FACE MASK DETECTION USING CONVOLUTIONAL NEURAL NETWORK

Nithya Sankari A[1], Sneha C[2], Swetha S[3], Ms.S.Manoruthra[4]

[1,2,3] B.E, Computer Science and Engineering & National Engineering College, Kovilpatti, Tuticorin.

[4] Assistant Professor M.E., Computer Science and Engineering & National Engineering College, Kovilpatti, Tuticorin,.

Abstract: COVID-19 pandemic originated by novel coronavirus is continuously spreading up to all over the world. The effect of COVID-19 has fallen on most of the development sectors. The eye system goes through a crisis. Many preventive measures are taken to reduce the unfold of this illness where carrying a mask is one among them. Here, the approach of Deep Learning for investigating faces with and whereas not masks were good trendy observations. Numerous latest algorithmic rules square measure are to come up with utilize the convolutional architectures to form the rules faultless at most possibility. The convolutional architectures had generated it realistically to bring out the component characteristics. The objective is to draft a binary face classifier that will note the human face at mean time in the figure with all of its position. Aboard this, it's bootable to notice one facial mask in each figure. The evolutions will be performed on retrieved human dataset to urge micro level accuracy for the sectional face masks. The leading benefit of convolutional neural networks (CNN) when comparing to its predecessors is that it ceaselessly detects the primary choices with the non-human management.

***Keywords*: COVID-19, convolutional neural networks (CNN), Deep Learning, Mask Detector, Artificial Intelligence.**

1.   Introduction

Since December 2019, the pandemic situation of COVID-19 has undergone a perennial impact in all over the world. Origin of COVID-19 is urban center, China. On March eleven, 2020, The World Health Organization (WHO) announced it as a life-threatening virus which acquired its origin over the globe and also critically attacked over 115 countries. Every single medi-care professional, aid organizations, health worker and clinical scientist unit of measurement in exploration of an accurate vaccine and medicines to beat the destructive illness, nevertheless no step-forward to achieve it till date. The most harmful disease which has outspread via the wind and physical contact once correlated in nursing the human sneezes, cough or interacts with the any other human, the water droplets that drool from the bridge

of their nose or mouth flow via the into the air and had an note on different peoples at intervals in the vicinity. As a result of Covid-19 pandemic, Mask detection has become a main safety measure that have more demand for somebody to put on facial masks, keep the social distance, and to wipe their hands with hand sanitizers, whereas a separate issue with social distance maintenance and cleanup square measure conveyed until currently, the thing of facial mask detection have not still exists dealt with enough. Identifying a facial mask throughout this influenza pandemic could also be necessary significant protection and is the foremost important move forward in time once maintaining social distance is difficult to require care of recognizing a mask is crucial. So Centers for illness management steered all pairs of years old and up to put on a mask publically different mutual distancing exists in some regions. The primary goal of this project is to find the existence of a mask on human faces. Conjointly correct face mask sporting is effective for communicable disease management, however the effectiveness of face masks has been diminished, largely because of improper sporting.

2.   Related Works

Formerly, numerous scientists and examiners have deeply selected monochrome face images. On the other hand, some were entirely built on the pattern recognition model that had access to the face model's initial information, while others were based on Ada-Boost exploitation, which was a fantastic job performance. Then the Viola Jones Detector arrived that enabled the development of face recognition technology and basic quantity face recognition possess opportunity. It was difficult to intercept because it two-faced various issues such as the inclination and radiance of the face. As a consequence, it primarily omitted to add uninteresting and soft lighting. So Researchers began their work to find a substitute, it has a completely different model which may merely introduce faces equivalently as if they wear facial masks.

Numerous datasets for face recognition were introduced to build the result of mask recognition models in the past. The previous sets of data contained pictures taken in a controlled environment, whereas the current set of data units of measurement were designed by taking on-line footage. Annotations unit of measurement evaluated to older datasets,

given for gift faces in these data sources. Big data sets unit of measurement instead of required for the production of higher employment and reviewing knowledge, as well as carryingout practical examples in a far more abundant, simpler way. It refers to a variety of pattern recognition systems that can test faces and mask them based on the user'sknowledge.

There are a variety of Face Mask recognition types. Its square measures are splitted into several kinds of classifications. Boosted cascades with simple choices were adopted in legally authorized classification, which made use of the Viola-Jones face detector, which was stated earlier in this

section. After that, a Various image mask detector was created motivated by the Viola detector model. to return to the previous state, a mask detector model was created to take advantage of the decision tree algorithm. Detection of facial masks throughout this class became extremely successful in detection of facial masks.

3. Methodology

The data is collected in different illumination conditions and the images of people with mask and without mask are collected. The network is trained with a single person image and then tested with the collected data. Once the network classifies the data correctly, it is implemented in real time video stream through a webcam which predicts the person with a mask or person without a mask.

A. Data Preparation

The total of 1395 images of a person with a mask and without a mask are collected. The dataset consists of 699 people's photographs using a mask and 696 people's photographs without using a mask. The images of person with a has a class of with_mask and the images of person without a mask has a class of without_mask. The dataset is augmented by rotating and flipping the images. After augmentation the total number of images is 2751 with 1380 images with with_mask class and 1371 images with without_mask class.

B. CNN model

CNN model is built with Conv2D, Dropout, Dense, MaxPooling2D and Flatten are some of the layers available. Softmax function is used which outputs a vector that shows the probability of with_mask class and without_mask class in the thick film. Adam optimizer is used as a loss implement due to the fact that there are only two types. Images are fitted to the sequential model that was built using Keras library. The model is trained several times to attain a higher accuracy rate. The results are labelled '0' as without_mask and '1' as with_mask. The boundary rectangle of with_mask is GREEN and for without_mask is RED.

C. Face detection

To detect a person with a mask or without a mask using a webcam, face detection algorithm is implemented. Cascade classifiers are used to implement face detection. Cascade classifiers are programmed by OpenCV to recognize the front view of the face by processing 1000 of positive and negative frames. OpenCV library is used to create an endless loop to the webcam in which the cascade classifier detects a face. The model predicts the possibilities of with_mass class and without_mask class. The higher probability is chosen and displayed in the video.

4. Experimental Results

A. Experiments

The dataset is splitted into a training set and a test set of 80% and 20% respectively.

Python programming language is used for the implementation and Jupyter notebook is used to run the code with OpenCV, Keras and TensorFlow.The Jupyter is an open source web application to create, edit and run the document in three languages such as R, Julia, and Python. Keras and TensorFlow are packages used to create a neural network and to develop this framework in deep learning.
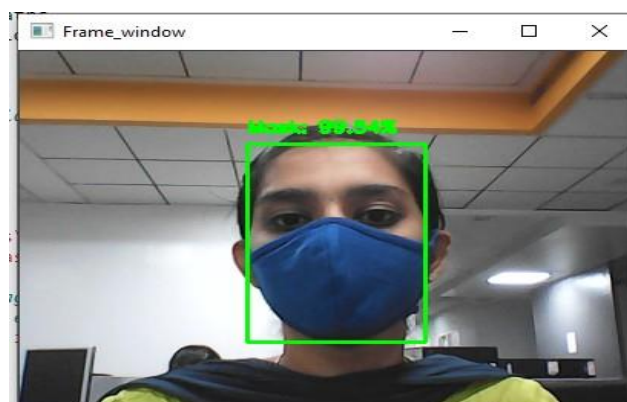
5. Analysis Of Result

Fig 1

Fig 2

Images of the person with mask in fig 1 and without mask in fig 2 are classified based on the features only. In this work, the

face from the video stream is detected using face detection algorithm. And based on the higher possibility between the two classesthe label is chosen and displayed.

6.   Conclusion

The classification of people wearing a mask and people not wearing a mask is used to automate the manual need of checking the person without mask in crowded places or organizations. In the proposed system Cascade classifier is used to extract the features of the face. The future work is to increase the accuracy of the model.

Acknowledgement:

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