Face Mask Detection using CNN

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ABSTRACT –Currently Coronavirus disease in 2020 has affected the world seriously, whichhas continued to be the reason of plight for millions of lives and businesseseven in 2021.As the world recovers from the pandemic and plans to returnto a state of the normalcy, there is a wave of anxiety among all individuals, especially those who intend to resume in-person activity. Studies have provedthat wearing a face mask significantly reduces the risk of viral transmissionas well as provides a sense of protection. However, it is not feasible to manually track the implementation of this rule. Technology holds the key here.We introduce a Deep Learning based system that can detect instances whereface masks are not used properly. Our system consists of a double stage Convolutional Neural Network (CNN) architecture capable of detecting the maskedand unmasked faces and can be integrated with pre-installed CCTV cameras. This will help track safety violations, promote the use of face masks,and ensure a safe working environment.
Keywords– Convolution Neural Networks (CNN), Object Detection, Object Tracking, COVID-19.

I. INTRODUCTION

COVID-19 has become a global pandemic with an exponential growth rateand an incompletely understood transmission process. A Mask play a vitalrole in this situation as, to outbreak the chain of COVID-19. As the pandemic slowly settles and such sectors become eager to resume in-person work,individuals are still sceptical of getting back to the office. 75% of employeesare now anxious about returning to the office. Multiple studies have shownthat the use and wear of face masks reduces the risk of viral transmission as well asprovides a sense of protection. However, it is infeasible to manually enforcesuch a policy on large premises and track any violations. Computer Visionprovides a better alternative to this. Using a combination of image classification for classifier, object detection, object tracking, and video analysis, we developeda robust system that can detect the presence and also absence of face masks inimages as well as videos.

A novel approach to detect masked face using Image captioning and MachineLearning. The technique of detecting and recognising the objects using deeplearning is mainly used to generate captions. We propose a two-stage CNN architecture, where a first stage detects human faces, while the secondstage uses a lightweight image classifier to classify the faces which were detected in the First stage as either Mask or No Mask faces and draws bounding boxesaround them along with the detected class name. This algorithm was further extended to videos as well. The detected faces are then tracked between frames using an object tracking algorithm, which makes the detections robust to the noise due to motion blur. This system can then be integratedwith an image or video capturing devicelike a CCTV camera, to track safetyviolations, promote the use of face masks, and ensure a safe working environment.

II. LITERATURE REVIEW

Joint FaceDetection and Alignment usingMulti-taskCascadedConvolutionalNetworksKaipengZhang, Zhan-peng Zhang,Zhifeng Liand Yu Qiao[1]

- Introduce a multi-task cascadedCNNs based framework for joint facedetection and alignment. A deep and cascaded multi-task framework whichexploits the inherent correlation between them to boost up their performance.
- In the learning process, they proposea new online hard sample miningstrategy that can improve the performance automatically without manual sample selection.

Image Caption Generation using Deep Learning Technique
ChetanAmritkar,VaishaliJabade

- They propose a model capable ofgenerating novel descriptions fromimages.
- For this task, they have used Flickr8k dataset consisting of 8000 imagesand five descriptions per image.
- In this work, they are using CNN as well as RNN. Pre-trained Convolutional Neural Network (CNN) isused for the image classification task.This network acts as an image encoder. The last hidden layer is usedas an input to Recurrent Neural Network (RNN). This network is a decoder which generates sentences.

Multi-Stage CNN Architecture forFace MaskDetectionAmit Chavda,Jason Dsouza,SumeetBadgujar, Ankit Damani, iPing Data LabsLLP, Mumbai

We propose a two-stage architecturefor detecting masked and unmaskedfaces and localizing them.It consists of two major stages:

- The first stage of our architecture includes a Face Mask Detector which localizes multiplefaces in images of varying sizes and detects faces even in overlapping scenarios.The detectedfaces (regions of interest) extracted from this stage are thenbatched together and then passed tothe second stage of our architecture, which is a CNN based FaceMask Classifier.
- The results from the second stage are then decoded and the final output is the image with allthe faces in the image correctlydetected and classified as eithermasked or unmasked faces.

III.RELATED WORK

Convolutional Neural Networks (CNNs)(LeCun et al., 1998) which is a key aspect in modernComputer Vision tasks like pattern objectdetection, image classification, patternrecognition tasks, etc. A CNN usesconvolution kernels to convolve with theoriginal images or feature maps to extracthigher-level features, thus resulting in a verypowerful tool for Computer Vision Tasks.

CNN Algorithm:
1. Give an input image into convolution layer.
2. CNN Train using image store database.
3. CNN Test using image store database.
4. Give image captioning prediction.
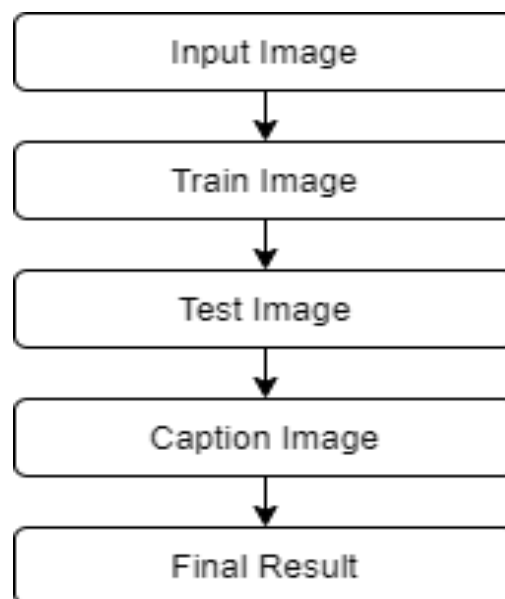5. Final Result.
6. Display Result.

Fig. 1 CNN Algorithm Flow Diagram

IV. PROPOSED SYSTEM

A novel approach to detect masked face using Image captioning and MachineLearning. The technique of detecting and recognition of the objects using deeplearning is mainly used to generate captions.

There are 3 major constraints for the project. They are as follows:
- Image input:
This module is used to take image from external andprovide that image to image processing unit. The image processingunit consist basic segmentation and morphological operation to improveimage features.
- Machine learning (CNN)image classification:
This module isused to detect and classify image of assign. CNN machine learning algorithm is used to detection and classification of image.
- Detection:
This module is used to detect face mask is wear by person or not.The resultant text will displayed on screen.

Basically,
- Input:
Faces of People Image
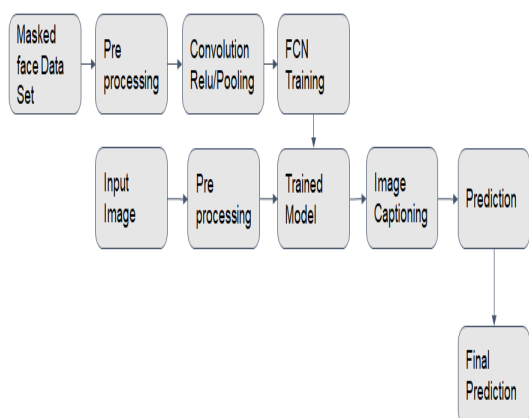- Output:
Face Masked People detected or not

Fig. 3 Generalized Block Diagram for the System

V.RESULTS

The system will start the video streaming and capture the face with the help of camera.

Case 1: If the image in picture or face in video is not wearing a mask, then the following results are obtained.

Input: Video image

Output: Door closed, No Mask along with percentage.

Case 2 : If the image in video streaming or person in video streaming is wearing a mask, then following results are obtained.

Input: Video image

Output: Door open, Mask along with percentage.

VI.   ADVANTAGES

- ALL people can communicate from a distance.
- All types of peoples can scan using this system.
- Using this system face masked detection can reduce spread of diseaseslike viral,covid-19, etc.

VII.   LIMITATIONS

- It is designed especially for detect face mask is wear by person or not.
- Each person image recognized is detect and display on screen.
- It is also allow for security purpose.

VIII.   APPLICATIONS

- Face Mask Identification in Public Places like Schools, Railway station,Malls, Offices, etc.
- Mask wearing in public detection avoids viruses.

IX. CONCLUSION

The Face Mask Detection Application is Convolution Neural Network forrecognizing the face masks. One of the vital applications of face mask recognition is to identify the face mask wear by person which is a vital tool ofreduce the spreading diseases in public area. This application will help toidentify patients and improve the general health of people. In this System,Convolution Neural Network provides a remarkable accuracy in identifyingthe faces by person including wearable mask.

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