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An Automated Covid-19 Face Mask Detection and Warning System with Deep Learning

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ABSTRACT

The corona virus COVID-19 pandemic is causing a global health crisis so the effective protection methods are wearing a face mask in public areas according to the World Health Organization (WHO). The COVID-19 pandemic forced governments across the world to impose lockdowns to prevent virus transmissions. Reports indicate that wearing face masks while at work clearly reduces the risk of transmission. As the result, to create an efficient and economic approach of using Artificial Intelligence (AI)for safe environment in a manufacturing setup. A hybrid model using deep and classical machine learning for face mask detection will be presented. A face mask detection dataset consists of with mask and without mask images, by using OpenCV to do real-time face detection from a live stream via our webcam. The use of dataset is to build a COVID-19 face mask detector with computer vision using Python, OpenCV, and Tensor Flow and Keras. The goal is to identify whether the person on video stream is wearing a face mask or not with the help of computer vision and (RCNN) deep learning.

Keywords : Facial Mask Detection, COVID-19, Deep Learning, Convolutional Neural Network(CNN), Regional based Convolutional Neural Network(RCNN), Smart City

I. INTRODUCTION

Deep learning methods aim at learning feature hierarchies with features from higher levels of the hierarchy formed by the composition of lower level features. Automatically learning features at multiple levels of abstraction allow a system to learn complex functions mapping the input to the output directly from data, without depending completely on human-crafted features. Deep learning algorithms seek to exploit the unknown structure in the input distribution in order to discover good representations, often at multiple levels, with higher-level learned features defined in terms of lower-level features. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones. Deep learning allows computational models that are composed of multiple processing layers to learn

representations of data with multiple levels of abstraction.

II. PROPOSED SYSTEM

To protect ourselves from the COVID-19 Pandemic, almost every one of us tend to wear a face mask. It becomes increasingly necessary to check if the people in the crowd wear face masks in most public gatherings such as Malls, Theatres, Parks. The development of an AI solution to detect if the person is wearing a face mask and allow their entry would be of great help to the society. A simple Face Mask detection system is built using the Deep Learning technique called as Regional based Convolutional Neural Networks (RCNN). This RCNN Model is built using the TensorFlow framework and the OpenCV library which is highly used for real-time applications. This model can also be used to develop a full-fledged software to scan every person before they can enter the public gathering. Using this model, an accuracy of over 99% is obtained. This can also be used further to achieve even higher levels of accuracy.

III. ALGORITHM

Regional based Convolutional Neural Network (RCNN) RCNN takes image as input, using selective search, region proposals are extracted from that image. Each region proposals are warped(reshaped) to a fixed size, that is passed as a input to the CNN. CNN extracts a fixed-length feature matrix for each region proposals. These features are used to classify region proposals using category specific linear SVM. The bounding boxes are refined using bounding box regression so the object is properly captured by the box.

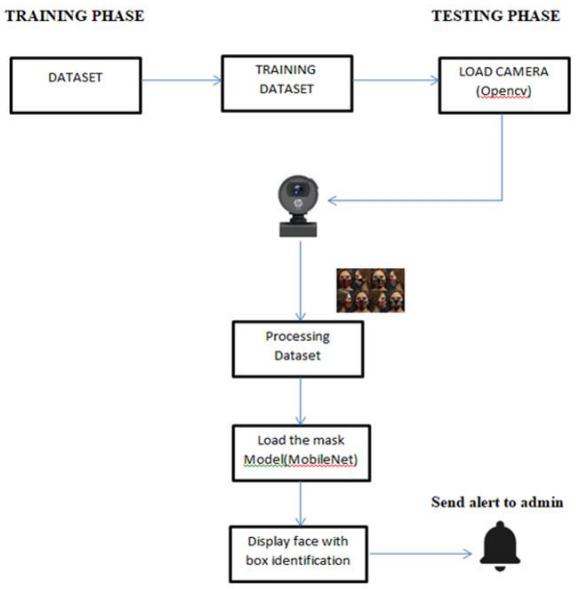

Fig. 1 System Architecture

IV. MODULES DESCRIPTION

A. Training Dataset

The datasets are collected from the various sources for the model. Then, the datasets is separated with the criteria of with mask and without wearing mask. After, the model is trained using Tensorflow&Keras with the dataset (with and without mask).

B. Open camera and OpenCV

For the real time application, the camera is opened and the OpenCV package is loaded to detect the faces of the people who are in the frame. The OpenCV package used to recognize the faces in the live video stream.

C. Load the Model

After the face recognition process, the pre-trained model is loaded. Here, the purpose of the pre-trained model is to detect the person wearing or not wearing mask.

D. Identify the wearing of mask or not

Applying the pre-trained model to identify the person wearing mask or not over live video stream with the help of camera. Through the model, the people are identified according to the criteria.

E. **Sent Alert**

At the end, alert is send to the corresponding authority, if the person did not wear mask is identified.

V. IMPLEMETATION

System implementation is the important stage of project when the theoretical design is tuned into practical system. The main stages in the implementation are as follows: Planning, Training, System testing and Changeover Planning. Planning is the first task in the system implementation. Planning means deciding on the method and the time scale to be adopted. At the time of implementation of any system people from different departments and system analysis involve. They are confirmed to practical problem of controlling various activities of people outside their own data processing departments.

Fig.2 Dataset Without Mask

Fig.3 Dataset with Mask

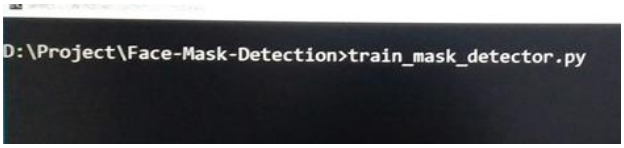

Fig.4 Initiation of Training Dataset

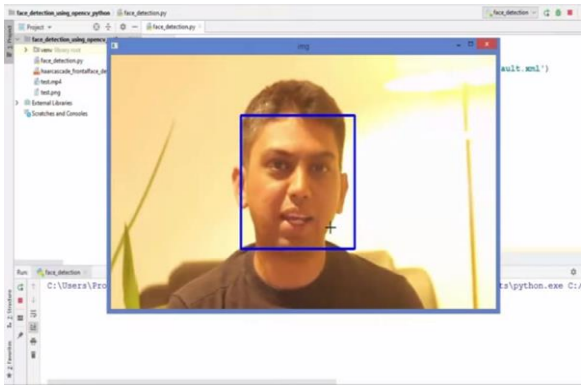

Fig.5 Face Detection with OpenCV

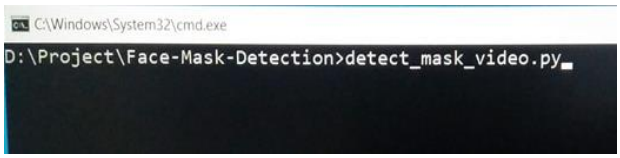

Fig. 6 Initiation of Mask Detector Code

VI. RESULTS AND DISCUSSION

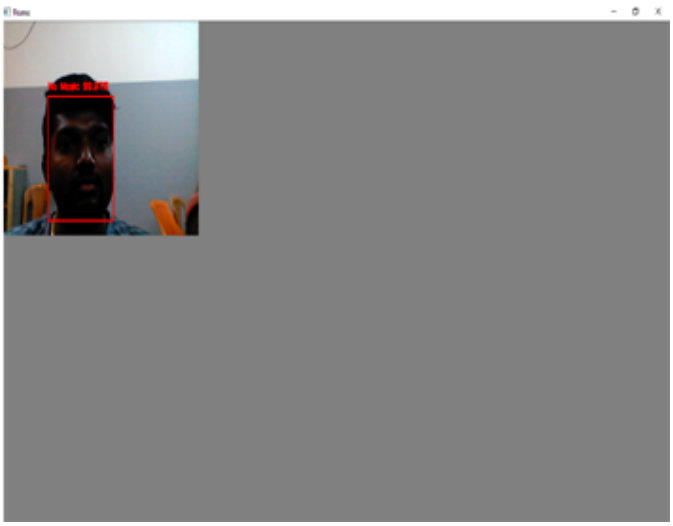

Fig.7 Person Without Mask Is Identified

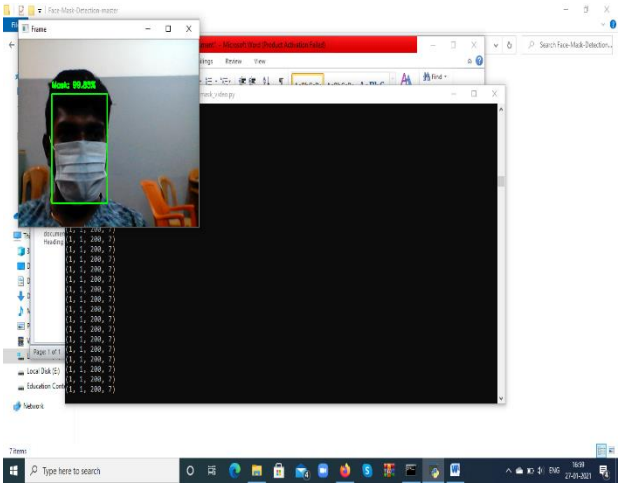

Fig.8 Person with Mask Is Identified

VII. CONCLUSION

A system is to reduce the spread of corona virus by informing the authority about the person who is not wearing a facial mask that is a precautionary measure of COVID-19. The motive of the work comes from the people disobeying the rules that are mandatory to stop the spread of corona virus. The system contains a face mask detection architecture where a deep learning algorithm is used to detect the mask on the face. To train the model, labeled image data are used where the images were facial images with masks and without a mask. The proposed system detects a face mask with an accuracy of maximum 99%. The decision of the classification network is transferred to the corresponding authority. The system proposed in this study will act as a valuable tool to strictly impose the use of a facial mask in public places for all people.

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