

A SURVEY ON FACE MASK DETECTION

Sharada kore

Faculty,BVCOW, Pune, India

Poonam Pise

Student Of Electronics and
Telecommunications

BVCOEW, Pune, India

Prajakta Thakare

Student Of Electronics and
Telecommunications

BVCOEW, Pune, India

Janhvi Morey

Student of Electronics and

Telecommunications

BVCOEW, Pune, India

Abstract— This paper presents a detailed survey on face mask detection systems. This paper attempts to develop a simple and effective model for real-time monitoring. The paper gives a detailed survey on face mask detection system. The different types of methods used for the system, software tools used, their outcomes and limitations. The aim of this paper is to get the exact knowledge about what innovation has been done till now and what can be done in future .It gives the direction to the future researchers to do further work on it or give some innovative idea on it.

Keywords—Face Mask Detection, Face Mask Detection System using ML/DL.

I. INTRODUCTION

In current times, after the rapid expansion and spread of the COVID-19 outbreak globally, people have experienced severe disruption to their daily lives. One idea to manage the outbreak is to enforce people to wear a face mask in public places. Therefore, automated and efficient face mask detection methods are essential for such enforcement.

Since the first case was identified by COVID-19 in 2019, the coronavirus disease spread quickly and caused the outbreak all over the world in 2020.As the COVID-19(Coronavirus) pandemic continues to spread, most of the world population has suffered as a result. 258 million confirmed cases of COVID-19 cases and 5,148,221 deaths worldwide. Therefore, people should wear face masks and keep a social distance to avoid viral spread of disease. We surveyed an effective and efficient computer vision strategy intends to develop a real-time application that monitors individuals publicly, whether they are wearing face masks or not. Face mask detection has a range of case applications, from face mask recognition to facial movements, where the latter is required to show the face with extremely high accuracy. As machine learning algorithms progress rapidly, the threats posed by face mask detection technology still seem effectively handled. This innovation is rapidly increasing, as it is used to recognize faces in images and in real-time video feeds. In this paper Section 1 provides the introduction of a complete survey on different face mask detection systems. Section 2 provides complete knowledge of different methods used to detect the face mask. Section 3 provides information about the different existing methods. Section 4 provides information about the different software tools which are used to detect the Face Mask. Section 5 provides guideline to the researches for future work in the field of face mask detection using different

technologies for their research work and Section 6 concludes the existing work done in the field of face mask detection.

II. LITERATURE SURVEY

Sr.no	Year	Author' s name	Title	Outcomes	Limitations
1	2019	Meenpal.T,Balakrishnan.A.,& Verma.A	Face Mask Detection using Semantic Segmentation	Recognize the face by segmentation and detection using Models. The Proposed network can detect non frontal faces and multiple faces from a single image.	It detects the multiple faces in a single Frame in pixels but is not able to detect the mask covered on the face.
2	2021	Ms. R. Suganthalakshmi A. Hafeeza, P. Abinaya, A.Ganga Devi	Covid-19 facemask detection with deep learning and computer vision .	The system comprises Mobile Net as the spine which can be very well utilized for high and low calculation situations.in order to extract more robust features,learning is used to gain weights from a similar task face detection ,which is trained on large datasets.	It will detect only live time faces and will not detect stored data .
3	2020	Mohmed Loey,Guasekaran Manogaran,Mohamed Hamed N Taha,Nour Eldeen M.Khalifa	Fighting against COVID-19: A novel deep learning model based on YOLO-12 with ResNet-50 for medical face mask detection	The target of this paper is to comment on and confine the clinical face mask objects, all things considered, pictures. Wearing a clinical face mask in open territories, ensure individuals from COVID-19 transmission among them.	It is intended to distinguish a kind of masked faces in picture and video based on deep learning models.
4	2020	Adithya K1, Jismi Babu	A Review on Face Mask Detection using Convolutional Neural Network	Essentially convolutional neural network technique is utilized quickly. The precision and decision making are exceptionally high in CNN contrasted with others.	Facial mask detection and unmasked face detection accuracy provided high variations
5	2022	Bingshu Wang,Jianbin Zheng,C.L. Philip Chen	Masked Facial Detection Methods and Datasets for Fighting Against COVID-19	Detect the Face by using Masked Facial Datasets and Deep learning Models	Variation of Image Resolution,Lacking of model size,Insufficiency of uniform evaluation for methods.
6.	2022	Dostdar Hussain, Muhammad Ismail, Israr Hussain, Roobaca Alroobaca, Saddam Hussain, and Syed Sajid Ullah	Face Mask Detection Using Deep Convolutional Neural Network and MobileNetV2-Based Transfer Learning	Deep Convolutional Neural Network (CNN) and MobileNetV2 transferred learning-based model, have been evaluated on two different datasets. The comparative results show that MobileNetV2 achieved 98% and 99% classification accuracy	Absence of Real time video streams into the datasets to detect the face mask in real time.
7	2020	Amrit Kumar Bhadani, Anurag Sinha	A Face Mask Detector using machine learning and image processing techniques.	Built an architecture to get the correct mask observation system. Mobile NetV2, classifier employed in this system. The resultant system performs and has the potential to detect face masks in image with multiple faces over a large variety of angles.	Security Concern will be raised as this would create a massive opportunity for people who cover their faces for nefarious reasons.
8	2021	Wadii Boulila,Ayyub Alzahem,Aseel Almoudi,Muhanad Afifi,Ibrahim Alturki	A Deep learning based approach for real time facemask detection.	An efficient CNN model based on MobileNetV2 for Real-time Facemask Detection is presented. The proposed approach achieved 99% accuracy in training and testing and can determine whether a mask is appropriately worn or not in real-time video streams	As it is not available in realworld surveillance cameras in public areas to check if people are following rules and wearing masks appropriately.
9	2020	Isunuri B Venkateswarlu,Jagadeesh Kakarla,Shree Prakash	Face mask detection using MobileNet and Global Pooling Block	The paper proposed a pre-trained MobileNet with a global pooling block for face mask detection and evaluated the model on two publicly available datasets; the model has achieved 99% and 100% accuracy on DS1 and DS2 respectively.	The proposed method is not applicable for multi image processing.
10	2021	Susanto,Febr Alwan Putra,Febr Alwan Putra,Ika Karlina Laila Nur.	The Face Mask Detection For Preventing the f of COVID-19.	This work developed the face mask detection by using YOLO V4 algorithm.The algorithm is able to detect and distinguish a non-wearing and a wearing-mask precisely with any condition of the surrounding environment.	The work of thermal detection in this device is not completed yet which helps the guard work easily.

III. METHODS

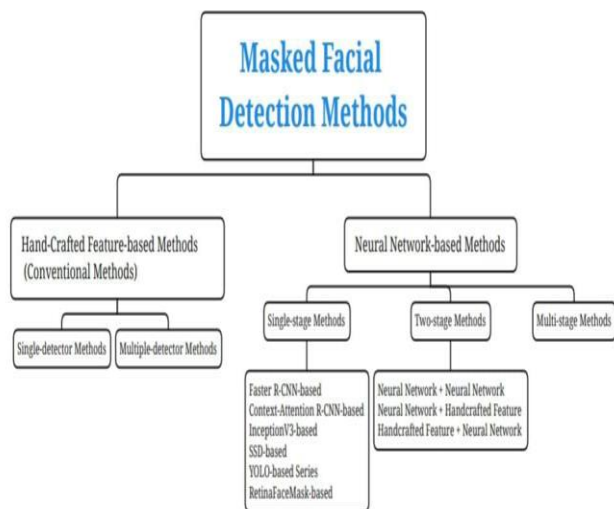


Fig 3.1 Different Face Mask Detection Methods.

• The Hand-Crafted Feature-based method:

Hand Crafted features refer to properties derived using various algorithms using the information present in the image itself. The algorithm detects feature points from the image using spatial filters and groups them into face candidates using geometric and gray level constraints. A probabilistic framework is then used to reinforce probabilities and to evaluate the likelihood of the candidate as a face. It is the Conventional method which involves two different methods: single-detector method and multiple detector methods.

• The Neural Network-based method:

Neural networks are used to recognize the face through learning correct classification of the coefficients calculated by the eigenface algorithm. The network is first trained on the pictures from the face database, and then it is used to identify the face pictures given to it. It is classified as the single stage methods ,two stage methods and multi stage methods.

1. Single -stage method: The stage involves the Faster R-CNN based, Context-Attention R-CNN based ,Inception V3-based,SSD-based,YOLO-based Series and retina Face Mask Based.

2.Two stage method:It involves neural network +neural Network, neural network +hand-crafted feature, handcrafted feature + neural network.

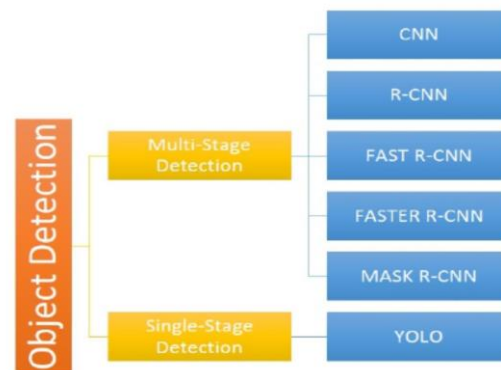


Fig 3.2 Represents the Object Detection.

The Object Detection Method involves two methods: multi stage detection and single stage detection.

• Multi Stage Detection:

The multi stage detection system is the system which is used in identifying the identity of a prisoner in a detention cell, through facial recognition automatically .It involves CNN is a kind of network architecture for deep learning algorithms and is specifically used for image recognition and tasks that involve the processing of pixel data, RCNN, stands for Region-Based Convolutional Neural Network, it is a type of machine learning model that is used for computer vision tasks, specifically for object detection ,Fast R-CNN is a deep convolutional network used for object detection, that appears to the user as a single, end-to-end, unified network. The network can accurately and quickly predict the locations of different objects. Faster R-CNN is an object detection model that improves on Fast R-CNN by utilizing a region proposal network (RPN) with the CNN model.

• Single Stage Detection:

One-Stage Object Detection Models refer to a class of object detection models which are one-stage. YOLO is an abbreviation for the term ‘ You Only Look Once’ . This is an algorithm that detects and recognizes various objects in a picture (in real-time). Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected.

IV. EXISTING SOFTWARE TOOLS AVAILABLE

YEAR	SOFTWARE TOOLS	FEATURES AND APPLICATIONS OF SOFTWARE TOOLS
1995	NumPy	NumPy can be used to perform a wide variety of mathematical operations on arrays. It adds powerful data structures to Python that guarantee efficient calculations with arrays and matrices and it supplies an enormous library of high-level mathematical functions that operate on these arrays and matrices.
2000	OpenCV	Open CV (OpenSource Computer Vision Library) is an open source computer vision software library for the purpose of machine learning. It includes C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS
2008	Pandas	Pandas is an open-source Python package that caters diverse tools for data analysis and also includes a range of methods that can be invoked for data 6 analysis, which becomes feasible when working on data science and machine learning problems in Python.
2010	Flask	Flask is a web framework. This means flask provides you with tools, libraries and technologies that allow you to build a web application. This web application can be some web pages, a blog, a wiki or go as big as a web-based calendar application or a commercial website.
2015	TensorFlow	TensorFlow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of TensorFlow.

V. FUTURE DIRECTIONS

The Future Directions for Face Mask Detection are as follows:

- 1) Create more balanced datasets. Class imbalance problems exist. Neural network-based methods are all appearance-based, which requires enough balanced data to train models.
- 2) It is expected to realize more multi-class detectors in future. Advanced works of object detection can also be employed for the task of masked facial detection.
- 3) Sometimes it detects accurately if a person has worn the mask or not only if the person is directly facing the camera it is quite useful in supermarkets, and airports.
- 4) Implement the proposed solution in real-world surveillance cameras in public areas to check if people are following rules and wearing masks appropriately.
- 5) The thermal detection on this device to help the guard's work easier. Furthermore, this device is hoped to be installed in other crowd areas which need face mask detectors.
- 6) Increase the size of the dataset by embedding real-time video streams into it to detect face masks in real-time.

VI. CONCLUSIONS

In this paper, we surveyed systems to classify face mask detection using both images and videos using different methods. Different methods and approaches of face mask detection and recognition have been reviewed in this paper. Deep-learning-based method and quantization-based technique achieves a high recognition performance. MobileNetV2 is a very effective feature extractor for object detection and segmentation. We surveyed continuous monitoring of the people's conditions and storing the people's data in the server using different methods like Deep learning, machine learning, mobile Net, Res Net, YOLO, Google Net, Global Pooling block concept. In order to investigate the performance, an extensive experimentation is conducted on various Image datasets. MobileNetV2 provides a very efficient mobile-oriented model that can be used as a base for many visual recognition tasks. also computer vision and image processing have an extraordinary impact on detection of face mask. For the best of our knowledge, this work addresses the problem of masked face recognition and different approaches during COVID19 pandemic. we conclude that as mentioned above there are different existing methods for the face mask detection system from that Machine learning technology progresses rapidly.

VII. REFERENCES

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