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Survey on Face Detection and Recognition in an Unconstrained (noise) Environment

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Abstract
The coronavirus pandemic in 2020 caused severe injury to many people, which led to the imposition of wearing a mask in all public places to limit the spread of the virus among individuals because it is transmitted through the saliva of the infected person. Because of constantly wearing the mask, it has become difficult to identify people because the mask covers half the face, so this aspect has taken on great importance for many researchers using deep learning to facilitate the identification of people while wearing the mask using YOLOv5 and CNN algorithms. In this research paper, we present the results of previous research conducted in the past few years.
Keywords: COVID-19, mask in face detection, CNN, Yolo v5, Deep learning

1. Introduction

These days, deep machine learning methods are useful in just about any field. where it has already been successfully used to identify human faces. In December of this year, the first human case of coronavirus infection was reported. Since then, there has been a global pandemic caused by COVID-19 [1]. The world is teeming with humanity. The pandemic has put the entire world in a dangerous position. Many people are exposed to disease and misery every day. There were roughly 16,207,130 contaminated cases and 648,513 deaths reported at the time of publication [2]. This number is steadily climbing. The World Health Organization (WHO) reports that fever and a dry cough are the most typical symptoms of coronavirus infection. weakness, nausea, vomiting, and loss of smell and taste [3]. The use of face masks in public areas has been imposed by many regulatory authorities, and other countries have instituted COVID-19 limitations like a national lockdown. Restricting movement, restricting public spaces, isolating people physically, and sealing off borders are all options. When using public transit or going to a sporting event, you will inevitably have a lot of interactions

with strangers. Public spaces, commercial districts, and workplaces However, it took some time for people to get used to wearing face masks routinely for a variety of reasons, such as the wide variety of masks available and the varying difficulty of overcoming various barriers. It's important to strike a balance between the precision of various models or errors, the requirements of deployment, and orientation. The detection model can be viewed and published on machines with low-resolution photos and faces and no real data collection. This research set out to do a complete analysis of the many AI models that have been developed to recognize face masks. [4].

Mask in Face System

- Face mask detection refers to detecting whether a person is wearing a mask or not by detecting the face. In fact, the problem is reverse engineering face detection, where the face is detected using different machine learning or deep learning algorithms for the purposes of security, authentication, and surveillance.
- With the spread of the coronavirus pandemic, it has become necessary and obligatory to wear a mask, and because wearing a mask makes most of the features of the face disappear, it has become necessary to work on the face detection systems that you want to wear as a mask in terms of security and in terms of the development of information technology, because face detection systems do not need to touch devices but rather just look at the system, thus reducing contact and the spread of the epidemic. As a result of what was mentioned in terms of security (distinguishing masked faces) and in terms of health (reducing contact and reducing the spread of the corona

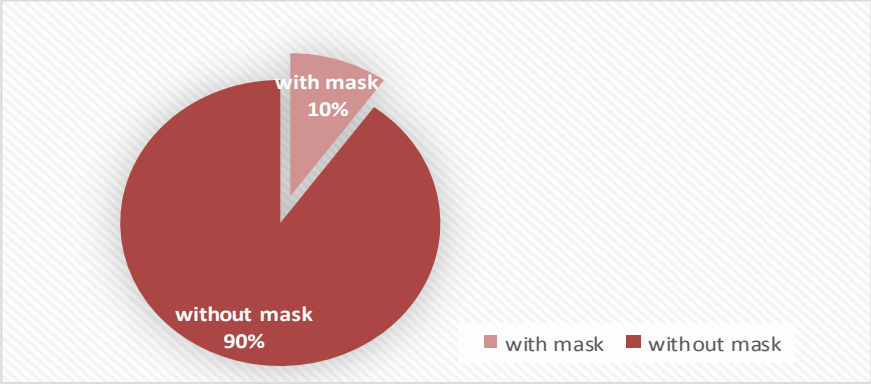

Figure 1: this show people not wearing mask high risk (90%) and people wearing mask slaw (10%)

2. Methods

This study follows the guidelines for conducting a literature review using three digital databases: IEEE Xplore, Science Direct, and Scopus. Science Direct is a world-renowned science and technology magazine available for one year. updated research papers in computer science, electronic engineering, engineering, and computer technology. The applications can be found in Medical Applications at IEEE Explore. Scopus is a reliable supplier in various fields, including medicine, health, science, technology, and engineering. The results of this literature review can help reveal the faces of people, and this is useful in increasing security for government institutions to facilitate access to wanted persons and to determine how to do so.

3. Search Strategy

A comprehensive literature search was performed in the three included databases that were published from 2011 to 2021. These indicators. They were selected because they provided adequate coverage of studies related to this research, considering how many there are. Methods for detecting faces and developing them Under the concepts of artificial intelligence, machine learning, and deep learning, this study was presented and conducted. a logical search strategy that uses various keywords related to the pervasive "face detection" and keywords related to detection, diagnosis, and classification of the face. These detection methods are used to improve research in many artificial intelligence systems, machine learning systems, and application studies of face detection.

4. Related Work

As of January 20, 2021, the uncontrollable coronavirus disease 2019 (COVID-19) had spread to 213 countries and territories worldwide, as well as two international conveyances, resulting in 96.1 million confirmed cases and 2.06 million deaths worldwide. The absence of resistance and a need for dynamic medicinal specialists. The susceptibility of the people was built up against COVID-19. This was classified as a pandemic by the World Health Organization (WHO)[7]. The only way to reduce the risk of the virus corona is to wear a mask. It has become necessary and obligatory to wear a mask; because of it, most facial features disappear. As a result, it has become necessary to work on the face detection systems that you want to wear as a mask in terms of security and terms of the development of information technology because face detection systems do not need to touch devices but rather look at the system, thus reducing contact and the spread of the

epidemic[8]. In this study, we look at past research that shows how important deep machine learning is for finding people wearing masks to protect themselves from diseases like the Coronavirus.

S. Liu and S. Sos This research study uses hand-crafted and deep learning (YOLOv3 and CNNs) features and SVM classifiers to present novel artificial intelligence tools. Computer simulations on five different face mask datasets (Real-World Masked Face Dataset (RMFD), Simulated Masked Face Dataset (SMFD), Medical Mask Dataset (MMD), Labeled Faces in the Wild (LFW)) and the proposed Artificially simulated masked face dataset (ASMFD) show that the proposed method is comparable to or better than traditional face mask recognition techniques in many cases.The proposed system may generate anonymized statistical data. It can assist agencies in predicting possible COVID-19 epidemics[6].

- Deep learning, OpenCV, Tenser Flow, and Keras are used in this paper by S. Shivaprasad. The employment of masks aided face detection as part of a study technique. With the help of this technology, safety is maintained. Face detection was performed using the MobileNetV2 and CNN frameworks. The precision of the approach. This study's F1-score is 0.92, whereas the one used is 0.96. The data was gathered from a few different sources. Various scientists and sources can use it to develop more advanced models, such as face recognition, facial patterns, and facial features for detection. The accuracy result for the mask face dataset (Real-World Masked Face Dataset (RMFD)) is 0.9896[9].
- The deep learning model for face mask identification is studied and developed in this study by J. Ieamsaard, S.N. Charoensook, et al. The YoloV5 uses five distinct numbers of epochs to train the model. Compared to the 86 photos examined, the deep learning model for face mask detection with 300 epochs performed the best, with an accuracy of 96.5 per cent and the highest precision and recall[4].
- A. Chavda presented in this research how to create a Deep Learning-based system that detects instances of improper use of face masks. This system uses a dual-stage Convolutional Neural Network (CNN) architecture to recognize masked and unmasked faces. The first stage uses a pre-trained Retina Face model for robust face detection. Faces were masked and unmasked to create an unbiased dataset. On the produced dataset, the second stage involves training three distinct lightweight Face Mask Classifier models, with the NAS Net Mobile-based model being chosen for categorizing faces as masked or

non-masked based on performance.[10].

The table below explains Related Work

Table (1): Related Work

RE	Author	YEAR	METHODS	DATASET	RESULT
1	S. Shiva Prasad	2021	CNN, Tensor-flow, open cv with keras	Kaggle dataset	Accuracy 0.96% And the F1-score is 0.92
2	S. Liu &S. Sos	2021	YOLOv3, CNN, SVM	RMFD, SMFD, MMD, ASMFD	accuracy 92.64% IN RMFD
3	Prathmesh Deval	2021	CNN, OpenCV	Kaggle dataset	
4	Jansi Rani sella	2021	SSD, CNN	A mixture 4 datasets was used from Kaggle	Accuracy f 96% - 99%
5	R. Tanwar .et al	2022	SVM, YOLO, LFW, SSDMNV2	RMFD	SVM = 99.64%. SSDMNV2 = 92.64% YOLO = 98.7% LFW=100%
6	S. Hao .et al	2022	a state-of-the-art	RMFD	Accuracy=98.23%
7	J. Ieamsaard, S.N. Charoensook, S.& Yammen,	2021	YOLO V5 CNN	The 853 images from the face mask dataset were divided into three groups: 682 images for model training, 85 images for result validation, and 86 images for model testing	Accuracy= 96.5%

8	Guanhao yang	2020	Deep learning, YOLO V5	AIZOOT learns. Face Mask Detection	Accuracy=97%
9	Lee, Won, & Hong	2020	CNN	ISLRVC2012, CVPR2019	accuracy 76.3% to 82.78%
10	Agarap	2018	CNN-SVM		
11	Galea & Farrugia	2019	Deep convolution neutral network (DCNN)	VGG Face, PRIP-HDC, MEDS-II.	error rate of 80.7 to 32.5 in real world forensic images.
12	Sunil Singh, Umang Ahuja,	2021	YOLO v3 FASTER R-CNN	MAFA, WIDER FACE	Accuracy =97.0%
13	C.Song and S. Ji	2020	SN-LF	CASIA-Web-face and Yale-B	accuracy is 94.23 in iterations 3000 in data set Yale-B

5. Motivation

Due to the enormous impact of the coronavirus on all countries and all people, it has become necessary to identify people while wearing the mask to enable the authorities to reach the people who want justice. Areas of research in artificial intelligence, such as ML and applications based on deep learning techniques, have been rapidly developing to this point. As a result, this section explains why studies have been conducted on face detection while wearing a mask. Machine learning to detect a face while wearing mask Diagnostic systems are effective and can stop the spread of mask wear among unknown or wanted people. Research can help determine the optimal model to reduce. The effect of wearing a mask and reaching a high level of accuracy in identifying the shapes of people while wearing the mask.

6. Conclusion

We conclude that the challenge of wearing a mask on your face is one of the most difficult, as about half of the face is missing, leaving only the eyes and forehead. From a security point of view, it is difficult to distinguish a face, and most detection methods rely on contact, such as a fingerprint or a vein, which is dangerous to touch from an epidemiological point of view. This problem was concluded based on research conducted between 2015 and 2022. Our research presents previous studies in this field to be able to access

and display the strengths and weaknesses of all models and to enable us to improve work on these models using deep machine learning algorithms that have proven merit and effectiveness in the detection of people while wearing the mask during the past years.

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اكتشاف الوجه والتعرف عليه في بيئة غير مقيدة (ضوضاء)

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مستخلص البحث:
تسبب جائحة فيروس كورونا في عام 2020 في إصابة الكثير من الأشخاص بإصابات بالغة ، مما أدى إلى فرض ارتداء كمامة في جميع الأماكن العامة للحد من انتشار الفيروس بين الأفراد لأنه ينتقل عن طريق لعاب الشخص المصاب. بسبب ارتداء القناع باستمرار ، أصبح من الصعب التعرف على الأشخاص لأن القناع يغطي نصف الوجه ، لذا فقد أخذ هذا الجانب أهمية كبيرة من قبل العديد من الباحثين الذين يستخدمون التعلم العميق لتسهيل التعرف على الأشخاص أثناء ارتداء القناع من خلال استخدام خوارزميات YOLOv5 و CNN. في هذه الورقة البحثية ، نقدم نتائج البحوث السابقة التي أجريت في السنوات الماضية.