A DEEP LEARNING TECHNIQUE FOR DETECTING FACIAL MASK

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ABSTRACT

The COVID-19 epidemic has had a dramatic impact on our daily lives, disrupting global trade andtransportation. Protecting one's face with a mask has become the new normal. Many public service providerswill need clients to wear masks correctly in the near future in order to use their services. As a result, detectingface masks has become a critical responsibility in aiding worldwide society. This paper proposes a simplifiedapproach to accomplishing this goal utilizingTensor Flow, Keras, OpenCV, And as well as some basic DeepLearning packages. The suggested approach successfully detects the face in the image and then determineswhether or not it is covered by a mask. It can also detect a face and a mask in motion as a surveillance taskperformance. On two separate datasets, the technique achieves accuracy of up to 95.77 percent and 94.58percent, respectively. We investigate optimum parameter values using the Sequential Convolutional NeuralNetwork model to appropriately detect the existence of masks without over fitting. As a result, all places likecinema halls, shopping malls, railway stations etc. becoming available. The number of instances of COVID-19 being reported around the country is steadily rising. It can be brought to a close if everyone observes thesafety precautions. As a result, we expect that this module will assist in detecting people wearing masks towork.

Keywords: Deep Learning, Computer Vision, Open CV, Keras, Facemasks, Safety improvement;

INTRODUCTION

Humans have been infected with a new viral strain known as novel coronavirus, which has never beenseen before in humans. Coronaviruses are a category of viruses that cause illnesses ranging from commoncoldstosevererespiratoryinfectionssuchasMiddleEastRespiratorySyndromeandSevereAcuteRespiratory Syndrome. In December of this year, the first coronavirus-infected patient was discovered [1]. Masksæ becoming more popular in public as a result of the international COVID-19 corona virus outbreak. BeforeCovid-19, people wore masks to protect their health from air pollution. Others cover their emotions to hidetheirfacesinpublic,whileothersareself-consciousabouttheirappearance.Toacquireabetterunderstanding of how our method could be used to lower infection rates. In several nations, people arerequired to wear face masks in public. The significant increase in cases and deaths in various locationsprompted the creation of these standards and rules. Surveillance of large groups of people in public places, onthe other hand, is becoming more difficult [2]. As a result, the face detection technique will be automated. In thispaper, we describe a facemask detection technique based on computer vision and deep learning. By detectingpeople who aren't wearing face masks, the proposed model can be utilized in conjunction with securitycameras to prevent COVID-19 transmission [3]. The model combines deep learning and standardmachinelearning approaches using OpenCV, Tensor flow, and Keras. Unfortunately, people are not adhering to theseguidelines, which are hastening the spread of the infection. The approach could be to identify persons who arenot wearing masks and report them to the appropriate authorities. Face mask detection is a technique fordetermining whether or not someone is wearing a mask. Deep learning algorithms are widely used in medicalapplications.Itcanrecognizebothmaskedandunmaskedfaces.Thistechnologyhasbeendevelopedtodetect whetherornotapersoniswearingafacemask.Iftheuserisnotwearingafacemask,thesystemwilldisplayamessagesuchas "withMask", otherwise"without mask".

LITERATURESURVEY:

Face recognition software can be useful in a variety of situations. The authors introduce presentationassault detection for face recognition as one of the domains in this paper. For the real things, they utilizedmedical face masks. With respect to the genuine presentation the effectiveness of the surgical face maskpresent attack detection has been tested and determined to be satisfactory [4]. The authors of this researchpropose a mask detection system for medical personnel working in operating rooms. In the operatingroom, health-care personnel are required to wear a mask, and any person who is not wearing the maskwill be detected by the suggested system. Face and medical mask wear are detected using two differentsystems. Their system has a recall rate of nearly 90% and a false positive rate of less than 5% [5]. Theydeveloped a method for detecting medical masks from photographs captured by Kaggle. The authors ofthis research focused on masked face detection from video. The masked person is discovered in thisapproach, which consists of four steps: estimating the distance between the camera and the person,detecting the eye line, detecting a part of the face, and detecting the eye [6]. They tested their algorithm on anumber of different video surveillance systems and obtained a high level of precision. A model formasked face detection for security purposes is presented in this paper. The authors of this researchfocused on masked face detection from video. The masked person is discovered in this approach, whichconsists of four steps: estimating the distance between the camera and the person, detecting the eye line,detecting a part of the face, and detecting the eye [7]. They tested their algorithm on a variety of videosurveillance systems and were able to reach a high level of accuracy. CNN's proposed model performedflawlessly,andtherecognitionofmaskedfacesisprecise.Anotherprojectinthissectoristhedetectionof masked faces, followed by the detection of the masked face that is unique. The suggested job isdivided into two steps. The first is to identify the masks that have been used. Covering a wider region ofthe face than necessary, and secondly, obtaining the face that is not seen in the dataset for training Usingtheproposed method, they were ableto attain a mean pixel accuracyof 90.32 percent [8].

PROPOSED METHODOLOGY

The proposed approach for mask detection is described below, as well as the numerous implementationphases required. The flowchart for this approach is shown below, and it depicts the overall flow of theprocedure.Themodelbeginswiththeloadingofthedatasetformaskdetection,followedbydatapreprocessing using PyTorch torch vision. Then, following the generation and training, MobileNetV2 is themodel that has been completed. The serialization of the face mask classifier is then performed. The model'sfirst phase is described in the above sentences, and the MobileNetV2 classifier is trained using the PyTorchdeep learning framework. We'll load this face mask classifier after we acquire the serialization of the facemask. The faces are then loaded from the picture / video stream that is accessible. The next step involvespreparing the PyTorch transforms and using Python's OPENCV. Finally, the face mask detector identifieswhetherpersons arewearing masksor not. Finally, in showfigure1, the resultsarepresented.

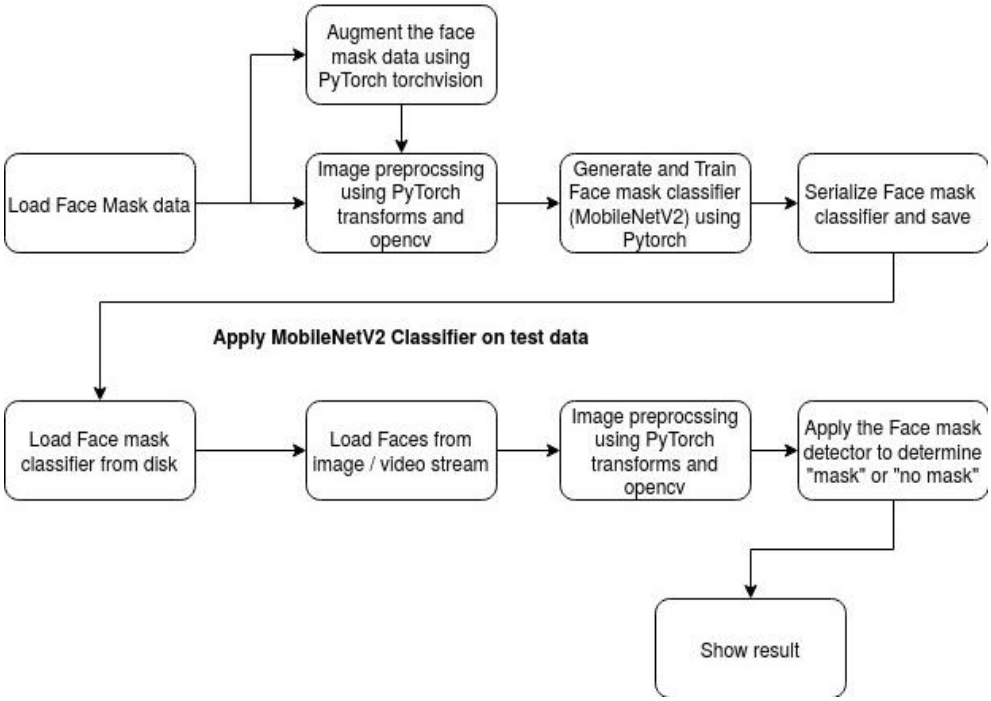


Figure 1: MobileNetV2 Classifier Training process

ALGORITHM

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning method that can take an image asinput, assign importance (learnable weights and biases) to distinct aspects/objects in the image, anddistinguish one from the other. In comparison to other classification techniques, the amount of pre-processingrequiredbyaConvNetissubstantiallylower.

AConvolutionalNeuralNetwork(ConvNet/CNN)isaDeepLearningmethodthattakesanimageasinputandassignsimportance(learnable weights and biases) to different aspects/objects in the image, allowing them to be distinguishedfrom one another. The amount of pre-processing required by a ConvNet is substantially less than thatrequiredby other types of networks.

FrameworksforDeepLearning:

The following options, based on availability, can be considered for the deployment of such adeep learningnetwork as shown in Figure 2.

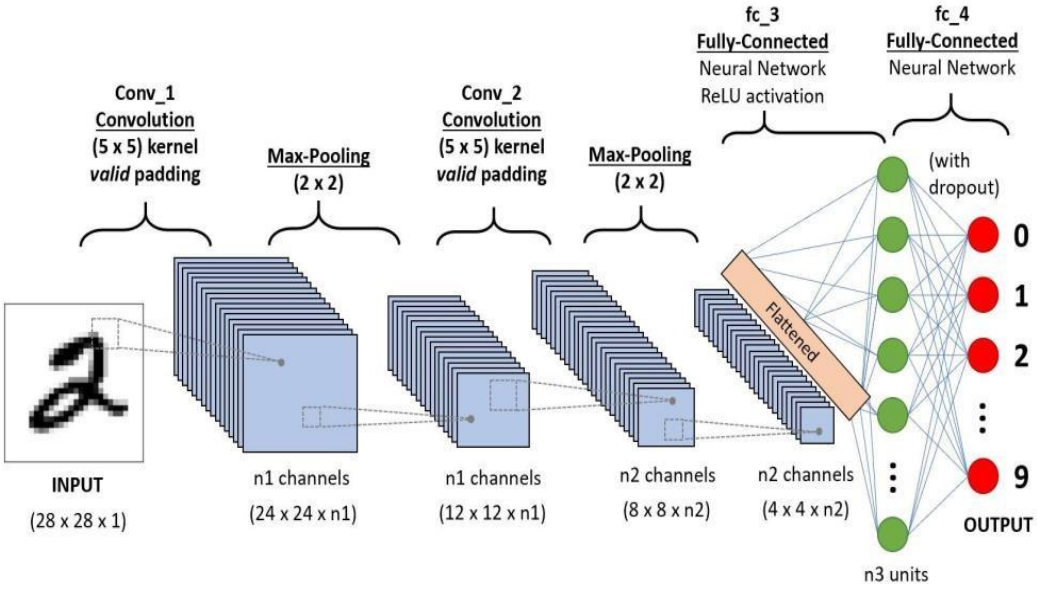


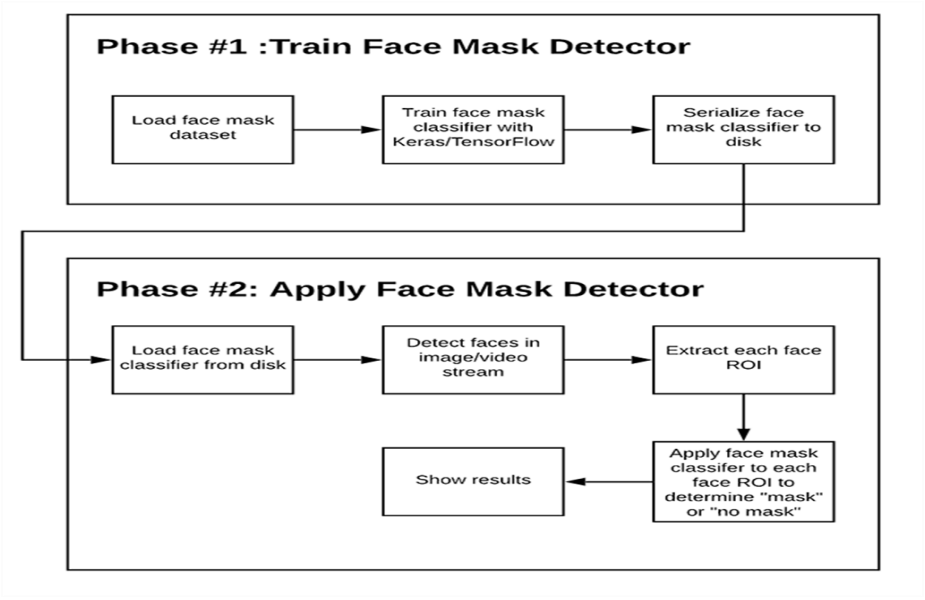
Figure 2: Framework of CNN

SYSTEM ARCHITECTURE

COVID-19facemaskdetectorwithtwophases as shown in Figure 3.

We'd like to split our project into two halves in order to train a specific face mask detector. Training the facemask detector- In this section, we'll focus on loading our face mask detection dataset from disks, training amodel on it (using Keras/Tensor Flow), and then serializing the face mask detector to disc. (Keras is an open-source software library for artificial neural networks that has a Python interface.) Keras is the user interfacefor Tensor Flow.Applying the face mask detector- Once the face mask detector has been trained, we can loadit, run it, and categorize each face as with or without a mask. Our goal is to develop a specific deep learningmodelthat can detect whethersomeoneis wearingamask ornot.

Figure 3: Phases of facemaskdetector



RESULTS

InourFaceMaskDetectionDataset,wehaveatotalof1509photosdividedintotwolabels:withmask:755imagesand without mask: 754 images.Theaccuracygraphis generated whiletrainingthedata as shown in Figure 4.

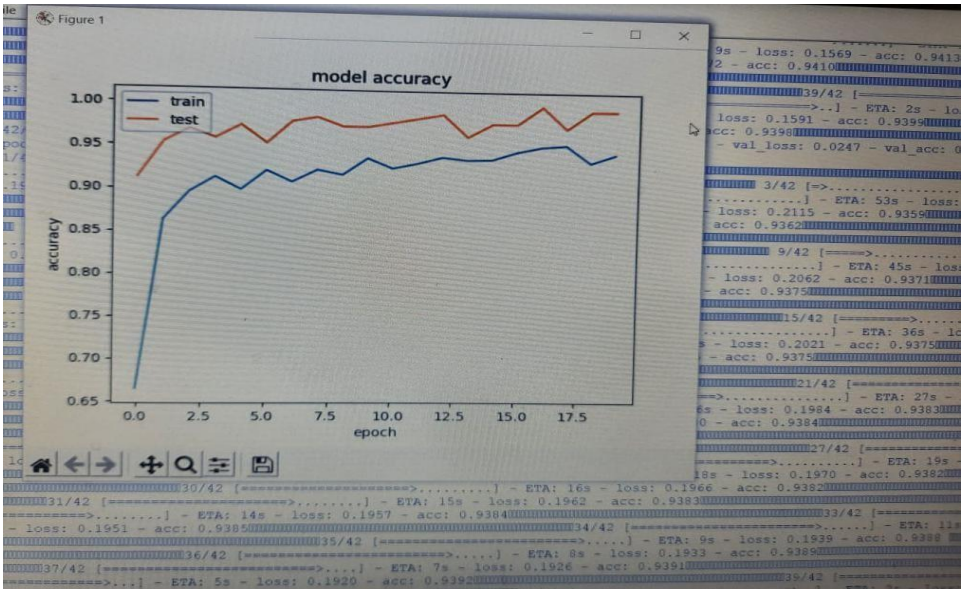


Figure 4: Accuracy of the model

Sample Test

Thefollowingis theoutputgeneratedwhiletesting thedataset.

WithMask as shown in Figure 5:

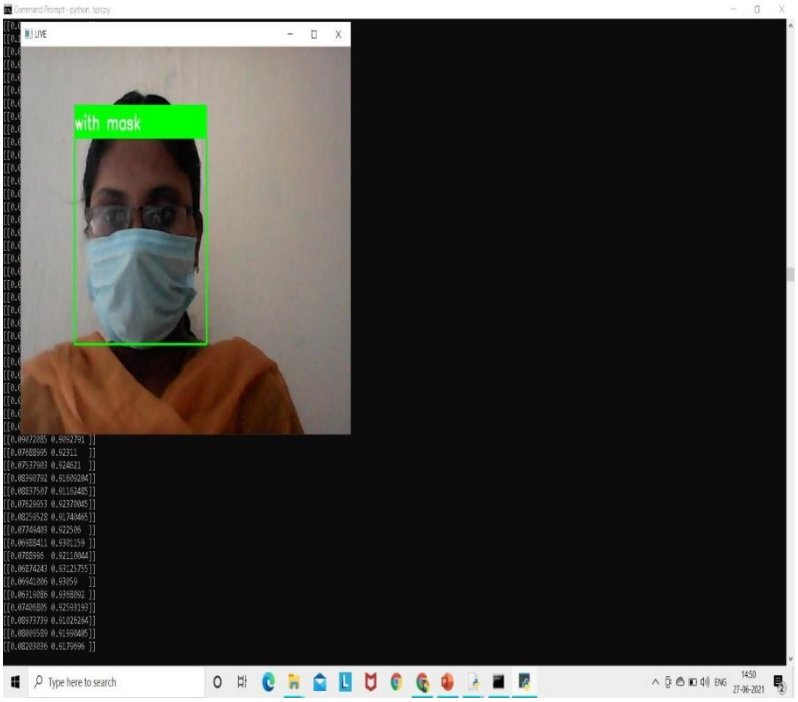


Figure 5: Detecting face with mask

WithoutMask as shown in Figure 6:

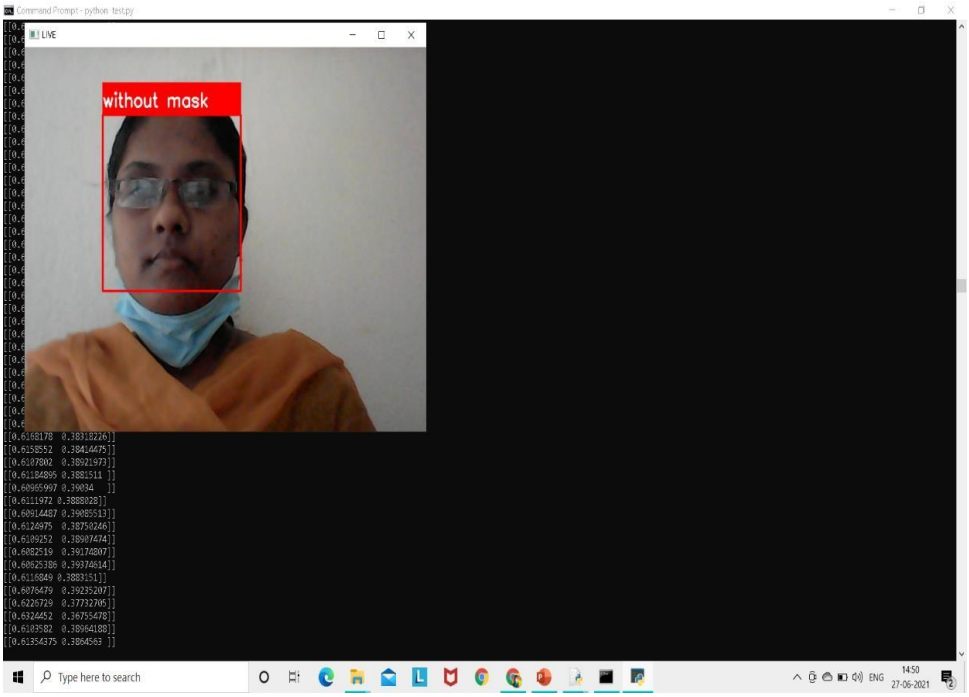


Figure 6: Detecting face without mask

CONCLUSION

The COVID-19 pandemic has presented a number of issues to the world, and the virus's spread must bestifled, since the virus has infected over one billion people worldwide, with the number continually rising.Wearing a mask is one of the most important precautions to take in order to prevent the spread ofrespiratory infections. The COVID-19 pandemic has presented a number of issues to the world, and thevirus's spread must be stifled, since the virus has infected over one billion people worldwide, with thenumber continually rising. One of the most important precautions is to wear a mask to prevent the spreadof infected individuals' respiratory droplets through coughing or sneezing. Healthy persons should alsowear masks. So far, we've shown a method that employs a deep learning algorithm as well as theframework for implementation, MObileNetV2 is employed. Python's PyTorch and OPENCV are alsoincluded. According to the findings, the suggested model is capable of recognizing persons with orwithout masks in photos and video streams. When the training and validation sets are compared, theaccuracyis determined to be90%.

FUTUREENHANCEMENT

The key goal for the future is to improve mapping methods while increasing precision. Getting a higherprecision than before isa common and efficient effect of every autonomous system.Detecting Byboosting the systems precision, the faces with and without mask can be distinguished. As a result, byinforming those who aren't wearing the alert-signal-enabled face mask this is the next enhancement wemust do in order to improve the system's accuracy and ease of detection makes it simple to identifythosewho aren't wearing masks and successfully alert them.

REFERENCES

1. Wang chen, Horby Peter W, Hayden Fredrick G, Gao George F. A novel coronavirus outbreak ofglobalhealthconcern. TheLancet.2020; 395(10223):470-473.doi:10.1016/S0140-6736(20)30185-9.
2. Xu, L.&Ren,Jimmy&Liu,C.&Jia,J..(2014). Deepconvolutionalneuralnetworkfor imagedeconvolution.Advances in NeuralInformationProcessing Systems. 2. 1790-1798.

3. V.Chamola,V.Hassija,V.GuptaandM.Guizani,"AComprehensiveReviewoftheCOVID-19Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managingits Impact," in IEEE Access,vol.8, pp. 90225-90265, 2020, doi: 10.1109/ACCESS.2020.2992341.
4. R. Ramachandra et al., "Custom silicone face masks: Vulnerability of commercial face recognitionsystems & presentation attack detection," 2019 7th Int. Work. Biometrics Forensics, IWBF 2019, pp. 1–6,2019,doi: 10.1109/IWBF.2019.8739236.
5. D.Chiang.,"Detectfacesanddeterminewhetherpeoplearewearingmask, 2020.
6. G.JigneshChowdary,NarinderSinghPunn,SanjayKumarSonbhadra,SonaliAgarwal"FaceMaskDetectionusing TransferLearning ofInceptionV3",2020.
7. P. Khandelwal, A. Khandelwal, S. Agarwal," Using computer vision to enhance safety of workforce inManufacturingin apostcovid world" 2020.
8. Bikku, T., 2020. Multi-layered deep learning perceptron approach for health risk prediction. Journal of Big Data, 7(1), pp.1-14.