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Face Mask Detection with Attendance System

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Abstract-Covid19 disease is the latest epidemic that forced an international health emergency. It spreads mainly from personto person through airborne transmission. Community transmission has raised the number of cases over the world. Manycountries have imposed compulsory face mask policies in public residencies as a preventive action. Manual observation of theface mask in crowded places is a tedious task. However, some people still do not wear masks in public areas, which might leadto infection of themselves or others. Therefore, automatic detection of the wearing of face masks may help global society, butresearch related to this is limited. Various machine learning based methods have been applied in health care to assist thedetection of COVID-19 cases from medical images. One issue that limits machine learning methods for detecting COVID-19cases is the lack of data. In this paper, we propose a Mask-RCNN which is able to detect face masks accurately and warn themto wear face mask.Mask-RCCN use two novel methods to achieve this. First, to detect mask region from the face using RPNand to extract rich context features and focus on crucial face mask related regions, we propose a novel residual contextattention module (RCAM). Second, to learn more discriminating features for faces with and without masks. This technique iscapable of recognizing masked and unmasked faces to help monitor safety breaches, facilitate the use of face masks, andmaintaina secureworking atmosphere.

Keywords- FaceMaskDetection,AttendanceSystem,FaceMaskRecognition.

I. INTRODUCTION

PeopleallacrosstheworldhaveracedtotheirlocalpharmacytogetsurgicalmaskswhentheoutbreakofCOVID-19 (Coronavirus) was designated a pandemic inearly March 2020.When aninfectedperson coughsorsneezes,thenewcoronavirusknownasSARS-CoV-2spreadsthroughthemouth.Thenewcoronavirus,accordingto theWorldHealthOrganization(WHO),spreads far quicker than earlier coronaviruses like SARSand MERS. Face masks can help prevent the spread of thecoronavirus(COVID-19),especiallyinregionswheresocial distanceis difficult. Facemasks are one methodusedtopreventillnesstransmission.
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Dental,isolation,laser, medical, procedural, or surgical masks are some ofthe othernamesfor them.Facemasks areloose-fittingmasks with ear loops, ties, or bands at the rear of the headthat cover the nose and mouth. When you have a cough orsneezing disease (with or without fever) and plan to bearound other people, consider using a face mask. The facemask will assist them avoid getting sick from you. Whenpeople should wear face masks in healthcare settings, thereare certain restrictions.

There are many different brandsand colours to choose from. It is critical to utilise an FDA-approvedfacemask.Allformsoffacemasks,whenapplied properly, serve to limit the spread of COVID-19(coronavirus).Yourfacemaskwillnotprotectyouoranybody else if it does not completely cover your nose and mouth.

Fig 1. APersonwithfacemask.

II. METHODOLOGY

VarGFaceNet,MobileFaceNet,andShuffleFaceNetarethree state-of-the-art lightweight CNN face models that theauthorchoseasthebestperformersinthisstudy.VarGFaceNetis a lightweightfacial recognition systemthat uses an efficient variable group convolutional networkbasedonVarGNet.Onnumerousbenchmarksforunconstrainedfacerecognition,MobileFaceNetandShuffleFa

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ceNethaveshowedcomparableperformancewithhigh-accurate verydeepfacemodels.

Pose and illumination consistency are used to offer a low-cost, accurate mask transfer approach for masked face dataaugmentation. This method can add the mask from anymask-enabled face image to any mask-enabled face image.The effect of wearing face masks on the behaviour of facerecognition systems is investigated through qualitative andquantitativeresearch.Toincreasetheperformanceofmaskedfacerecognition,anAMaskNetisproposed.

To cope with the low feature extraction capability causedby the light-weight model, the author proposed two novelmethods to enhance the model's feature extraction process.First,toextractrichcontextinformationandfocusoncrucialfacemaskrelatedregions,weproposeanovelresidual context attention module. Second, to learn morediscriminating features for faces with and without masks,weintroduceanovelauxiliarytaskusingsynthesizedGaussian heat map regression. Ablation studies show thatthesemethodscanconsiderablyboostthefeatureextractionabilityandthusincreasethefinaldetectionperformance.

Dense net is densely connected-convolutional networks. ItisverysimilartoaResNetwithsome-fundamentaldifferences and utilises dense connections between layers,through Dense Blocks, where we connect all layers (withmatchingfeature-mapsizes)directlywitheachother.Itfocuses on making the deep learning networks go evendeeper, but at the same time making them more efficient totrain,byusing shorterconnectionsbetweenthelayers.

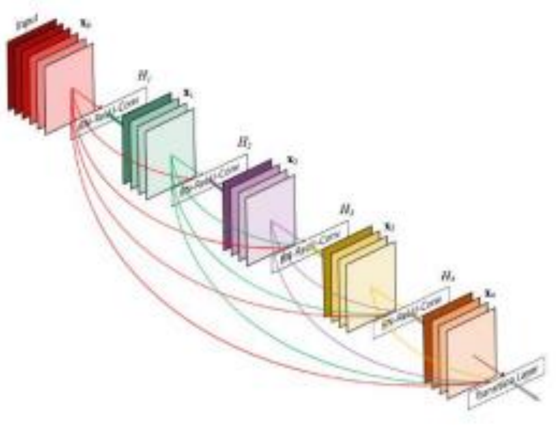

Fig 2.DenselyconnectedConvolutionalNetworks.

1. CollegeDashboard:

In thismodulewedevelopedwebbrowser-basedinterface designed to be used by college admin, TeachingStaff and Student– untrained in data science – to predictand detect face with mask and no mask for attendanceSystem.

2. DatasetAnnotation:

FMRDataacquisition,asthebasicstepofrecognition process, aims to collect a large amount of databothinsizeandtype.

3. Pre-processing:

Image preprocessing are the steps taken toformatimagesbeforetheyareusedbymodeltrainingandinference.The steps tobetakenare:

- Readimage
- Resizeimage
- Removenoise (Denoise)

4. FaceMaskDetector:

In this module the matching process is done withtrained classified resultand testLive Camera CapturedClassifiedfile.TheEuclideandistanceiscalculatedbetween 2 ROI points and hence the centre coordinates aretransformedintorectangularcoordinatestomakethebounding box.

5. AttendanceSystem:

After successful face verification and recognition, thestudent's attendance is recorded in front of his or her rollnumber.Anerrorpageappearsifthefaceisnotv recognised.Itentails the creation of attendancereports.Themoduletakesstudentinformationanddailyattendancestatusfromstudentdatabase.Attendancereportsare createdand savedto afile.

III. RESULT

Theimportantpointsinvolvedwiththeperformancemetrics are discussed based on the context of this project:

- **TruePositive(TP):**ThereisaFace,andthealgorithmsdetectface with mask andnomask.
- **False Positive (FP):** Thereis noFace,butthe algorithmsdetectasface withmask ornomask
- **FalseNegative(FN):**ThereisaFace,butthealgorithmsdonotfacewith mask ornomask.
- **TrueNegative(TN):**ThereisnoFace,andnothingisbeing detected.

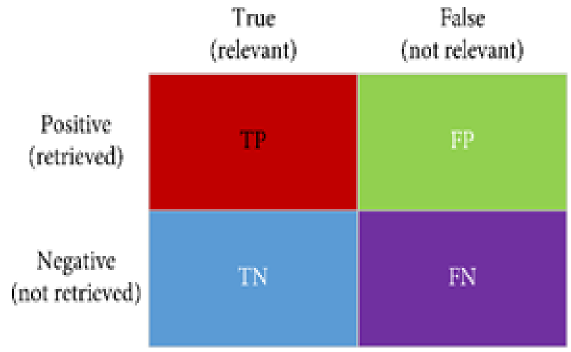

Fig 3.ParameterDefinition.

1. Accuracy:

Accuracyisameasurethattellswhetheramodel/algorithmisbeingtrainedcorrectlyandhowitperforms. In the context of this thesis, accuracy tells howwell it is performing in detecting Face in ATM Machine.Accuracyiscalculatedusing thefollowingformula.

Accuracy = (T P + T N)/ (T P + T N + F P + F N)

Accuracy:0.9984025559105432

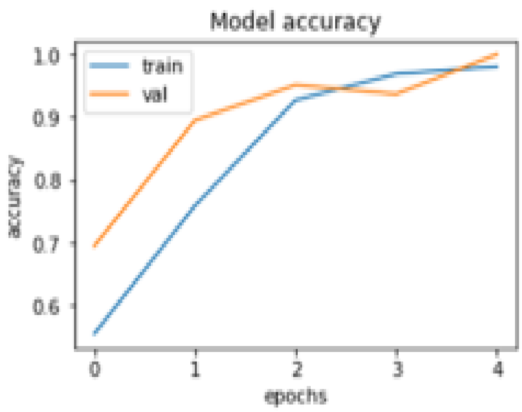

Fig 4. Accuracy.

2. Precision:
It denotes the ratio of positively predicted cases that are actually positive. In the context of this thesis, precision measures the fraction of objects that are predicted to be Card Holder and are actually Card Holder Face present in ATM environment. Precision is calculated using the following formula.

Precision = T P/ (T P + F P) Precision: 0.9990234375

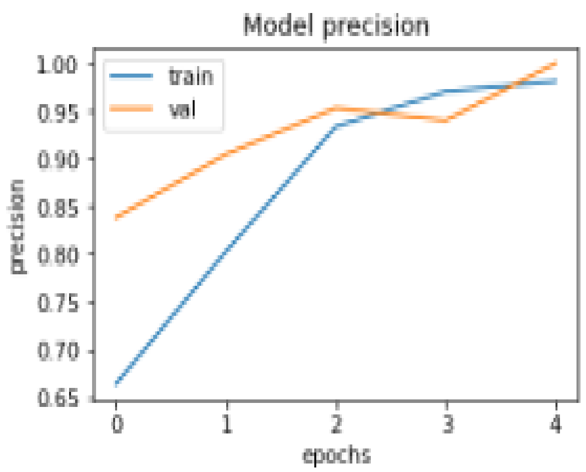

Fig 5. Precision.

3. Recall:
Itistheratiobetweenactualpositivecasesthatarepredicted to be positive. In the context of this thesis, recallmeasures thefraction of Face thatare predicted as Faceand identify the card Holder. Recall is calculated using thefollowingformula.

Recall =T P/ (T P + F N)

Recall:0.9964285714285714

IV. CONCLUSION

Wearingaprotectivefacemaskhasbecomestandard and required for many public services, colleges,andimportantbusinessprovidersasthecovid-19pandemichasspread.BoththeWHOandtheCDCemphasis etherelevanceandeffectivenessof usingtheproper masks for personal and public health. Face maskdetection and facial recognition with a mask are thereforecriticalinmodern society.Thisstudy presentedafacemask detection andfacial recognition with masksystemforaccess,attendance,andhealthcheckunderthe pandemictosuittheabovepurpose.Amaskregionconvolutional neural network approach for face detectionand recognition with mask or no mask was suggested inthis project.

The approach can use glcm to extract features,rpn to generate rois, roialign to preserve precise spatiallocation, and the entire convolutional network to generatebinary masks (fcn). As a result, the proposed frameworkcanaccuratelydetectfaceswhilealsosegmentingandpredictingeachface,mask,ornomaskinanimage.Dependingontheresultsofthetests,eachmodelperformedreasonablywellandcorrectlyidentifieditsclasses for each characteristic. With proposed models, anaverage of 97 percent accuracy is attained, indicating thatthemodelscanbecombinedandtestedonreal-timefootage.

Theresultsdemonstrateagoodcompromisebetweenlimitedprocessingresourcesandgreatperformance.Thisprojectincludesvideoacquisition,database design, and high-level data analytics as part of anend-to-end solution. Small enterprises, organisations, andinstitutions can utilisethesystem andsolutionforfreeunder the COVID-19, and it can help them adopt socialdistancing.

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