FACEMASK DETECTOR USING MACHINE LEARNINGTECHNIQUIES

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***Abstract*:**
Worldwide covid-19 is spreading from one person to another. COVID-19 pandemic has rapidly affected our day-to-day life disrupting the world trade and movements. World Health Organization (WHO) issued some important rules to fight against Covid-19. According to WHO, wearing facemask is an important measure to avoid spread of covid-19 in crowded areas and public place. To detect the person weather is wearing a facemask or not it becoming a challenge. By using man power it is very difficult to identify person wearing facemask an in large groups. Hence we propose a detector which detects a person facemask using machine learning, image processing techniques and deep learning. A person can observe and detect facemask can do by sitting in remote areas and can observe effectively and provide directions accordingly. The proposed method detects the face from the image correctly and then identifies if it has a mask on it or not. As a surveillance task performer, it can also detect a face along with a mask in motion. The method attains accuracy up to 95.77% and 94.58% respectively on two different datasets. We explore optimized values of parameters using the Sequential Convolutional Neural Network model to detect the presence of masks correctly without causing over-fitting. Therefore, face mask detection has become a crucial task to help global society. In our proposed system we will use live video stream and finally in output it gives alert sound (buzzer) when someone not wearing mask. Our goal is to identify whether the person on image/video stream is wearing a face mask or not with the help of computer vision and deep learning. This paper presents a simplified approach to achieve this purpose using some basic Machine Learning packages like Tensor Flow, Keras, Open CV. Using deep learning algorithms like Convolution Neural Networks used to train the models to detect a person wearing facemask or not.

Keywords*: Open CV, Keras, Tensor flow, Convolution Neural Network algorithm.*

1. INTRODUCTION

Wearing facemasks in public is in trend due to rising spread of Covid-19. Some people are very conscious about their health so they wear facemasks regularly when they go out. On March 11 2020 the WHO has declared covid-19 is a global pandemic. To avoid pandemic situation, the countries imposed guidelines like lockdown, wearing masks in public etc. With using development of machine learning techniques, we can overcome the detection of person whether wearing facemasks or not. Using Artificial Intelligence (AI) based on Machine learning and deep learning we can fight with covid-19.People is instructed to wear masks in public. These laws are imposed to avoid exponential death of people due to Covid-19.Observing large groups of people wearing masks or not are becoming a challenge. By using techniques like computer vision and deep learning we are introducing facemask detector model. The proposed model by using web camera decreases the Covid-19 transmission by allowing the detection of people wearing masks or not. This model is combined between deep learning and classical Machine learning techniques with Open CV, Tensor flow and keras. This is proposed by using CNN algorithm. Our solution uses neural networking models to examine Real-Time Streaming protocol (RTSP) video streams using Open CV. We proceed to modern- day deep learning and classic projective geometric techniques it helps to meet requirements with high accuracy. If any person violent the guidelines of wearing mask, facemask detector will detect and send signals to take further actions on them. In this model, accuracy obtained between 70%-80%.

2. LITERATURE REVIEW

Wearing masks is obligatory during this international pandemic .The spread of the disease can be caused by the respiratory droplets and social distancing in the crowded areas. Mrit Kumar Bhadani [1] and Anurag Sinha proposed a paper on detecting a face mask using ML and how to process the image techniques .In this propose paper, the model can detect the mask of the people wearing or not wearing a mask with image and real time video stream. This model is a unification of deep learning and classical ML techniques with Open CV, Tensor flow and Keras which is trained on CNN model. 2] Shashi Yadav proposed a paper on face mask detection and safe social distancing based on Deep Learning. This paper uses the approach to detect facemask by monitoring in real time in public places. The union of light weighted neural network MobileNetV2 (4) and Single Shot Detector (SSD) including transfer learning technique for achieving the balance of limitations of the resource and recognition accuracy have been used. Amit Chavda [3], Jason Dsouza, Sumeet Badgujar and Atkin Damani proposed a method for detecting a facemask using CNN Multi-Stage Architecture .This system consists of dual-stage CNN which is efficient of detecting the one's wearing masks and not wearing the masks .The first stage is Retina Face model which is a pre trained model and the second stage is involved of three variable light weight classifier models of face mask on the existing data set ,and on performance based ,the NAS Net Mobile model was taken for classification of faces as masked or unmasked.

To enhance the performance on video streams, Centroid Tracking was included to the algorithm. Mohammad Marufur Rahman[4],Md. Motaleb Hossen Manik, Md. Milon Islam, Saifuddin Mahmud proposed a method for detecting face mask which is an automated system in city network .An architecture under deep learning which consists of datasets like images of people who are masked and unmasked has been trained. Using CCTV, the public places are monitored. Ashutosh Balakrishnan[5], To Shan Meenpal, Amit Verma proposed a method on detecting face mask using RGB channel images which is containing localized objects .In this method, they presented a method to produce the detailed segmentation of the face mask from any sized input .For semantical segmentation of the images ,the fully CNN has been trained .The results are demonstrated on Multi Human Parsing Dataset with mean pixel level accuracy .Non-frontal faces and multiple faces can also be detected from single image.

3. RELATED WORK

Computer Vision is a field that include processing, analyzing, understanding image in high dimensional data from real world in order to produce numerical and symbolic information. It is a technology that obtains information from images. Deep Learning is a technique for learning using neural network. Neural network is biologically inspired programming ideas which enable a computer to learn from data. Open Source Computer Vision Library (Open CV) is a collection of algorithms for computer vision. Its basic focus on real time image processing .Tensor Flow is a mathematical computation library for training and building your machine and deep learning models with easy to use high level APIs. Keras is a neural network API .It is a library written in python. It also works with other libraries and packages such as tensor flow which makes deep learning easier. Keras implement quick experimentation and fast prototyping. (Article in Engineering Science and Technology an International Journal November 2020).

AI is used to create safe environment. A model using deep and classical machine learning for face mask detection will be presented. A face mask detection dataset consists of with mask and without mask images; we are going to use Open CV to do real-time face detection from a live stream via our webcam. We will use the dataset to build a COVID-19 face mask detector with computer vision using Python, Open CV, and Tensor Flow and Keras (IRVEJ).

[1] We introduce a Deep Learning based system that can detect instances where face masks are not used properly. Our system consists of dual-stage Convolutional Neural Network (CNN) architecture capable of detecting masked and unmasked faces and can be integrated with pre-installed CCTV cameras. This will help track safety violations, promote the use of facemasks, and ensure a safe workingenvironment.

[2] CNN plays an important role in computer vision related pattern recognition tasks, because of its superior spatial feature extraction capability and less computation cost. CNN uses convolution kernels to convolve with the original images or feature maps to extract higher-level features. (RETINAFACEMASK: A FACE MASK DETECTOR, June 9, 2020).

[3] Binary face classifier which can detect faces in any orientation irrespective of alignment and train it in an appropriately to get accurate results. The model requires inputting an RGB image of the model. The model's basic function is feature extraction and class prediction. (Conference Paper • October 2019 DOI: 10.1109/CCCS.2019.8888092).

4. PROPOSED WORK

While Considering the image quality, the factor which influence the system accuracy .It is important to apply various image preprocessing techniques to standardize the image that we supply to the system .Most algorithms are extremely sensitive to lighting situations, so when there is dark the system fails to give accurate results. The other problem which is faced by the model is the position of the image, referring to angle, motion, etc.

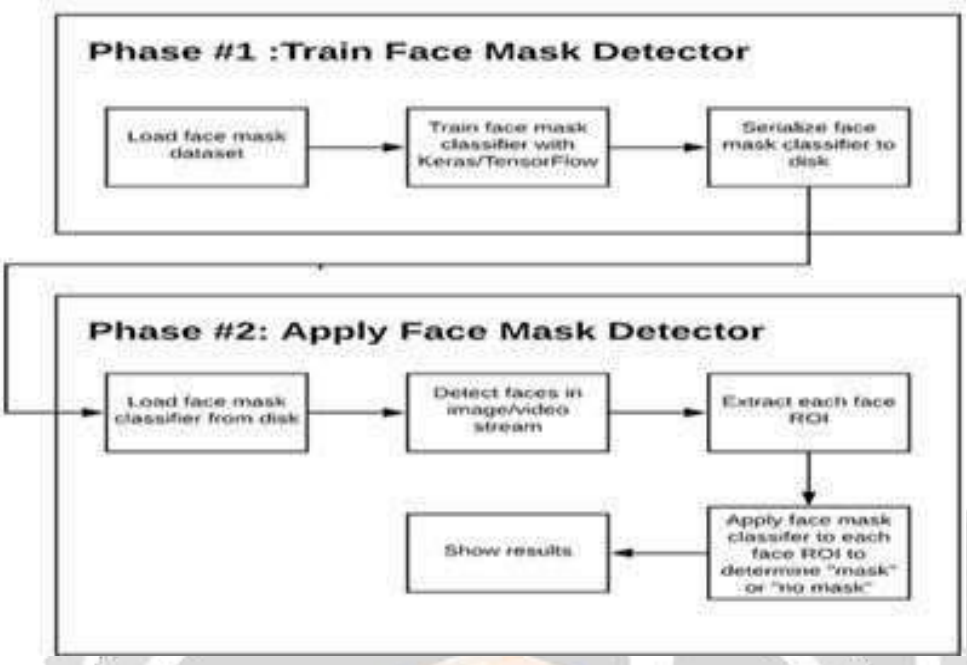

Fig-1: Phases of Face mask Detection

Open CV uses a type of detector called a Haar Cascade classifier. Given an image, which can come from live video, the face detector examined each image location and classifies it as face or non-face. This classifier runs over the image several times to search for face across the range of scale .this process consumes time to complete the task due to algorithmic tricks classification which became fast.

It is easy to use a webcam stream as input instead of a file list. Here we just need to take frames from a camera instead of from a file and then we run until the user wants to quit in place of file list to finish.

The figure1 shows the workflow of the model involved in the scenario and the sequence of steps taken to carry out the functionality of the scenario.

Step 1: Initially the user starts the system then the camera starts capturing the frames.

Step2: The frame captured is sent to the classifier.

Step 3: The classifier then extract the facial feature of the frame.

Step 4: After the extraction of the facial features, the system starts detecting the Region of Interest for the mask.

Step 5: If mask not found it highlights the image with red color.

These steps keep repeating till the user quits i.e. switch of the system.

5. METHODOLOGY

Face detection: The main aim of this model is all about the detection of the face weather the person wearing mask or not. Before it detect face mask it should have to detect the landmarks of the face. This can possible by segmentation and feature extraction most of difficult is to finding this task.

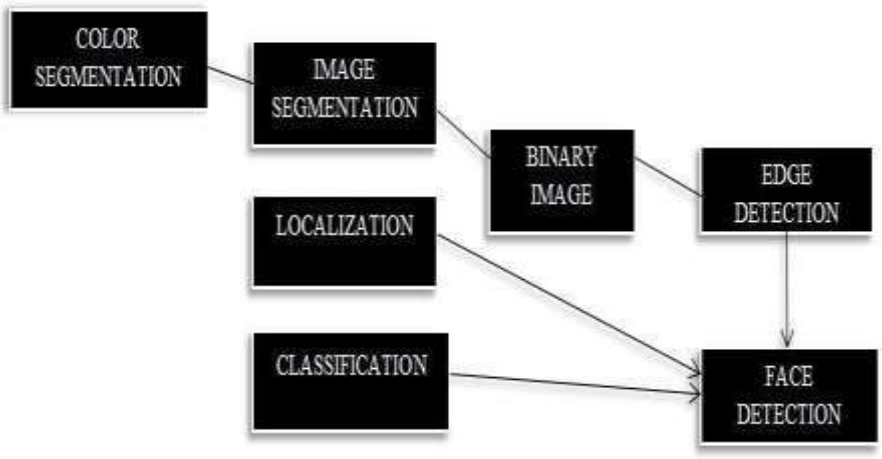

Fig- 2: Steps in face mask Detection

Data collection: The collection of the images of with facemask and without mask from the various sources.

Image Acquisition and preprocessing: In this we have to convert all the images to same size and resolution by using image interpolation algorithm. This increase or decrease the size of the image to the target image.

Computers cannot able to detect the images it only perform the computation on numbers. So we have to translate all the images to numbers for the computer to understand. First, the image data convert to black while photo. Computer will give image value of pixel based on how enlighten the image is. Later converting images into array and computer perform operations on that array. we proceed the result array for further step.

Data preparation and Model construction: First, we have to divide our datasets into training dataset and testing dataset. To train the dataset we have to consider 80% of the data, to test the dataset we have to consider 20% of the data. Then we have to train the data iteratively.

We are constructing our model by using CNN (convolution neural network). CNN uses some characters for the optical identification. As of now we completed data preprocessing now we can construct the neural model. This can do by CNN using three layers:

Convolution 2D it extracts the features from the images, and coverts into positive and negative values matrix based on the feature identification. ReLU layer which converts all the negative values into positive values.

Max-pooling layer takes the highest positive value from the matrix.

Model training: After model construction we have to train the model. We are able to build the ANN (artificial neural network) that identifies the images. Later have to split the dataset to train and test the dataset. Lastly using training the dataset we will build and train the model.

Model testing and evaluation: The training of the model we carry to test the model. In this phase a test dataset is loaded. This dataset is never seen by the model. Therefore, its real correctness will be tested. Finally, the prepared model can be used in the daily practical applications. This means the model can now ready to test new data.

6. RESULT AND DISCUSSION

From our architecture by collecting all the elements, we get the correct mask identification system. CNN classifier is employed in this system. The result performance and potential to detect face mask in multiple images with accuracy percentage. And if person not wearing the mask it produce alarm signal sent to control room further action will take by them.

Fig- 3: Detect face with mask or without mask in real time video stream

7. CONCLUSION AND FUTURE WORK

As the technology are flourishing with emerging trends, the availability, so we have novel face mask detector can give rise to publichealthcare.

We did using Keras, CNN, and Open CV to detect whether humans are wearing face marks or not. Models were tested with real-time video streams and images. Models can note non frontal faces and multiple faces wearing faces wearing face mask or not. By the occurrence of face mask detector we can notice if the person is wearing a face mask and permit their appearance would be of considerable assist to the public.

Now a days ongoing system is implemented using CNN they developed best system. In future we can integrate with the system implementing social distancing that make full system make highly impact on decreasing the spread of Covid-19.Face recognition is important to tracking of criminals. The person who is not wearing mask in large mobs can be detecting by producing alarm signals without using of manpower. When the pandemic getting over it becomes helpful in banks, shops etc. if any person tried to crime. So these challenges create a scope for implements new face mask detection algorithms which gives high accuracies and precisions.

8. REFERENCES

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