

Automatic Facial Mask Rule Violation Detection: A Review

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Abstract— As per the concern of COVID-19 spread; there are several precautions through which it can be reduced either following social distancing and wearing facial mask. Facial mask is mandatory to keep away from virus droplets that also help to reduce the positive cases. Facial mask detection is bit challenging for the researchers because it has distinct postures of wearing mask that may correct or incorrect. System is to detect all these postures and declare if it has violations or not. There are various researches have been done in this field but they didn't met the desired accuracy because of partial conditions of wearing masks. This paper intended to review the implemented researches where system suffers somehow. Most of the systems are based on Convolutional neural network and uses precompiled library for detecting facial mask automatically for real time or offline benchmarks.

Keywords— COVID-19, Facial Mask, Convolutional Neural Network, Classifiers, Machine Learning, Image Processing, Pattern Recognition.

I. INTRODUCTION

As per the World Health Organization (WHO) official Circumstance Report – 205, coronavirus 2019 (COVID-19) has universally tainted more than 20 million individuals causing over 0.7million death [1]. People with COVID-19 had a wide extent of side effects and its indications to genuine sickness. Respiratory issues like windedness or trouble in breathing is one of them. Older individuals having lung infection can have genuine difficulties from COVID-19 sickness as they have all the earmarks of being at higher danger [2]. Some human pertain coronaviruses that taint from 229E, HKU1, OC43, and NL63. Prior to crippling people, viruses like 2019-nCoV, SARS-CoV, and MERS-CoV taint creatures and develop to human coronaviruses [3]. People having respiratory issues can wear mask and stay away to protect themselves. Environmental factors of a infected individual can cause contact transmission as drops

conferring viru. To check certain respiratory viral illnesses, including COVID-19, wearing a clinical cover is exceptionally important. The general population ought to know about whether to put on the veil for source control or abhorrence of COVID-19. WHO focuses on clinical mask and respirators for health care assistants [4]. Hence, face cover identification has turned into a significant assignment in present worldwide society. Face mask detection includes in identifying the area of the face and afterward deciding if it has a mask on it or not.



Fig. 1. Face Mask Detection

The issue is generally related to general item location to identify the classes of articles. Face recognition completely manages the cluster of particular pattern of elements for example Face. It has various applications, like auto driving, education, observation, etc. Here the primary test of the assignment is to recognize the face from the picture accurately and afterward distinguish on the off chance that it has a cover on it or not. To perform the observation, the proposed technique ought to recognize a face with the movement of mask. The fast advancement of computer vision has drawn more for worldwide scourge Covid-19 to empower human- computer network and further develop general health administrations. Because of the quick spread of the (Covid- 19), different nations are confronting a significant health emergency. As indicated by the World Health Organization (WHO) a powerful method to shield individuals from Covid-19 is to wear clinical masks in open regions. It is truly challenging to physically screen individuals openly puts and distinguish the face mask in the video which is principally on the grounds that the actual mask goes about as an impediment to the face discovery calculation, in light of the fact that there are no face signs in the mask region. Accordingly, programmed face mask identification framework assists specialists with distinguishing individuals who might be powerless to contaminations illness. [5].

II. RELATED WORKS

A. Related Works

There are numerous researches were completed within side the discipline of automated face mask detection. This paper is intended to review those researches and find out the common challenges with them. The accuracy of the system is often important because correct recognition can better emulate the system with correct classification and recognition. Wei Bu et al. [6] proposed deep learning based calculation for masked face recognition. This calculation depends on a recently planned CNN network system comprises of three CNNs.



Fig. 2. Masked Face Testing Set [6]

They proposed a new dataset called "MASKED FACE dataset" which have 160 pictures for training and 40 pictures for testing. To conquer the overfitting problem due to the inadequate of preparing tests, they pre-train the models with

the extensive FACE dataset, and tweak them with the MASKED FACE. They assess the masked face discovery calculation on the MASKED FACE testing set and it accomplishes extremely acceptable execution. Wang Jian et al. [7] proposed a mask wearing recognition technique based on the PP-YOLO calculation, builds up a mask wearing location informational index MaskData, utilizes the Tweak strategy and the EMA procedure to move learning to the first PP-YOLO, and utilizations measurement to play out the model Pack, lastly get the PP-YOLO-Mask model. The trial results show that the PP-YOLO-Mask model proposed in this paper has a Guide of 86.69%, and has accomplished great location brings about the recognition of mask wearing in open scenes. Contrasted and other standard models, the model in this paper has better exactness and thinking speed. Has a decent application prospect in the counteraction and control of the new crown pestilence. Alok Negi et al. [8] proposed a high level investigation techniques and different methodologies that could engage specialists, researches and the medicals to recognize the perilous COVID-19 and speed it up care systems by proficiently testing huge volumes of examination. The result is being utilized to adequately oversee, compute, figure and screen current contaminated individuals and future possible cases. Along these lines, they proposed CNN and VGG16 based deep learning models to fuse and authorize computer based intelligence based careful steps to recognize the face mask on Mimicked Masked Face Dataset. This strategy is fit for perceiving masked and unmasked faces to assist with observing wellbeing breaks, work with the utilization of face masks, and keep a safe working climate.

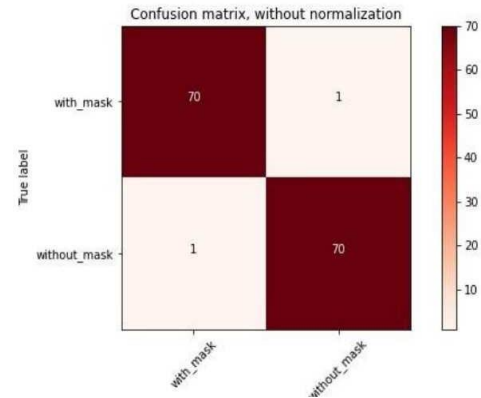


Fig. 3. Validation Set [8]

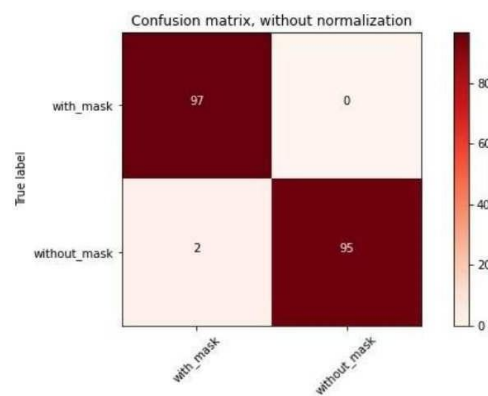


Fig. 4. Test Set [8]

Soniya Sahana Srinivasan et al. [9] proposed an effective resolution for screening social distancing in open regions where it is truly challenging to screen physically. Four unique modules have been produced for individual location, social distancing, face recognition and face mask characterization. The framework performs sensibly well with an exactness of 91.2% and normal F1 score of 90.79% on the marked video dataset with normal expectation season of 7.12 seconds on a 1 second video (50~90 picture outlines), where 5.24 seconds is spent on individual location. It additionally furnishes information increase methods to manage the absence of dataset locally.



Fig. 5. Output [9]

Isunuri B Venkateswarlu et al. [10] proposed a pre-compiled MobileNet with a worldwide pooling block for face mask location. The pre-compiled MobileNet takes a picture and produces a multi-dimensional component map. The worldwide pooling block that has been used in the proposed model changes the component map into an element vector of 64 elements. At long last, the softmax layer performs parallel arrangement utilizing the 64 provisions. They assessed the proposed model on two freely accessible datasets. The proposed model has accomplished close to the higher accuracy on DS1 and DS2 separately. The worldwide pooling block that has been utilized in the proposed model maintains a strategic distance from overfitting the model. Further, the proposed model beats existing models in the quantity of boundaries just as preparing time. Wuttichai Vijitkunsawat et al. [11] proposed the masked face discovery by examination of 3 renowned calculations of AI: KNN, SVM, and MobileNet on various situations.



Fig. 6. Dataset of Masked People [11]

From the trial, it may be seen that the level of the exactness pace of the MobileNet calculation is the most elevated proficiency, with gradual precision as well as the continuous circumstance. Be that as it may, the level of the exactness of all calculations step by step drops when observing real time because of elements like camera quality, enlightenment.



Fig. 7. Dataset of Without Mask [11]

Truong Quang Vinh et al. [12] proposed a face mask detection tool using Yolov3 that utilizes Haar Cascade classifier for classifying the mask and face from various frames. The drawback to Haar cascades is that they will in general be inclined to false positive identifications, require boundary tuning when being applied for surmising/recognition, and just, as a rule, are not as precise as the more "present day" calculations.

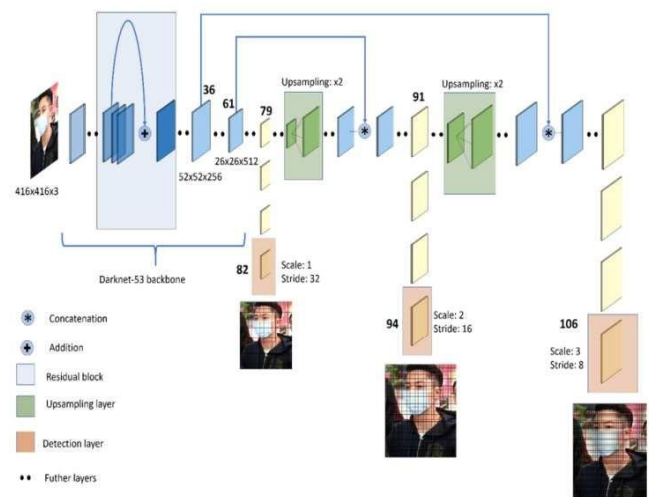


Fig. 8. Yolo Architecture [11]

Mingyuan Xu et al. [13] proposed technique which depends on SSD mask calculation. SSD is Single Shot Multibox Detector. It is a procedure that is utilized to distinguish objects in pictures utilizing a single deep neural network. Fundamentally it utilized for object recognition in a picture. By utilizing a base engineering of VGG-16 Design, SSD is ready to perform other item detectors like YOLO and Quicker R-CNN in both speed and exactness. The design of SSD is given in the figure beneath. Preparing a SSD model

without any preparation will require a ton of information, so here I have imported pretrained loads (Caffe Face Detector Model) utilizing OpenCV. By utilizing the mask name and non_mask mark, the jumping box information from json records is extracted. The faces from a specific picture are extricated and put away in the information list alongside its name for the preparation cycle.

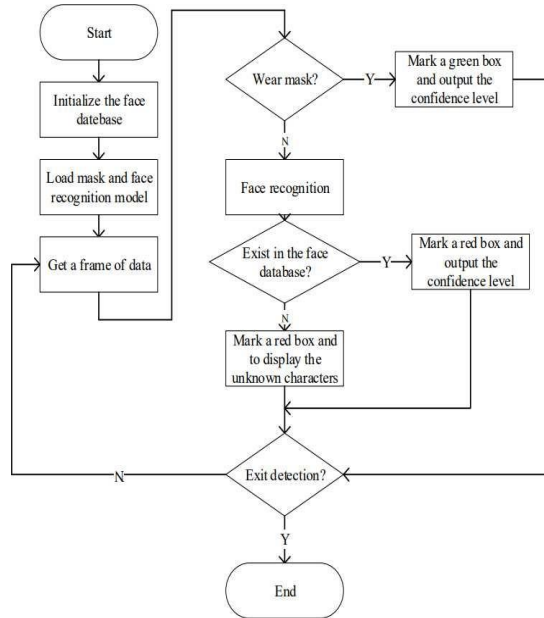


Fig. 9. Simulated electric field [12]

Sohaib Asif et al. [14] proposed an examination that expects to utilize deep learning to consequently identify face masks in recordings. The proposed system consists of two parts. The main part is intended for face location and following utilizing OpenCV and AI, and in the subsequent part, these facial edges are then prepared into our proposed deep exchange learning model MobileNetV2 to distinguish the mask region.

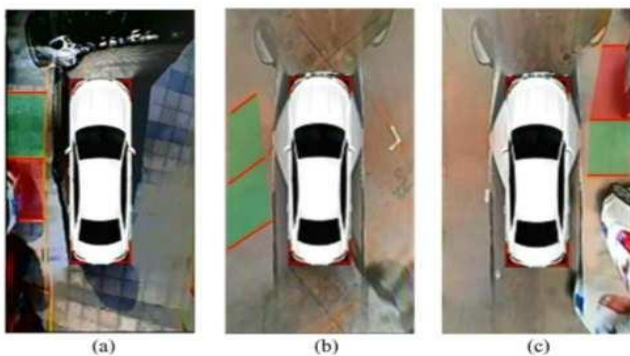


Fig. 10. Experiments Results of Typical Parking Slot. (A) Rectangular Type. (B) Slated Rectangular Type. (C) Open Rectangular Types

The proposed structure was tried on various recordings and pictures utilizing the cell phone camera. The object is to accomplish high-precision ongoing identification and arrangement. Test results show that the work proposed in this paper can adequately perceive face masks with

numerous objectives and give powerful faculty observation. This exploration is valuable for controlling the spread of the virus and forestalling openness to the virus.

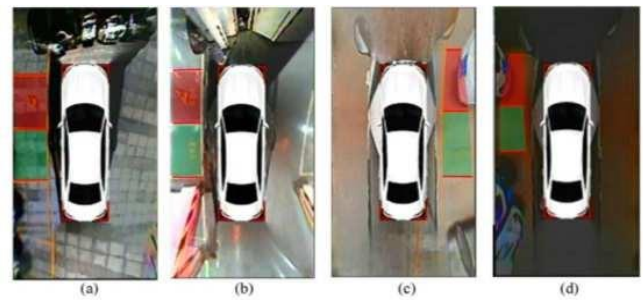


Fig. 11. Experiments Results In Diverse Special Situations. (A) Outdoor Scenes (B) Underground Parking Slots (C) Damaged Parking Slot Markings (D) Variation In Light Intensity.

III. CONCLUSION & FUTURE SCOPE

This paper is effectively assessed a few frameworks which have been implemented till now where there are a few imperfections over there. Most of the system uses machine learning techniques to prepare the framework with different samples. Yet, an enormous dataset can burn-through the huge measure of memory that expands the execution time where it is imperative to convey as prior as conceivable with elevated level of precision. This paper depicts the strategy for detecting facial mask rule violations using image processing tools. So the feature extraction step is sufficient relying upon the area where the face mask is identified. Thus, proper division calculation is required which can be adequately find facial features? There are various researches met the desired accuracy but they are not proficient to detect the mask at each level or situations. System should be more effective that can detect mask at every point whether it is partial or complete. In future a system can be developed that may have good accuracy rate with less false alarm or recognition that acquire less execution time.

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