Realtime Mask and Face Detection Using Tensor Flow, Keras and OpenCV

Vaibhav Yadav[1], Ayush Gupta[2], Sanjiv Kumar[3], Prabhishek Singh[4], Manoj Diwakar[5], , Kapil Joshi[6]
[1,2,3,4]Amity School of Engineering and Technology, Amity University Uttar Pradesh, Noida, India
[5]Graphic Era deemed to be University, Dehradun, Uttarakhand, India
[6]Department of CSE, UIT, Uttaranchal University, Dehradun, India
vaibhavyadav477@gmail.com[1], Ayush16gupta20@gmail.com[2], skumar8@amity.edu[3], prabhisheksingh88@gmail.com[4], manoj.diwakar@gmail.com[5], [6]kapilengg0509@gmail.com

Abstract— Due to the COVID19 pandemic, our day-to-dayliveshavebeenchangeddrasticallyandglobaltradeandmovements are severely disrupted. To wear a proper sanitizedprotectivefacemaskhasnowbecomeanecessityforthegeneralpublic.Nowadays,manyof thepublicandprivatecompanieswillrequesttheiremployeestousefacemaskswhile doing their job in the workplace. Face maskdetection system has now become an integral part of our society.ThisResearchPaperfocuses our mind onamoresimplifiedand a strict approach to protectourselvesfromCovid19 pandemic.Byusingmachinelearningtechnologieslike TensorFlow with Keras and OpenCV, and ScikitLearn, wecandetectthat whether a person is wearing his/herfacemask or not.Thismethodcorrectlydetectsthehuman face and then recognizes whether that face is wearing amask or not and even detects whether the mask is over the noseor not. As a surveillance system, the software can detect that the face is wearing a mask or not even in motion. The method isbuilt to achieve accuracy upto 95.77% in two different data sets.WeareusingtheSequentialformofConvolutionalNeuralNetworkmodelinwhichoptimizedvaluesareachievedtodetectthe correctpresenceof themask.

Keywords: Keras,OpenCV,TensorFlow,FacialRecognition,Real-TimeMaskandFaceDetection,CNNarchitecture.

1. Introduction:

According to (WHO) World Health Organization, in the year2019, millions of people were infected by coronavirus diseaseand almost a million deaths were reported due to COVID19.SymptomslikeLossofTasteandBreathingproblemslikeshortness of breath were reported all around the world and it was seen that elderly people with lung disease may havesevere complications. Droplets of cough of the infected personcarrying the virus can reach to the neighboring people, this make the virus communicable.

Our people should know the importance of wearing face mask as a safeguard against

COVID19, toregularize the riskof getting infected froman infected person during the "pre-symptomatic" phase.WHOfocuses that medical masksandventilators are a priority formedicalpersonnel,because of whichmaskscreeninghasnowbecomeanintegraltaskintoday'ssociety.Thismaskdetectionsystem basicallydetectsthepositionofyour face and then finally detects the presence of the mask on yourface. The thing is almost similar to general object recognition to recognize objectclasses.

2. Dataset:

Twodatasetswereusedtoexperimentwiththecurrentmethod:dataset 1 contains 1,376 (one thousand and thirty-six) images,whichincludes690(sixhundredandninety)imagesofrandom people who are wearingthe protective face masks andthe rest 686 (six hundred and eighty) images of people who are not wearing face mask. The first figure primarily includes thefront face pose withthe same typeofmaskwhichisjust thewhitecoloronly.

Kaggle's record 2 consists of 853 (eight hundred and fifty-three) imagesandtheirfacesareerasedwithor withoutmasks.In the figure (Fig-2) there are also face collections that aredesignedforhead-turning,bowing,andbowingwithmorethanonefacepresent inthe sameframe.

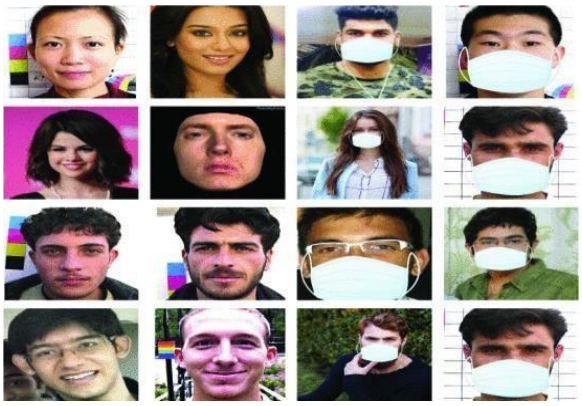

Figure 1: Samples including faces with and without white face masks.

Figure 2: Samplesincludingfaceswithandwithout colored face masks.

3. IncorporatedPackages:

A. TensorFlow:

TensorFlow is defined as an interface that expresses machine learningalgorithms, that includes some special topics like sentimentanalysisthatisusedtocaptureexpressions,speechrecognition for voice, geographic information extraction, visionby computer, tax etc.

B. Keras:

Kerasprovidesbasicbuildingblocksforbuildingandtransporting AA arrays at high iteration rates. It not only has thescalabilitybutitalsohasthemodifiedcross-platformcapabilities. Therefore, the core data structures and APIs whichare included in Keras are the multiple layers and differentmodels of the idea that we have worked upon. The vector isconvertedtoabinaryclassarrayandthemodelisgenerated.

C. OpenCV:

OpenCVis an open-source machine learning tool andsoftware libraryusedtodistinguishandrecognizefacesandobjects,trackprogressive modules, eye movements to track, track cameraactions, red-eye of flash images, search for comparison imagesfromanimagedatabase.

4. TheProposed TechnicalMethod:

The technical methodconsists ofaparticularclassifier that was structured by the algorithmandCNNmodelthatcomprisesofthetwo2Dconvolutional layers which are used to connectthelayers ofdense neurons. This mask recognition system algorithm is asfollows:

A. DataProcessing:

Data preprocessing refers to the process of converting data froma specific format into a kind of format that is more robust anduser-friendly. The data can be of any form like an image or in avideo format or even in plain text. This includes a compositionmodel and analyses the relationship available between differententities and sub properties. The suggested method interacts withOpenCV and NumPy tools that interacts with images and data in videoformat.

a) ConvertingRGBimagetograyimage:

Nowadays, our current imagerecognitionsystems areabletowork with grayscale format of images without even moving into theprocess of converting color images tograyscale images. The main reason is that grayscalecolormethodhas very littleconsequencewhen working withrobustdescriptors.Sincegrayscalestreamlinesthealgorithmandreduces computational requirements, it is used to extract someparticulardescriptorsinsteadofworkingoncolor.

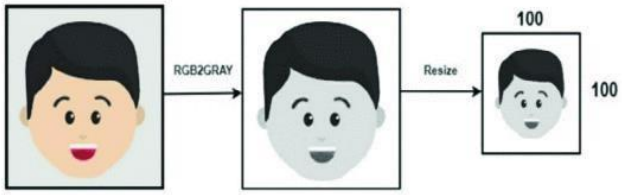

Figure 3: Conversion of RGB image into Grayscale image of 100 x 100 size.

b) ImageReshaping:

The image that we take as input is a three-dimensional system tensor inwhich each channel has a single prominent pixel. The maincondition is that the images must be similar in size to match the3Dfeatureoftensor.It canonlyacceptfinelytunedimages,whichcausesseveral difficultieswithdatacollectionandmodeldeployment.

B. Trainingof the Model:

We have included a layer of Mobile nets in this CNN architecture to improve the response time of the system. This may affect the accuracy of the model but the resulted accuracy is sufficient for our model. This particular modification has let us improve the software exponentially. Now the next step is the splitting of the dataset. This means themodel should be trained on a particular set and then should betestedonanotherdataset.Thelossofvalidationisbeingmonitored with a Model Checkpoint. The images that we areusing to train the system is included in this sequential model.Here, we use 20% of the data that has been already trained as the validation data. The model has been trained for almost 20 epochs, which nowmaintainsa balancebetweenprecisionandthe possibilityofoverfitting.

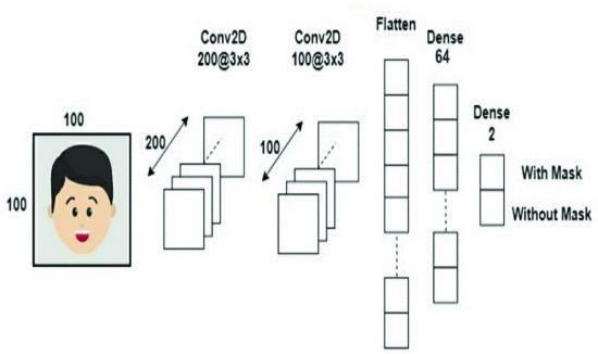

Figure 4: Convolution Neural Network (CNN) architecture

5. WHAT's UNIQUEINOUR RESEARCH PAPER?

A. Facial recognition with and without glasses

There were three independent variables: the glasses and gender of the person being stimulated, and theperson'sprocessingdepth. Theinitialtwoindependentvariableswerevariedthroughphotographs of men and women with or without glasses. Theprocessing depth was manipulated by having the test subjectsassess the characteristics (deep) or the appearance (superficial) of the stimulus subjects during the initial exposure phase [16].

B.ProperwayofwearingFaceMask:

Face mask is the key part in this pandemicsituation asthisistheonlysafeguardthatcanpreventthespreadof this infectious disease. Other errors such as wearing the mask below nose or wearing a loose mask are generally not taken intoaccount but they can also contribute to the spread of the virus.

6. Result and Analysis of the Model:

The face and mask recognition model has been trained, validated, and tested on dataset.The method achieves an accuracy of upto 95.77%. It shows how this optimizedprecision reducesthe costoferrors and can be considered to be amore versatile and detailedMaxPoolingisconsideredtobeoneofthereasons which offers a rudimentary translational. The optimized value of neurons is 64, which is not muchhigh.The larger numbers of neurons can result in poorer performanceofthe model propose.

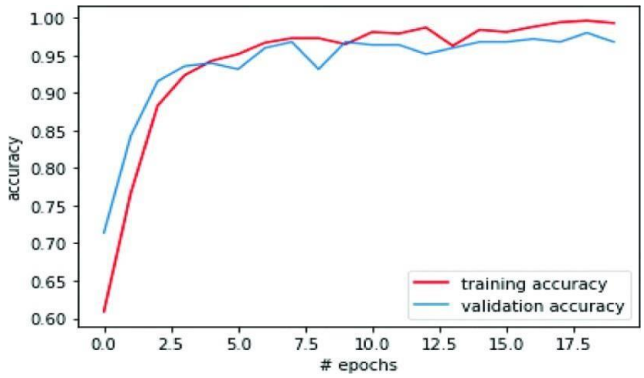

Figure 5: Graph showing - Epochsv/sAccuracyin the reference todataset.

7. Conclusion:

We explained how this technology can be helpfulforsituationslikeCovid 19.Wearing a mask could becomemandatory shortly giventhe Covid19 crisis. The model usedwill make a major contribution to the public health systems. The main motive ofthis model is to set a strict policy for the general public to wearprotective face mask in a proper way so that we can prevent thespread of COVID 19 on a large scale and even put a full stop to it.

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