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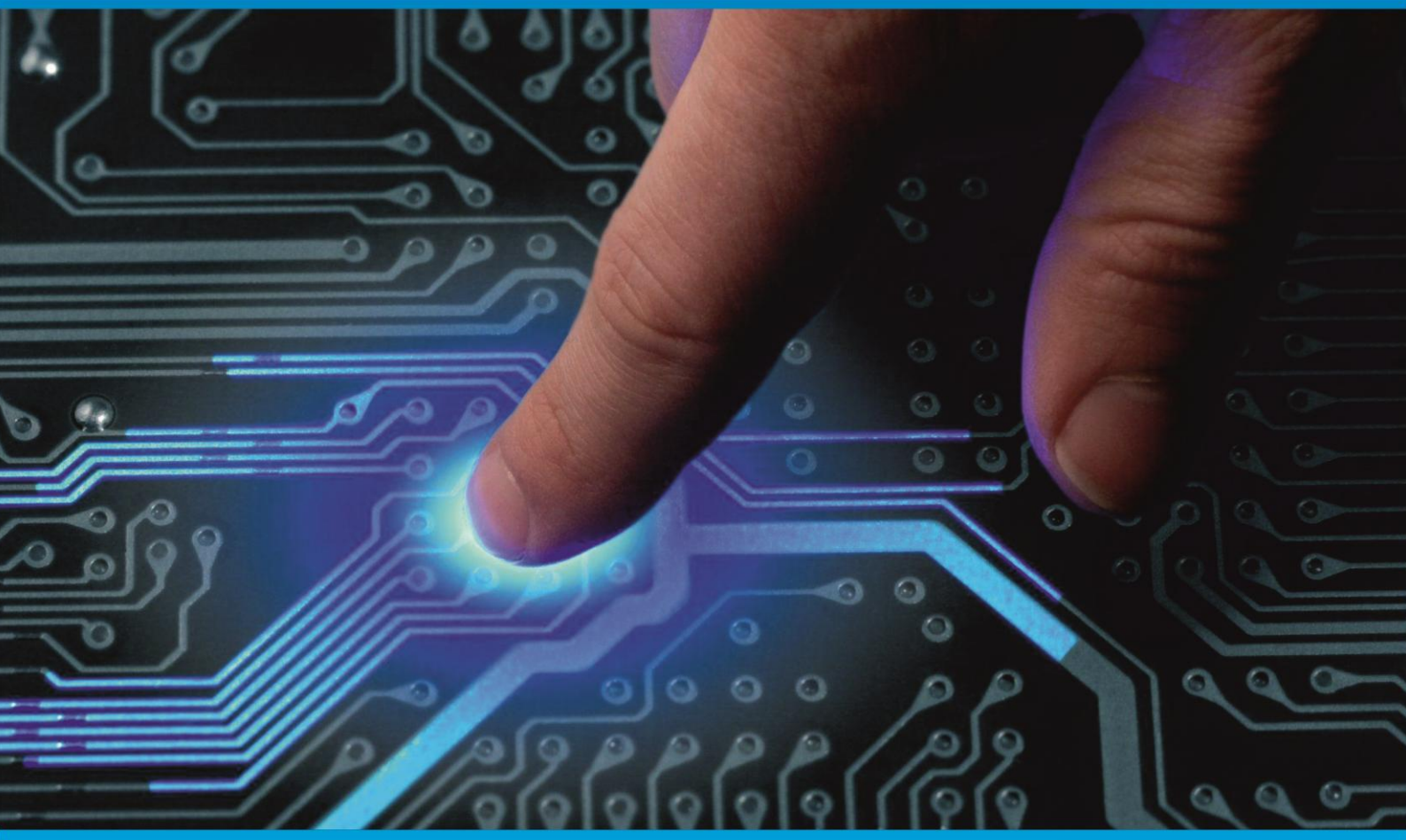

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Real Time Scrutiny of Face Mask at Firm Using Deep Learning Framework

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ABSTRACT: The COVID-19 pandemic caused by novel coronavirus is continuously spreading until now all over the world. Many countries require everyone to wear a mask in public to prevent the spread of coronavirus. The use of facial masks in public spaces has become a social obligation since the wake of the COVID-19 global pandemic and the identification of facial masks can be imperative to ensure public safety. Detection of facial masks in video footages is a challenging task. In this work, we propose an approach for detecting facial masks from video using deep learning. A deep learning architecture is trained on a dataset that consists of images of people with and without masks collected from various sources. Convolutional Neural Networks (CNN) are trained to classify people wearing face masks with impressive accuracy. Person without a mask is identified and an alert message indicating that person to wear face mask will be sent by using twilio.

KEYWORDS: Covid, mask, face detection, mask detection, CNN, twilio

I. INTRODUCTION

In today's world COVID-19 has become a pandemic all over the world. People all over the world are facing challenging situations due to this pandemic. Every day a large number of people are being infected and get died. Fever, dry cough, tiredness, diarrhoea, loss of taste, and smell are said to be the major symptoms of coronavirus by the World Health Organization (WHO). Many precautionary measures should be taken to fight against coronavirus like cleaning hands, maintaining a safe distance, wearing a mask, refraining from touching eyes, nose, and mouth. Among these wearing a mask is the most important one. COVID-19 is a disease that spreads from human to human which can be controlled by ensuring proper use of a facial mask. The spread of COVID-19 can be limited if people strictly maintain social distancing and use a facial mask. Very sadly, people are not obeying these rules properly which is speeding the spread of this virus. So our motive to identify the people who are not wearing facial mask inside the firm and informing or suggesting that person to wear mask in public places, to prevent the spread of coronavirus.

The main aim is to develop an application to identify whether the people working in a firm are wearing facial mask. The workers will be monitored using the video stream. From that video stream the workers without facial mask will be identified. The contact number of that person will be stored. By using their twilio account id the contact number of the person without mask will be retrieved and a text message indicating that person to wear facial mask will be sent. In existing systems, a person has to monitor manually or there are systems to classify people who are with masks and without masks. Here, our project explains a method of building a Face Mask Detector using Convolutional Neural Network(CNN) Python, Keras, Tensorflow and OpenCV. In simple words the objectives of the application is, to ensure that every person working on a firm need to wear facial mask and thereby helpful in preventing the spread of the novel coronavirus.

II. RELATED WORK

In Tracking and visualizing face masks

Peng Sun proposed the practical computer vision sensing framework for person and face mask tracking. The face mask detection module was trained and validated on a challenging low resolution, face mask dataset curated from 50+ hours of surveillance camera footage. From this framework we learnt the methodology for monitoring the person continuously for hours under surveillance camera footage and instead of surveillance camera we tried it using web camera.

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Demerits:

- Space for some application tool is limited.
- Working on large number of dataset with high pixel value is difficult.

Facial mask detection

Mohammad Marufur Rahman proposed the deep learning architecture which is trained on a dataset that consists of images of people with and without masks collected from various sources. The trained architecture achieved 98.7% accuracy on distinguishing people with and without a facial mask for previously unseen test data.

From this paper we have learnt more about the classification of image based on whether the person is wearing facemask or not with higher accuracy using the proposed deep learning framework.

Demerits:

- The developed system faces difficulties in classifying faces covered by hands since it almost looks like the person wearing a mask.
- Since the information about the violator is sent via internet, the system fails when there is a problem in the network.

Gabor wavelet feature extraction

Gayatri Deorehas created a method simpler in complexity thereby making real time implementation feasible. General mask detection algorithms deal with complex algorithms like feature based algorithms and learning based algorithms. Methods based on facial features exploit the information of facial features such as mouth or skin color to decide whether there is mask on face or not. In this project, author proposes support vector machines for occluded face recognition. In this approach occluded face detection with gabor wavelets, principle components analysis and support vector machine.

However we are not going to use gabor wavelet method but we learned a lot to detect face mask without exploiting the image which is detected from the video stream.

Demerits:

- Face detection using gabor wavelets is computationally intensive
- Needs more learning about the technique.

III. SYSTEM ARCHITECTURE

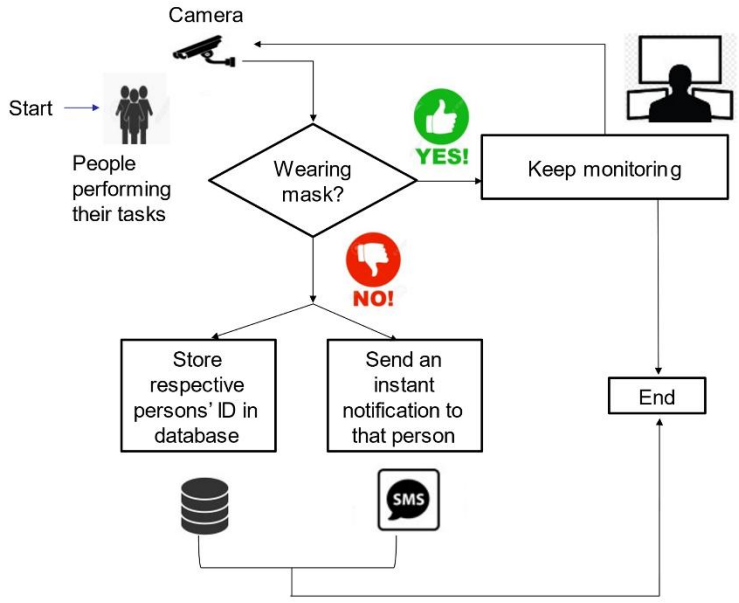

Fig.1. System architecture

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Data Collection

Data from different resources were collected for training and testing the model. We collected a total of images of people with mask and images of people without mask. For training purposes 80% of the samples used and the rest were used for the testing purpose.

Preprocessing

The images captured by the Web cameras are used in preprocessing. In the preprocessing step, the image is transformed into a greyscale image because RGB colour image contains too many redundant information which might not be required for mask detection. Then we reshape the images to maintain uniformity of the input images. Then the images are normalized and after the normalization, the value of pixels range from 0 to 1. Normalization helps the learning algorithm to learn faster and capture necessary features from the images.

Architecture development

The learning model is based on mobilenetv2 which is useful for pattern recognition in the images. The network comprises of one input layer, several hidden layers and one output layer. A flatten layer reshapes the information into a vector to feed into a dense network. The dense layer comprises of a series of neurons which learn the non-linear features. The dropout layer prevents the network from overfitting by dropping out units. Finally a dense layer containing two neurons distinguishes the classes. RsLu and softmax are used as the activation functions. Then Adam optimizer is applied.

Screening and reminding through SMS

The main purpose of our system is to screen the persons who do not wear the face mask properly and remind them through a SMS. The learning architecture identifies whether any input image is without a face mask. If such a person is detected, then a remainder message is sent to their cell phone by using Twilio by recognizing that person through face net. This information is also recorded and sent to the corresponding authority in order to find the frequent defaulter. If proper actions are taken, people would wear the face mask properly and this would help greatly to limit the growth of covid-19.

IV. SIMULATION RESULTS

- The dataset is partitioned into two different classes with nearly 1340 images and 80% is used for training and 20% is used for testing dataset.
- In order to avoid wrong predictions, we created augmented dataset with the images without wearing mask, and we got productive results.
- The developed architecture is trained for 32 epochs because further training results in overfitting on the training data.
- Overfitting makes the model learn the unwanted patterns of the training samples. Hence, training accuracy increases but test accuracy decreases.
- The video stream is used detect whether the person is wearing mask or not, suppose if the person is without mask it will be indicated in red box with the accuracy value else it will be in green color.

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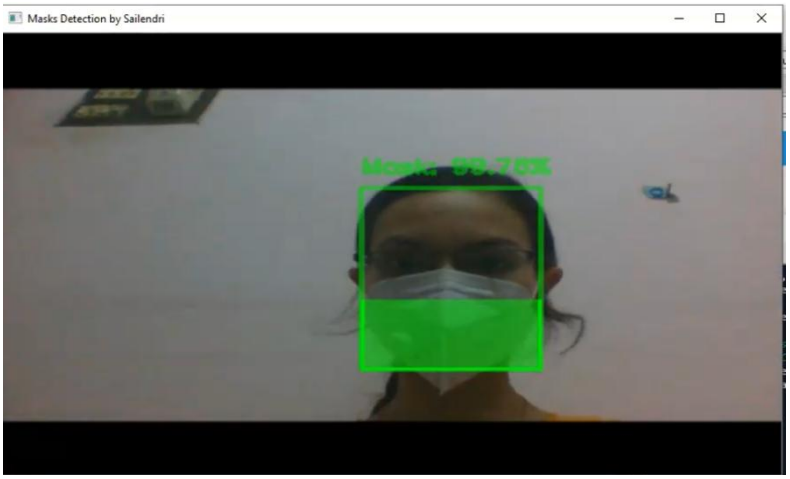

Fig.2.System detecting person with mask

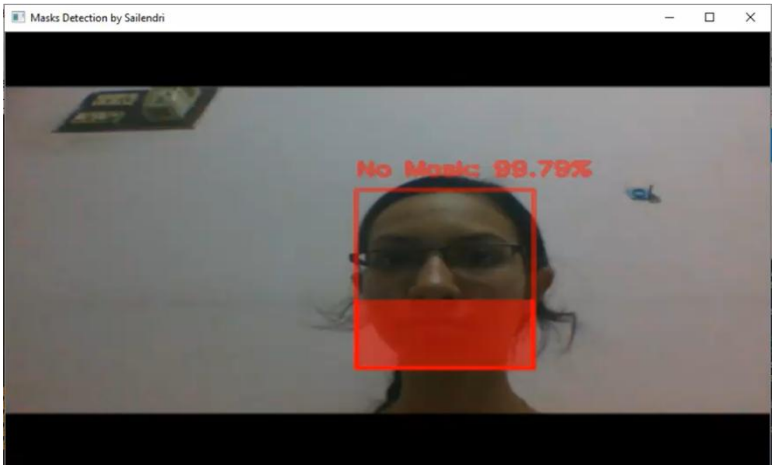

Fig.3.System detecting person without mask

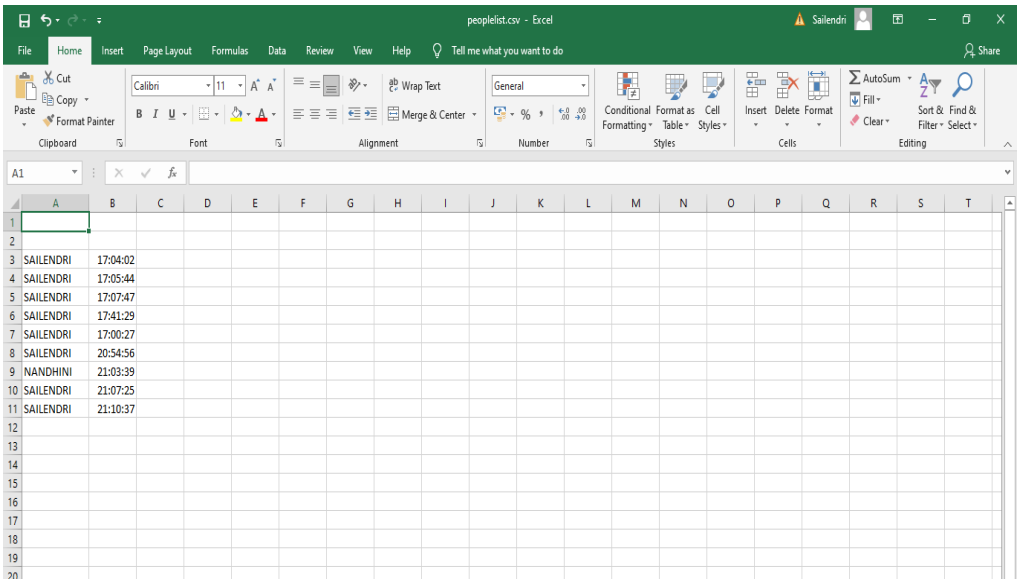

Fig.4.Name of the person is noted.

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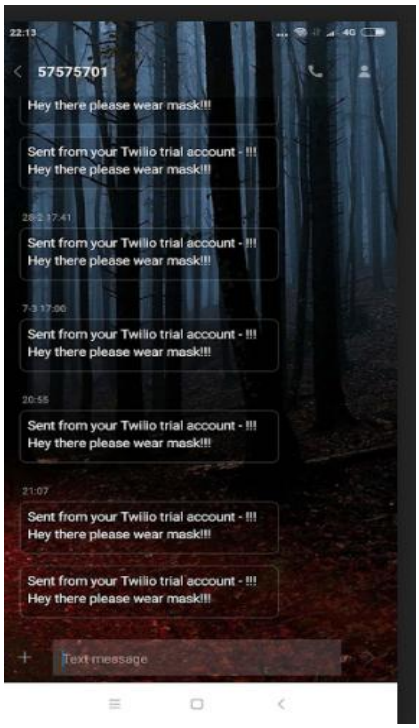

Fig.5.Instant notification is sent to the violator.

V. CONCLUSION AND FUTURE WORK

Deep learning has lots of applications in today's world. We try to incorporate technology in all the fields possible. Similarly, to keep people safe from the spread of corona virus, we implemented this project, with SSD Model and MobilenetV2 architecture, which notifies the people not wearing mask instantly in messenger and also there is a database which stores the ID of the people. The system proposed in this study will act as a valuable tool to strictly impose the use of a facial mask in firms for all people. We tested this model with images and also with real time streaming of videos and the accuracy is also achieved. In future, we will try to add location by using GPS to the database so that if a firm has two or more branches, we can categorize them easily. And also we would like to integrate our work with CCTV cameras for mass screening purposes so that not only in firms, we can also use it in public places. As a result, with the help of these technologies, we can prevent the spread of corona virus and lead a happy life.

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