facial covering location applications to decide if an individual is wearing a facial covering. This raises the requirement for a viable framework for identifying facial coverings on individuals for transportation, thickly populated regions, private areas, enormous scope producers, and different undertakings to guarantee security. To distinguish covering on individuals, this task utilizes ML with OpenCV and picture handling.

II. PROBLEM STATEMENT

With the lifting lockdown stages moving, the world has been battling the pandemic in the incredible soul. This is the ideal opportunity to be more proactive than any other time. To battle the infection, legislatures all around the world have perceived the force of man-made brainpower and ML.

Since social separation and wearing a cover are the main ways of staying away from disease until vaccinations become generally accessible, computer vision as Mask Detection is a restoring variable to get our lives in the groove again. Constant veil location can address checking issues in thickly populated regions.

III. RELATED WORKS

1. Study of face mask detection in video analytics and Real- Time face mask detector using YOLOv3.

2. M.K.J. Khan, N. Ud Din, S. Bae, J. Yi, Interactive removal of microphone object in facial images, Electronics 8 (10) (2019).

3. C. Li, R. Wang, J. Li, L. Fei, Face detection based on YOLOv3, in:: Recent Trends in Intelligent Computing, Communication and Devices, Singapore, 2020.

4. M. S. Ejaz, M. R. Islam, M. Sifatullah and A. Sarkar, "Implementation of Principal Component Analysis on Masked and Non-masked Face Recognition," 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT), Dhaka, Bangladesh, 2019.

IV. DATASET

Two datasets were used for testing the current method. Dataset 1 contains 1376 images, 690 of which feature people wearing face masks, and the remaining 686 feature people who do not wear face masks. Fig. 1 primarily depicts a frontal pose with a single face in the frame and the same type of mask in white only.

Fig. 1. Samples from Dataset 1 including faces without masks and with masks

Dataset 2 from Kaggle contains 853 images in which the countenances are clarified with or without a mask. Figure 2 shows some face collections with head turn, tilt, and slant, as well as multiple faces in the frame and different types of masks with different colors.

Fig. 2. Samples from Dataset 2 including faces without masks and with masks

A. TensorFlow

TensorFlow, a point of interaction for communicating ML calculations, is utilized to carry out ML frameworks into manufacture in an assortment of software engineering fields, including opinion investigation, voice recognition, location detection, computer vision, text synopsis, data recovery, computational medication revelation, and imperfection recognition [18]. TensorFlow is utilized as the backend for the whole Sequential CNN design (which comprises a few layers) in the proposed model. It is additionally utilized in information handling to reshape the information (picture).

B. Keras

Keras provides fundamental reflections and building units for the creation and delivery of ML arrangements at a high iteration velocity. It fully utilizes TensorFlow's scalability and cross-platform capabilities. Keras' primary data structures are layers and models [19]. Keras is used to implement all of the layers in the CNN model. It aids in the compilation of the overall model in conjunction with the conversion of the class vector to the binary class matrix in the data processing.

C.OpenCV

OpenCV, an open-source computer vision and Machine Learning library, is utilized to differentiate and perceive faces, perceive objects, bunch developments in accounts, follow moderate modules, follow eye movements, track camera activities, remove red eyes from pictures taken with the streak, track down practically identical pictures from a picture information database, see the scene and set up markers to overlay it with upgraded reality, etc. The proposed strategy utilizes these OpenCV highlights in the resizing and variety transformation of information pictures.

A) Data Visualization: Data perception is the most common way of changing conceptual information into significant portrayals using encodings and information correspondence. It is gainful to research a particular example in the dataset.

The absolute number of pictures in the dataset is addressed graphically in the two classes - 'with cover' and 'without a covering.'

The categories=os.listdir(data path) proclamation classifies the rundown of indexes in the predefined information way. The variable classifications are currently as follows: ['with cover,' 'without covering]

Then, at that point, to decide the number of names, we should utilize labels=[i for I in range(len(categories)] to recognize those classes. It doles out the names [0, 1]

Presently, every classification is planned to its comparing name utilizing name dict=dict(zip(categories, marks)), which first returns an iterator of tuples as a zip object, where the things in each passed iterator are matched together in the request they were passed. 'with the cover': 0, 'without a covering': 1 is the planned variable label dict.

B) *Conversion of RGB image to Gray image:*Modern descriptor-based image recognition systems routinely work on grayscale images without elaborating on the method used to convert from color to grayscale. This is because when using robust descriptors, the color-to-grayscale method has little effect. The addition of non-essential information may increase the size of the training data required for good performance. Grayscale is used for extracting descriptors rather than working on color images instantly because it rationalizes the algorithm and reduces the computational requirements.

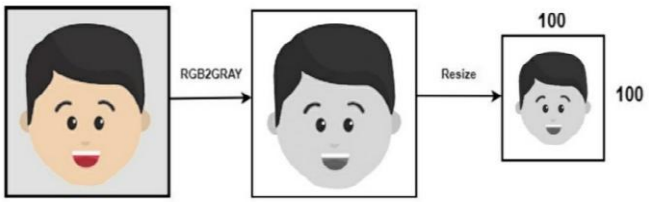


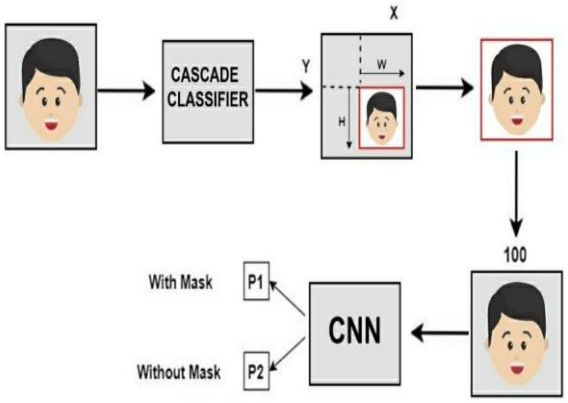
Fig. 3. Conversion of a RGB image to a Gray Scale image of 100x100 size

We utilize the capacity cv2.cvtColor(input picture, banner) to change the variety space.The kind of not set in stone by the banner here. The banner cv2.Color BGR2GRAY is utilized for dark change in this situation.
Profound Cnns require a fixed-size input picture. Therefore, we want a decent normal size for each of the pictures in the dataset.
The greyscale picture is redraw to 100 x 100 utilizing cv2.resize().

C)Image Reshaping: The contribution during picture assignment is a three-layered tensor, with each channel containing a noticeable, novel pixel. Each of the pictures should be a similar size and relate to a similar 3D element tensor. In any case, neither pictures nor their it are ordinarily coextensive to compare including tensors. Most Cnns can acknowledge pictures that have been adjusted. This causes a few issues during information assortment and model execution. In any case, reconfiguring the information pictures prior to increasing them in the organization can help with defeating this constraint.
The pictures are standardized to bring the pixel range somewhere in the range of 0 and 1 nearer together. Then, at that point, utilizing data=np. reshape (information, (information. shape, picture size, picture size, 1)), they are changed over to four-layered exhibits, where 1 addresses a grayscale picture. The information is changed over to downright names in light of the fact that the last layer of the brain network has two results with a cover and without a cover demonstrating that it has straight out portrayal.

C. Training of Model

A)Developing the model utilizing Cnn design: Cnn has acquired prominence in an assortment of PC vision errands. The current technique utilizes consecutive CNN. This is a typical misconception.
The Rectified Linear Unit (ReLU) and MaxPooling layers are added after the principal Convolution layer. The Convolution layer is instructed by 200 channels. The bit size is set to three by three, which determines the height and width of the two-layered convolution window. Since the model ought to know about the normal state of the information, the primary layer in the model should be furnished with input shape data. The accompanying layers are fit for performing natural shape figuring. For this situation, the information shape is data. shape[1:], which returns the elements of the information exhibit beginning at record 1. The default cushioning is "legitimate," and that implies that the spatial aspects are permitted to shorten and the information volume is cushioned. The Conv2D class' actuation boundary is set to.
The subsequent convolution layer has 100 channels, and the portion size is set to 3 x 3. It is trailed by the layers ReLu and MaxPooling. The long vector of information is gone through a smoothing layer, which changes the framework of highlights into a vector that can be taken care of into a completely associated brain network classifier, prior to being taken care of into Cnn. A dropout layer with a half possibility setting contributions to zero is added to the model to decrease overfitting. Following that, a thick layer of 64 neurons with a ReLu enactment work is added. The Softmax enactment work is utilized in the last layer, which has two results for two classes.
b) Data splitting and CNN model training: Once the blueprint for data analysis has been created, the model must be trained on a specific dataset and then tested on a different dataset.When making a prediction, a proper model and an optimised training test split help to produce accurate results. The test size is set to 0.1, which means that 90% of the data in the dataset is used for training and 10% is used for testing. ModelCheckpoint is used to track validation loss. The images in the training and test sets are then fitted to the sequential model. In this case, 20% of the training data is used as validation data. The model is trained for 20 epochs (iterations), with a trade-off between accuracy and speed.



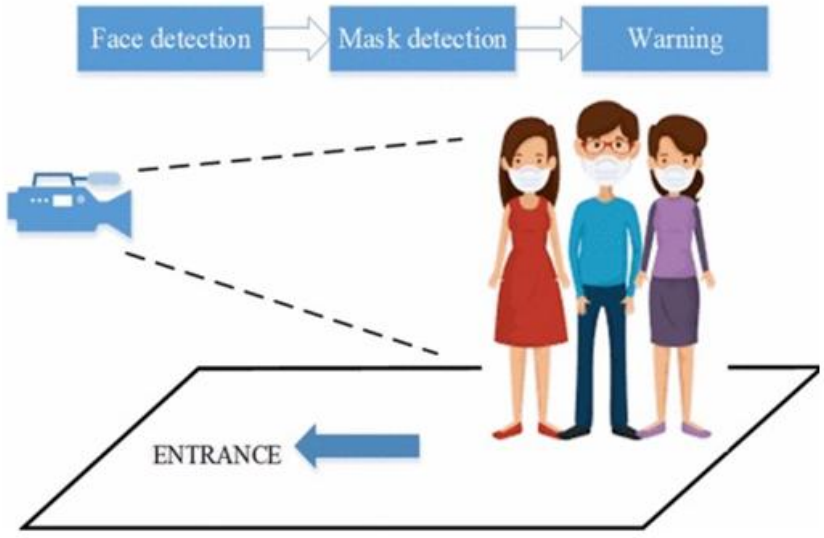
V. APPLICATIONS

We are use this system in multiple areas like

- Railways station, Bus stop and Airport.
- All MNCs and Offices. Schools and Colleges.
- Temples and Hospitals.
- Malls, Movie Theaters and parks and many more public places.

VI. METHODOLOGY

The above system design is created to perform all of the specified tasks by combining machine learning classifiers, OpenCV, and image processing. First, a base model will be generated, followed by the collection of 200 images with and without a face mask. The model will be trained using this 400-image dataset. The model will be subjected to the machine learning messages on the screen such as "Mask" and "NO MASK," .algorithm. After that, the model will detect whether or not the person is wearing a face mask and display



VII. CONCLUSION

With the growing number of COVID-19 cases all over the world, a system to replace humans in checking masks on people's faces is desperately needed. This system meets that requirement.

This system can be used in public places such as train stations and shopping malls. It will be extremely useful for businesses and large establishments with a large workforce. This system will be of great assistance there because it is simple to obtain and store data on the employees working in that company, and it will be very easy to identify those who are not wearing uniforms.

If you are not wearing a mask, an alert will be sent to that person to take precautions.

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