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# A Review on Face Mask Detection Methods and Techniques

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**ABSTRACT:** To protect ourselves from infectious diseases caused by viruses, we must now wear a mask. We are currently dealing with a pandemic owing to the COVID-19 virus. It has a negative impact on the lives of living creatures, particularly humans. The entire world seemed to be stuck in its routine. Because of the lack of direct lessons, educational institutions are severely affected by the pandemic crisis. To avoid this, they are willing to have classes with some guidelines in place, such as social distancing, masking, and hand sanitization. Several government agencies are aiming to make wearing a face mask mandatory; this process can be aided by employing AI and image processing techniques to detect face masks. Machine learning, Deep learning, and a variety of other methodologies are used in the approaches outlined in the article for face and mask detection.

**KEYWORDS:** Face mask detection, AI, Image processing techniques, Machine learning, Deep learning.

## I. INTRODUCTION

COVID-19, a disease caused by a novel corona virus, has claimed many lives around the world, and the only way to avoid it is to keep physical distance and wear a face mask in public places. College campuses sent students home for a year before places of worship, restaurants, and stores closed in reaction to the corona virus pandemic, and some schools had begun to conduct online classes and exams. However, it is not as beneficial as physical education [1].

Furthermore, even persons who have no symptoms can spread the infection, making it difficult to prevent infection. Wearing a mask and practicing social distancing, as recommended by the World Health Organization (WHO), can help reduce illness spread. Many studies have shown that wearing a mask helps reduce the spread of viruses. Wearing a N95 mask is 91% efficient in stopping viral transmission, while surgical masks are only 68 percent effective. Wearing a mask can help you from getting sick. As a result, the use of masks and hand sanitizers has been shown to be useful in preventing illness spread. As a result, a face mask detection system is necessary, which will inform people and assist in pandemic prevention [11].

### 1. Literature Survey/ Techniques for Face Mask Detection

K. Nithiyasreea and T. Kavithab [1] provide a deep learning-based face mask recognition system based on the ResNet50 CNN architecture, as well as a list of pupils who did not wear the mask in the classroom. For face mask recognition, the model uses live footage from the classroom camera, which obstructs COVID19 transmission. The suggested deep learning-based face mask identification system can be linked to a student database in order to obtain contact information. The produced students list can then be compared to identify the student who should be penalized for not wearing the mask in class. Retina Face Mask, the first high-performance single stage face mask detector, was proposed by Xinqi Fan and Mingjie Jiang [2]. To begin, we created a new dataset incorporating these annotations to address the problem that previous studies did not distinguish between correct and incorrect mask wearing situations. Second, a context attention module was developed to focus on learning discriminating features linked with wearing a face mask. Third, we applied what we learned from the face detection challenge to other problems, inspired by how humans enhance their abilities by doing so.

Toshanal Meenpal et al. [3] create a binary face classifier that can recognize each face in the frame, regardless of its alignment. We offer a method for creating accurate face segmentation masks from any image of any size. For feature extraction, the approach starts with an RGB image of any size and employs Predefined Training Weights of VGG – 16 Architecture. Fully Convolution Networks are used in the training to semantically segment out the faces in the image. The loss function is Binomial Cross Entropy, and the training method is Gradient Descent. Furthermore, the FCN's output image is processed to remove unnecessary noise, avoid any incorrect predictions, and create a bounding box



around the faces. The Properly Wearing Masked Face Detection Dataset (PWMFD) was proposed by Xinbei Jiang et al. [4], which includes 9205 photos of mask-wearing samples divided into three groups. Squeeze and Excitation (SE)-YOLOv3, a mask detector with roughly balanced effectiveness and efficiency, was also proposed. We introduced the attention method into Darknet53 by introducing the SE block to get channel relationships, allowing the network to focus more on the important feature. To increase the stability of bounding box regression, we used GIoUloss, which can better express the spatial difference between predicted and ground truth boxes. Table 7 provides short summary of reviewed papers.

Table 7 short summary of reviewed papers

Author	Journal	Method	Result
G K Jakir Hussain et al. [5]	Journal of Physics	Support Vector Machine and a Symbolic Classifier	The project is developed as a prototype to monitor temperature measurement and to detect mask for the people
Kaihan Lin et al. [6]	Hindawi	R-CNN	Experimental results with self-built face dataset as well as public available datasets have verified that our proposed G-Mask method achieves promising performance.
Safa Teboulbi et al. [7]	Hindawi	AI	The system performs with F1-score of 99%, sensitivity of 99%, specificity of 99%, and an accuracy of 100%
Shanmughapriya M et al. [8]	Ilkogretim	the GloU loss method	The proposed algorithm can be used in real time over a video to detect people with incorrect face masks
Apurva Rajkumar Laddha, K.K. Chhajed [9]	International Journal of Research in Engineering and Science	CNN	The accuracy and decision making is very high in CNN compared to others
Saleha Maryam et al. [10]	International Conference on IoT Based Control Networks and Intelligent Systems	Mobilenet Mask detection technique	The validation of more than 770 sample are having an accuracy of 93% whereas 276 validation samples attains 100%
Hruthik S. Upendra et al. [11]	International Conference on Emerging Technologies: AI, IoT, and CPS for Science & Technology Applications	Haar-Cascade algorithm and OpenCV library classifiers	The results show that the trained model is 98% accurate in face mask detection

## II. PROPOSED SYSTEM

We propose with twin objective of creating a Binary face classifier which can detect faces in any orientation irrespective of alignment and train it in an appropriate neural network to get accurate results. The model requires inputting an RGB image of any arbitrary size to the model. The model's basic function is feature extraction and class prediction. The output of the model is a feature vector which is optimized using Gradient descent and the loss function used is Binomial Cross Entropy. The feature extraction and prediction is performed using pre-defined training weights of VGG 16 architecture. The basic VGG-16 architecture is depicted in Figure 1. Our proposed model consists of a total of 17 convolutional layers and 5 Max pooling layers. The initial image size which is fed to the model is  $224 \times 224 \times 3$ . As the

image is processed through the layers for feature extraction its passed through convolutional layers and max pooling layers.

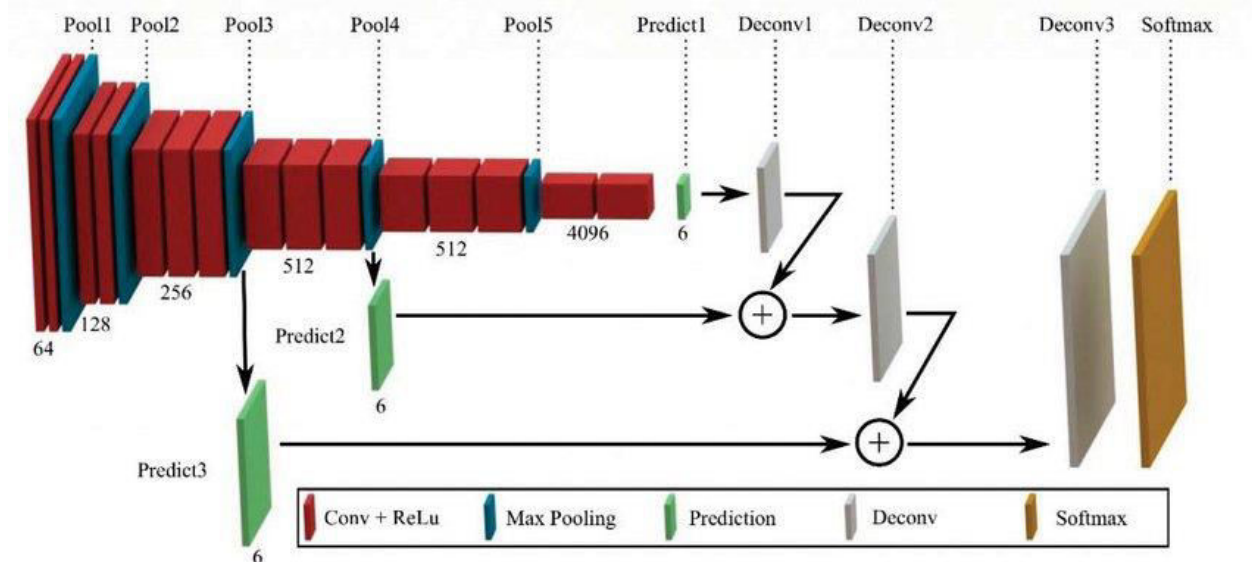


Figure 1. The complete architecture of Fully Convolutional Network used generating segmentation masks.

### III. FUTURE SCOPE

The developed system can detect the live video streams but does not keep a record. Unlike the CCTV camera footage the admin can not rewind, play or pause it. As whenever a strict system is imposed people always try to break it. Hence when a person is detected with no mask, the head of the organization can be notified via mail that so and so person entered without mask. The proposed system can be integrated with databases of respective organizations to keep a record of the person who entered without mask. With more complex functions a screenshot of the person's face can also be attached to keep it as a proof.

### IV. CONCLUSION

We addressed some research articles on facial mask detection in this paper. Mask detection is a difficult task nowadays, as we all know. Facial Mask Detection is utilised in a variety of applications, including preventing the transmission of the Corona Virus, tracking and identifying criminals, and anti-spoofing. Each of these articles employs a different set of algorithms, methodologies, and approaches, but the end goal is the same: to detect a face, facial features such as eyes, nose, and brows, and to determine whether or not a person's face is hidden behind a mask.

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