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Face Mask Detection Using CNN for Covid-19

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Abstract: Due to the COVID-19 pandemic caused by the novel corona virus, it becomes necessary to wear facemasks every time we go out. This leads to the need of a system which can detect whether a person is wearing a face mask or not. The proposed system uses Machine Learning as the technology. It uses CNN along with OpenCV. Convolutional Neural Networks (CNN) algorithm is used to train the dataset that consists of images of people with or without face masks. The proposed system is a real time system which is able to capture the image of face in a live video stream and determine whether it is wearing a facemask or not. It is designed to increase the safety of people against COVID-19. The main advantage of the proposed system is that it helps in reducing human interaction which leads to decrease in the risk of getting infected by COVID-
19. The key concept of this system is to use Machine Learning algorithm to determine whether detected face is 'Masked' or 'Unmasked'.

***Key Words*: :** Face Mask Detection, Convolutional Neural Network, OpenCV, COVID-19, Corona virus, Machine learning.

I. INTRODUCTION

The COVID-19 pandemic is an ongoing pandemic caused by the novel Corona virus. It is mainly caused by the Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV-2). The World Health Organization hasdeclared it as a global pandemic. The COVID-19 can often be asymptomatic which makes everyone necessary to take the precautions. It spreads mainly from person to person through respiratory droplets which travel into the air when the infected person coughs, sneezes, talks or shouts. These droplets can then land in the mouths or noses of people who are near the infected person or they may breathe these droplets in. People who have been infected by the corona virus remain contagious for up to 14 days and may spread the corona virus even if they areasymptomatic. The preventive measures suggested by the WHO are social distancing, wearing face masks in public, air-filtering, hand washing, covering one's mouth while sneezing or coughing and self-isolation for symptomatic people.

WHO has advised to use facemasks every time you are exposed to other people. Facemasks are a simple barrierto help prevent respiratory droplets from reaching others. The main function of wearing a mask is to protect those around you, in case you are infected but not showing symptoms and also to protect ourselves from infected but asymptomatic people. So as a precaution it is advised to wear a face mask so as to reduce the chances of gettinginfected. The inefficiency to detect such people may cause increasing risk of infection.

Face Mask Detection involves detecting the face and then determining whether the detected face is wearing a face mask or not. Machine Learning algorithms are used to in this paper to build a Face Mask Detection model.Our aim is to detect the people not wearing face masks and thus decrease the risk of getting infected by COVID-19.

II. LITERATURE SURVEY

1. Title: Facial Mask Detection using Semantic Segmentation
Author name: Toshanlal Meenpal, Ashutosh Balakrishnan, Amit Verma

Description: This paper gives a clear idea about Fully Convolutional Network for training the data. It explains about Face segmentation and Detection used for detecting faces from the image. It also explains the Binomial Cross Entropy as loss function.

2. Title: Multi-angle Head Pose Classification when wearing mask for face reorganization under the covid-19 Coronavirus Epidemic.
Author name: Shuang Li, Xin Ning, Lina Yu, Liping Zhang, Xiaoli Dong, Yuan shi

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Description: This paper discusses about Color texture analysis. It explains about the color conversionof RGB scheme image into HSV scale. It also explains about training CNN to extract features for classification.

3. Title: Detecting Masked Faces in the Wild with LLE-CNNs
Author name: Shiming Ge, Jia Li, Qiting Ye, Zhao Luo
Description: This paper uses MAFA dataset for training Classifier. It explains how LLE-CNN is usedfor masked face detection.

III. DATASET USED

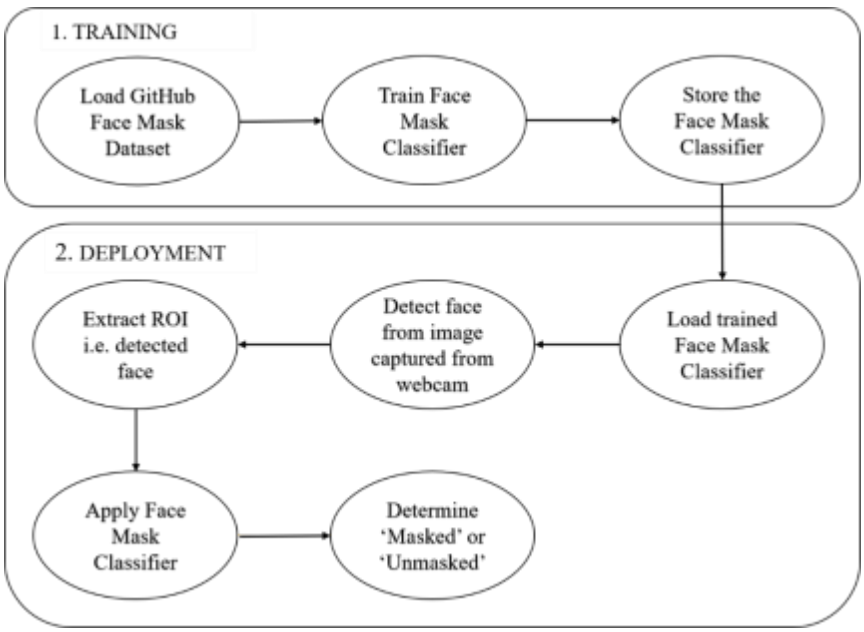
The dataset used for the proposed project is 'Face Mask Detection Dataset' from GitHub. It contains 3833 images belonging to two classes – 1915 images with mask and 1918 images without mask. The dataset mostlycontains images that have frontal face pose with single face.

IV. SYSTEM ARCHTECHTURE

The project implementation is divided into two phases: Training and Deployment.

In training phase, the GitHub dataset named 'Face Mask Detection Dataset' is loaded. This dataset is used to train the Face Mask Classifier using CNN algorithm. VGG-16 (Visual Geometric Group) architecture will be used to train the CNN classifier. Store the trained Face Mask Classifier on the disk.

In the deployment phase, first the trained Face Mask Classifier is loaded. Then user's face is detected from the image captured from the webcam. OpenCV is used to detect the face from the captured image. OpenCV is a library of different models and it already contains many pre-trained classifiers for detecting face. For detecting faces, OpenCV requires grayscale images and the image that is captured from the webcam is in RGB scheme. So, the RGB scheme image will be converted into Grayscale image. Next the region of interest (ROI) will be extracted i.e., the detected face. From Region of Interest, the feature vector is extracted which is further passed on to the CNN classifier. The trained Face Mask Classifier is applied to the extracted feature vector which then determines whether the detected face is wearing a face mask or not.



SYSTEM ARCHITECTURE

V. CONCLUSION

We are working on a model that can detect whether or not a person is wearing a face mask properly and it also prompts

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the person to wear one. Given the way how things are going, face masks are going to be a more integral part of our society and public health in general, in such a scenario this system would be imperative to ensure safety guidelines are followed.

VI. REFERENCES

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