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# Deep learning-based Face mask detection using YoloV5

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**Abstract:** *Face mask identification has increased quickly after corona emphatic last years for various law enforcement security schemes and other business uses. In the present situation due to Covid-19, the requirement for face mask identification applications, identification of temperature and hand sanitizing is directly in high need for Railway Entrance, in the office Entrance, Airport Entrance, Museums, and Amusement Parks, also in the other Public Places and companies to guarantee safety. The face appears to be growing for others to culminate in a new approach to discovering a new line and suggests defining a face mask. The recommended method for classifying face mask identification using real-time COVID-19 care for human actions. e. This paper is to study an effective method for face mask detection using a deep learning model created by "Yolov5". Finally, we proposed continuous monitoring of human attitudes and store people's records on the server using the in-depth knowledge of the idea and the comparative model developed with a different number of epochs: 20, 50, 100, 300 and 500.*

***Keywords:*** *Covid-19, deep learning, Face mask detection, temperature detection, Convolutional neural network.*

## I. INTRODUCTION

The input mask detection machine is an acquired video, and the result is the identity or discovery of masks from the detected video database. The technique of interpreting the transcripts on faces and instructing them to count them can be very challenging for pathologists because (1) the size and outline of mitotic centers are the same as non-mitotic centers, and (2) a diagnostician can magnify an enormous display of a wide variety of histopathological images. Among these problems, lip detection is a great advantage for detecting the degree of facial development. Methods for computerized detection and segmentation of mitotic cells have been proposed for multispectral histological imaging [1]. This article contains three unique components: classification and segmentation, mitotic cell discovery, and phototype differentiation [2]. The masks and cells

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must be destroyed or disposed of with viable treatments to avoid many diseases through surgeries, radiotherapy, chemotherapy, etc. To prevent the spread of inflamed cells. About 40,000 deaths are expected annually. Early forecasting techniques play a very important role in reducing the cost of lost lifestyles.

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a previously unrecognized evolving virus. The disease causes respiratory distress in more severe cases, accompanied by coughing, fever and respiratory problems. Thousands of daily deaths are emerging internationally through COVID-19. This deadly virus is spreading rapidly worldwide, and more than 1.6 million people are currently affected in 188 countries at the time of writing [3]. Due to the lack of adequate quality care, the first way to deal with a COVID-19 outbreak is to show the site of infection initiation through early assessment, epidemiological investigation, isolation, enhanced social distancing, and quarantine, ban events, and more private hygiene. He carries a medical mask and keeps the rooms well ventilated. Unfortunately, many humans have a regular chance of getting infected, and the scenario won't worsen in the next few days. However, technical responses to address the consequences of the COVID-19 pandemic are increasing. Innovations, the Internet of Things, artificial intelligence and telecom networks have been at the forefront in the following decade, including 4G in Sudan and 5G abroad. Today, it plays a critical role in increasing the network's security response to the COVID-19 pandemic, in line with the World Health Organization (WHO) and the Centers for Disease Control (CDC) [4]. Therefore, the lifespan of the artificial intelligence (AI) resource should help identify COVID-19. In non-moderate cases, extensive strategies have gained extensive experience, and fully accurate and successful detection of COVID-19 has been made. It can also decorate drone-based full-frame capabilities, including capacity estimation and social distance, COVID-19 monitoring, log processing, artificial intelligence (AI), Internet of Things (IoT), thermal imaging and reality. cleaning control.

## II. REVIEW OF LITERATURE

Briefly, we will show the current work applied to the type and continuation of the mask under the next element. There are several methods used to detect face masks. However, to the first level of our knowledge, there may not be an answer that would collectively mask these factors

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to achieve this intent and allow implementation on low-cost IoT devices at the same time.

**Krishan Kumar et al. [2020]** Within the new international coronavirus, multidisciplinary tasks have been included to limit the spread of the epidemic. Interestingly, the AI pool will become part of one's endeavours. This outcome-based method is fully used to monitor, investigate, wait, and focus on existing patients and skilled patients. Developments to show social distancing or hide awareness specifically made headlines. Most of today's superior technologies for face mask reputation are based entirely on in-depth expertise and a selection of facial samples. Almost all people wear masks throughout the coronavirus outbreak on the road to prevent the spread of the COVID-19 virus. Our goal is to form a custom deep mastery model that will allow you to do it right even if you are not a person. Almost everyone wears a mask and looks at the idea of pruning with Keras-Surgeon. Inexperienced figure cutting can be done by reducing the model's size so that it can be smoothly applied and inferred into compact structures.

**Jiang et al. [2020]** Face-show attacks have become a fascinating possibility for maintaining popularity structures, and several Countermeasures have been offered across the past decade. But, most of them are for 2D face performance attacks rather than a 3D face mask. Unlike a real face, 3D masks are usually composed of resin and have an easy ground, which results in differences in the reflected image. Therefore, we recommend a unique detection method to attack the display of 3D face masks with the help of reflection difference modelling based on the intrinsic evaluation of the image. In the suggested approach, the face image is first prepared with the help of natural disintegration to calculate the reflection image. The depth distribution is then drawn from 3 orthogonal levels to symbolize the energy variations in the reflection shots among the real face and the 3D face masks. Comprehensive operations within the 3DMAD database reveal the effectiveness of our suggested era in distinguishing masking from real masks and show that general discovery performance precedes other contemporary technologies.

**Ning et al. [2020]** The top position type is widely used for preprocessing before hearing problems and two modes because face popularity algorithms require an input image of the front face. But under the

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influence of the COVID-19 pandemic, humans have worn masks to protect themselves, prompting most regions to protect themselves. You cannot apply some common algorithms to render the mode type in the new scenario. So this article has included the HGL era to deal with the head mode class by adopting the colourization texture evaluation of the image and the source image. The proposed HGL approach combines the H channel of the HSV shadow region with a face image and a grayscale image and teaches CNN to extract features for classification. Evaluation on the MAFA dataset shows that, compared to algorithms that rely entirely on face point detection and the convolutional neural community, the proposed method achieved better global accuracy (lead accuracy: 90-3, 64%, lateral accuracy: 87.17%).

**Talha Ikram et al. [2020]** COVID-19 is a disease that has negatively affected human health and international daily life, so we must take in-place measures to control the improvement of these types of diseases. Standard operating procedures (SOPs), such as wearing masks and maintaining social distancing, are implemented by health care and government authorities. These SOPs mitigate the improvement of COVID-19. However, they are in circumstances that people do not usually follow. The panels in this survey explore traditional strategies that can use to detect widespread operational violations. These strategies rely in most cases on the creativity and foresight of the notebooks used to detect items and estimate distance. We can also detect fully-knowledge-based strategies that are used to detect items to find SOP violations.

**Meenpal et al. [2019]** Face detection has become an unusual problem in image processing and computer vision. Many new algorithms are designed using convolutional architectures to make the algorithm as valid as possible. These convolutional systems made it possible to extract even pixel recordings. Our goal is to design a binary face classifier that can detect any face on the body regardless of its alignment. We provide a method to grow the correct face segmentation mask for any arbitrary duration entering the image. The technology uses predefined learning weights for the VGG 16 architecture to extract features Starting with an RGB image of any period. Teaching ends with fully convolutional networks to segregate the faces in that image linguistically. The gradual regression of schooling is used even when the binomial entropy is used as the loss

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origin. In addition, the FCN output image is processed to remove unwanted noise, avoid false predictions, if any, and create a subject with fringes on the faces. Moreover, the proposed model also showed serious consequences in recognition of non-frontal faces. Besides, he is also capable of hitting two pairs of face masks on one body. Experiments were performed on the human data set for multiple analyses, obtaining a pixel pitch accuracy of 93.884% for the split face mask.

**Mahore et al. [2018]** Biometric frameworks have changed traditional framework authentication methods. The whole concept of facial popularity is based on the fact that any character has specific natural features. However, these systems are likely to suffer from various types of spoofing attacks. Phishing is a system of deceiving a device by pretending to be a legitimate consumer to gain illegal access. Face verification systems are ideal for counterfeit attacks because they facilitate direct access to facial images. A phishing attack can be classified into two types: 2D and 3D. 2D fake attacks with the help of using a legitimate user photo or video and fake 3D attacks using 3D masks. Here, we present a new method for 3D mask presence detection that relies entirely on face spoofing using descriptors based on frequency and texture. The proposed method extracts sensitive talents that depend, in particular, on the pixel-adjacent binary sample transformed into discrete waves. We evaluate the proposed construction within the publicly available 3D mask attack dataset. Our generation excels at the art.

## III. PROPOSED METHODOLOGY

One of the main protective measures taken by the government and the World Health Organization is to wear a mask when going out with social distancing. Therefore, we developed an image-based version of CNN to determine whether all subjects wore a mask in this proposed work. Also, we have covered the idea of using pruning models with Keras-Surgeon.

### Face Mask Detection

In this proposed approach, We utilized the Python programming language along with the tensor flow framework. And convolutional neural networks (CNN) as deep learning patterns to design an effective network for finding the facemasks images. Our goal is to train a custom CNN model to detect a person is wearing a mask or not.

Our version consists of the following subsystems: mask detection subsystem

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import temperature records to the server. First, whatever we try, the entrance build must pass a non-contact temperature test. For this reason, we rely on the Esp8266 IR thermometer (with MLX906148) or digital thermal sensor (AMG88339, for example). In addition, it uses the ESP8266 WiFi module to communicate with the partial servers when using the MQTT protocol. If that person's temperature is higher than usual, the door will be locked to ensure that the character doesn't try to enter the building any further. Otherwise, if the passenger temperature is average, he will sign Esp to open the door. Guests then proceed to the next verification step: mask discovery. For this task, an innovative and optical computer subsystem is based entirely on a digital camera in most cases. If the passenger is not wearing a mask or does not cover his nose, the Esp will not open the door. Otherwise, if they wanted person is wearing a mask, the door can be opened.

The main requirement to carry out this task is the use of the Python programming language along with Deep Proficiency, Machine Proficiency and Arduino C, Imaginative and Prophetic Computer, and Python Libraries. The architecture includes Mobile Net as the backbone and can be used for episodic and hypercomputation possibilities. We use CNN algorithm in our proposed system.

**Implementation:**

We have four modules

**1. Datasets Collecting**: We obtain the mask and non-mask datasets. However, we can get a high resolution depending on the accumulation of the number of images.

**2. Datasets Extracting**: We can extract the mask v2 cellular internet usage characteristics and without a mask set.

**3. Models Training**: We will train the the model using open cv,keras (python library).

**4. Facemask Detection**: We can get stuck in the pre-processing of the images. Moreover, we detect it via live video. If humans are wearing masks, they will be allowed to, and if they are not wearing masks, a bell will ring for them to wear masks to prevent the transmission of viruses.

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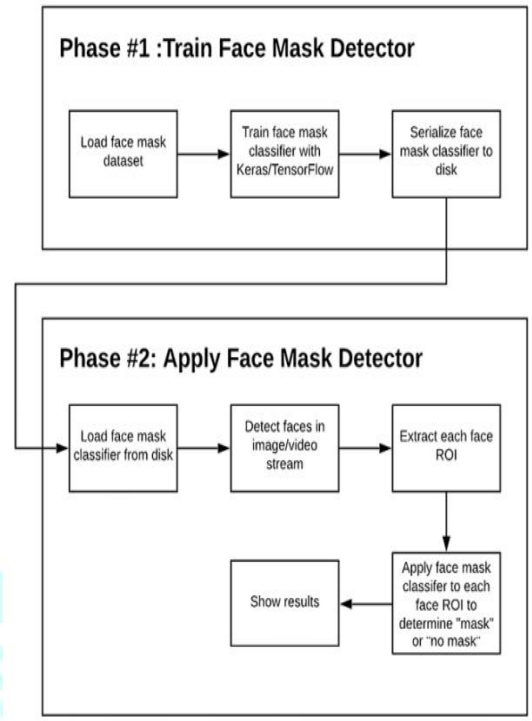


**Fig.1** work procedure for proposed work

**Contactless Temperature Detection**

The MLX90614 sensor is a non-touch infrared temperature sensor that detects temperatures from -20°C to 120°C. It can communicate with the microcontroller through the I2C interface. Being an I2C tool, you need to contact SDA.

**BLOCK DIAGRAM**

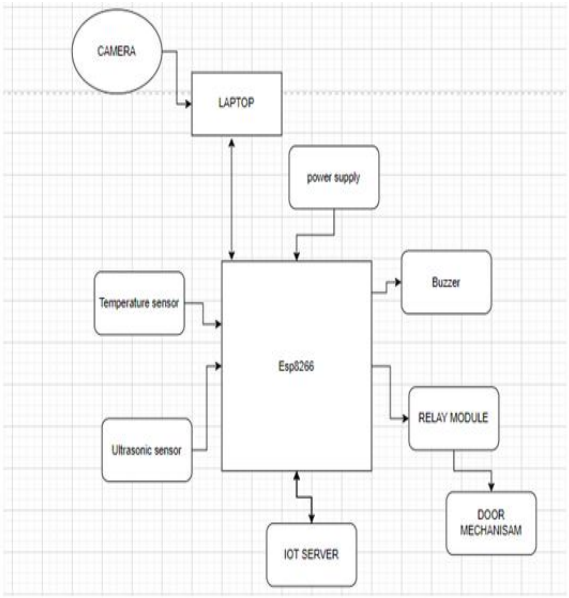


**Fig.2** Block diagram for proposed work

Manual monitoring can be very difficult for officers to check whether or not people are wearing masks. So in our approach, we use a webcam to hit human faces and prevent the transmission of viruses. It is highly accurate and fast, and we can keep people out of our focus. In addition, it provides a bell to put on the mask.

**DATASET USED**

There are only a few data sets available for face mask detection. Most of them are created artificially, which does not constitute the true international standard as it should be, or the data set is riddled with noise and incorrect labels. Therefore, defining the correct dataset that could satisfactorily function for the SSDMNV2 model took some effort. The dataset used in the educational model is transformed in

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a certain way into a set of several open-source datasets and images, including data from Mikolaj Witkowski's Kaggle Mask dataset and the dataset from Prajna Bhandary available at PyImageSearch. In addition, data regarding the use of the presented data set were collected with the help of the Masked Face Resolution application and application data set (Wang et al., 2020). The Kaggle dataset consists of images of people wearing medical masks and XML files containing their descriptions and masks. This data set contains a total of 678 images. The other prosthetic mask dataset of Prajna Bhandary was taken from PyImageSearch. The dataset includes 1,376 images divided into two lessons with an athletic mask, 690 photographs without a mask, and 686 photographs.

The synthetic dataset generated by Prajna Bhandary took generic images of faces and performed facial contours. Facial contours have made it possible to identify facial features such as the eyes, eyebrows, nose, mouth, and jaw. This used an artificial method to create a dataset by including masks as men or women without masks. However, the footage is no longer reused in the artificial ageing process. The use of samples without masks posed a threat that the model would become highly skewed. In addition, it has become dangerous to use photographs from data sets from various other resources. Therefore, they included a data set consisting of compelling and unconvincing images of humans, which compensated for error correction.

## IV. EXPERMENTS AND RESULTS

The suggested method is tested with a Python simulation tool and also, compared to some other current methodologies. The popularity of face masks is an essential technology in computer evaluation, visualization, prediction, authentication and image verification. The machine advises knowing the set of each masked and unmasked image should start with training. Similarly, the machine can be processed down to segmentation, feature extraction, and diploma type. In this suggested CNN technique, the accuracy of mask recognitions is compared by three special classifiers: decision tree, support vector machine, and neural network. Among most of these classifiers, the CNN classifier predicts a more secure hyper-level; it separates all trait vectors linearly by projecting them into a region of better dimensions. Decision tree classifier that computes the final results of the unknown sample, with the help of evaluating the distance between the unknown point and its nearest neighbor factor. Compared with

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traditional class techniques, CNN reduces experimental training errors and generalization errors by defining the most significant margin between the isolation of super-planes. Finally, the CNN classifier provides better results compared to two other strategies.

**Fig.3** Sample image dataset with mask people

**Fig.4** Sample image dataset without mask people

The training phase image includes 678 images that are used for predict the dataset in real-time. And all images are obtained from "Prajna Bhandary" from PyImageSearch. Figure 5 indicates several test and training images utilized to identify that mask wear or not. Finally, figure 6 shows the proposed device for mask detection.

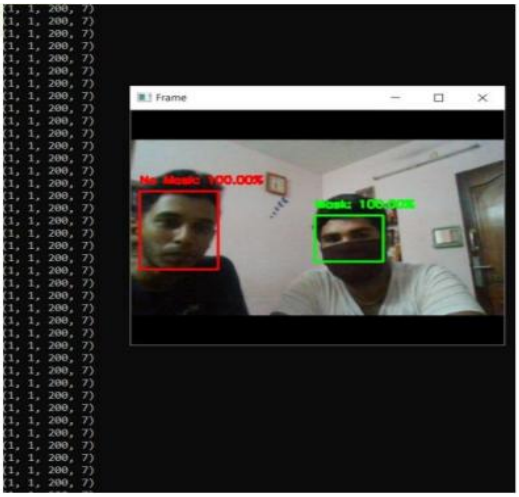


**Fig.5** Results of detected of face mask

Table.1 Performance analysis

| Approach | Accuracy (%) | Running Time(s) |
|---|---|---|
| Proposed Method CNN | 91.11 | 7.24 |
| Support vector machine | 89.4 | 18.3 |
| Neural network | 86.02 | 26.14 |
| Decision tree | 83.35 | 33.10 |

The table.1 shows the performance analysis of proposed model of CNN with

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the comparison of various existed algorithms.

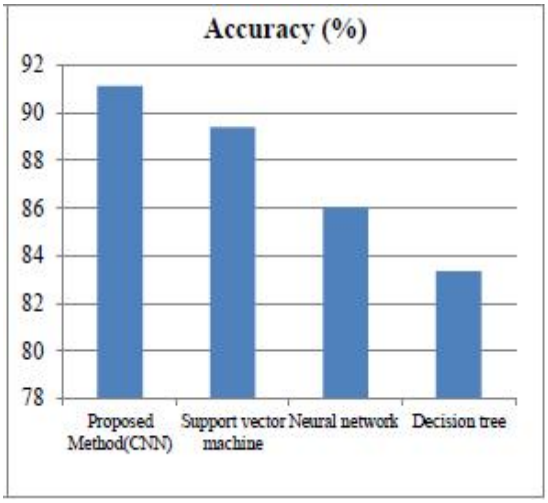


**Fig.6** Comparison of various method's Accuracy

As shown in figure 6, the proposed method's accuracy is compared with the traditional methods of SVM, NN, DT. With the analysis of the chart, we can say that the proposed method got better accuracy than previous methods.

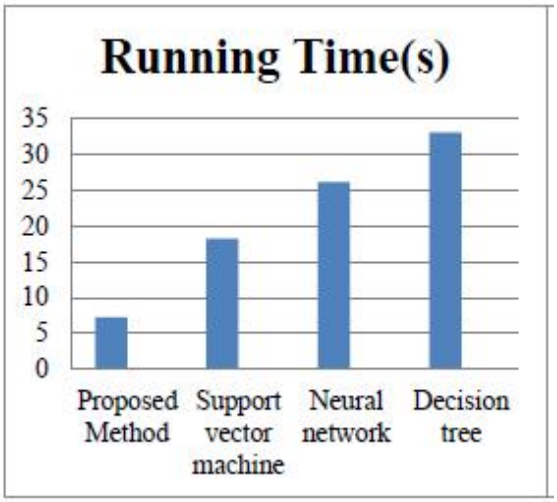


**Fig.7** Comparison of various method's Running Time (s)

As shown in figure 6, the proposed method's running time is compared with the traditional methods of SVM, NN, and DT. With the analysis of the chart, we can say that the proposed method got better accuracy than previous methods

## V. CONLUSION

We have effectively implemented an operational prototype of the face mask and body temperature sensor in this company. This company can be used in places where there are mass gatherings, such as universities, schools, workplaces, stores, etc. The system first detects if the character is wearing a mask and sends the records to the microcontroller. The non-contact temperature sensor reads the body temperature of a man or woman and, when checked, opens the barrier arm and allows the man or woman to enter. With the help of this challenge, the automated response is implemented; Therefore, no human needs to view COVID-19 protocols. The accuracy of face mask detection can be completed by marking the unit with a larger image dataset. Ultimately, detecting the temperature of the mask and frame can help us reduce the massive accumulation of people in one place without a mask, reducing the possibility of ignition. The accuracy (%) and execution time of the proposed version of CNN are compared

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with the current vector utility, neural network, and selection tree methods. Experimental effects showed that the proposed method had better overall performance compared to the current algorithms.

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