FACE MASK DETECTION SYSTEM FOR PUBLIC SAFETY

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INTRODUCTION

- The increasing prevalence of infectious diseases in recent decades has posed a serious threat to public health. Routes of transmission differ, but the respiratory droplet or airborne route has the greatest potential to disrupt social intercourse, while being amenable to prevention by the humble face mask. Face masks are part of an infection control strategy to eliminate cross-contamination. The ongoing COVID-19 pandemic has even resulted in a global usage of face masks. But some people still refuse to put on a mask or face covering when they leave the house, regardless of the rules in their local area. The system identifies and warns those who shows relactance in wearing masks on public places that include Offices, Sports venues, Hospitals/healthcare organizations, Densely populated areas, Entertainment and hospitality industry

LITERATURE SURVEY

Facial recognition involves using computing to identify human faces in images or videos, and then measuring specific facial characteristics. This can include the distance between eyes, and the relative positions of the nose, chin and mouth.

When facial recognition is used to identify faces in a crowd, it requires a significant database of profiles against which to compare the main image. These profiles can be legally collected by enrolling large numbers of users into systems. Not applicable in present scenario.

Facial recognition systems will need to adapt.

PROPOSED SYSTEM

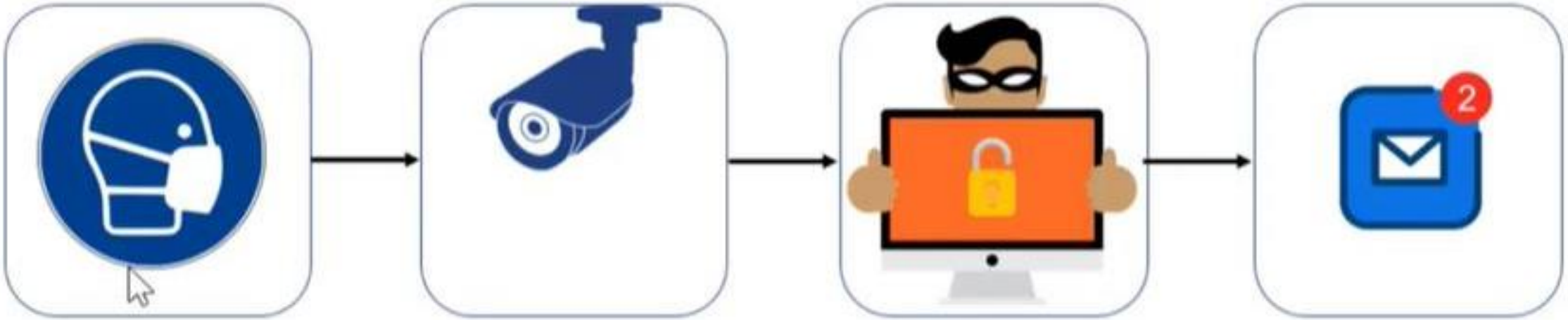
The face mask recognition system uses Deep learning to detect the person with or without a mask. It can be connected with any surveillance system installed at your premise. The system does not allow anyone to enter the premise without a mask and also ensure that everyone maintains the safety protocols. The system sends an alert message to the authorized person if someone tries to enter the premise without a mask. The authorities or admin can check the person through the system to confirm their identity.

It also allows real-time access to the video fed of people with or without mask inside the closed environment. The accuracy rate of detecting a person without a face mask is 95-98% depending on the digital capabilities. The data can been transferred and stored automatically in the system to enable reports whenever you want.

COMPONENTS

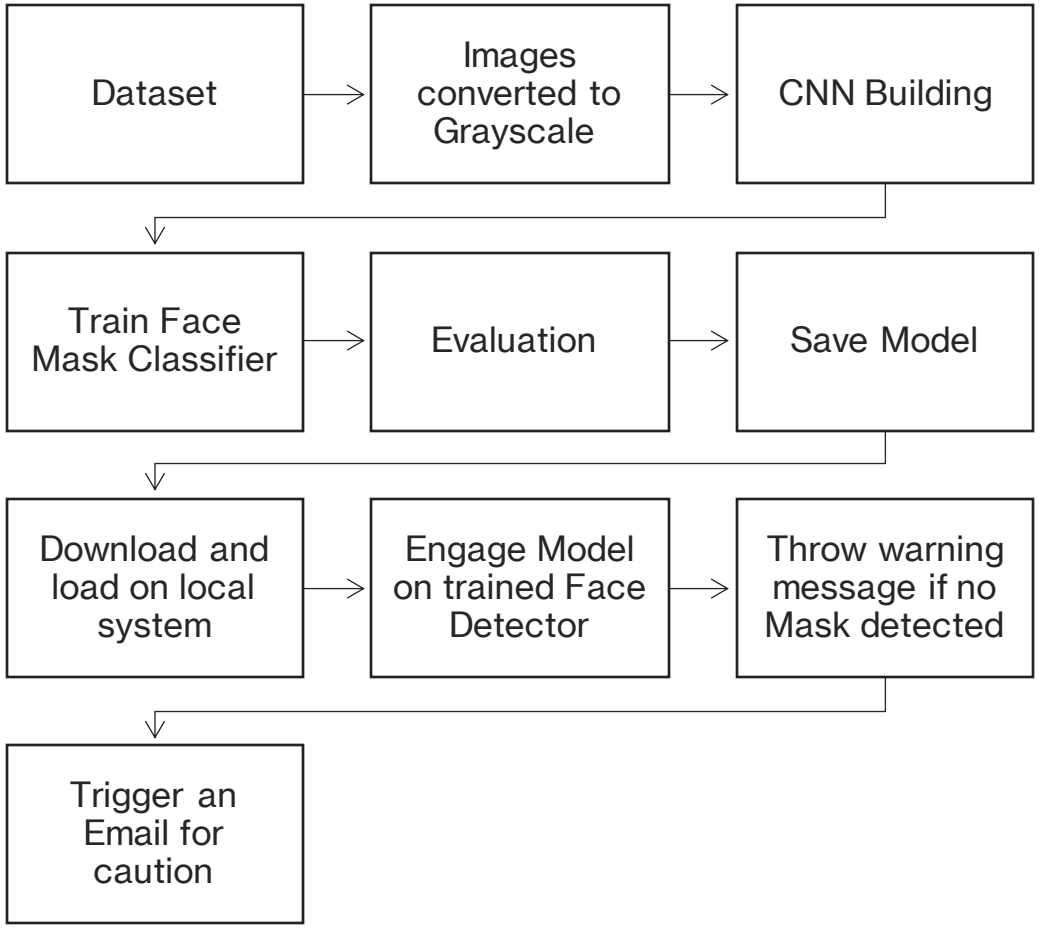
- A Surveillance camera
- A System
- A Display Screen

FIRST LEVEL OF SAFETY DETECTION



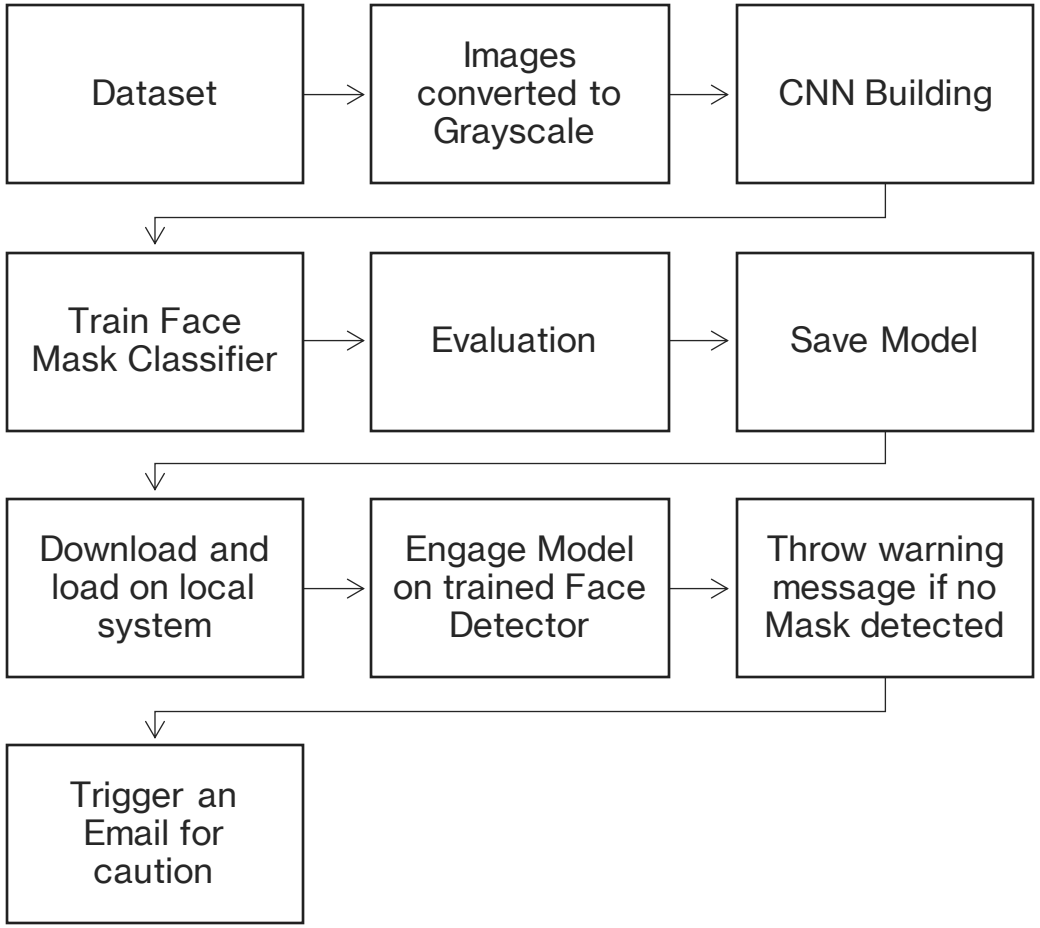
WORKING

- Configured working Directory of **with mask(1915) and without mask(1918) images** and Mount Google drive to make use of Google Colaboratory.
- Data Pre-processing to convert images to Grayscale and separate out labels and Images.
- Buiding CNN using sequential API of Keras.
- Training Face Mask Detection Classifier on image Data using Keras and Tensorflow as Backend.



WORKING

- Evaluate the Model to see the loss and Accuracy.
- Save and Download the model to local system.
- Extract Face ROI from the live Camera feed.
- Engage trained mask detection to face identifed and determine whether if mask found or not.
- Throw a warning message pop up and trigger an email to the authorities.



CNN Architecture

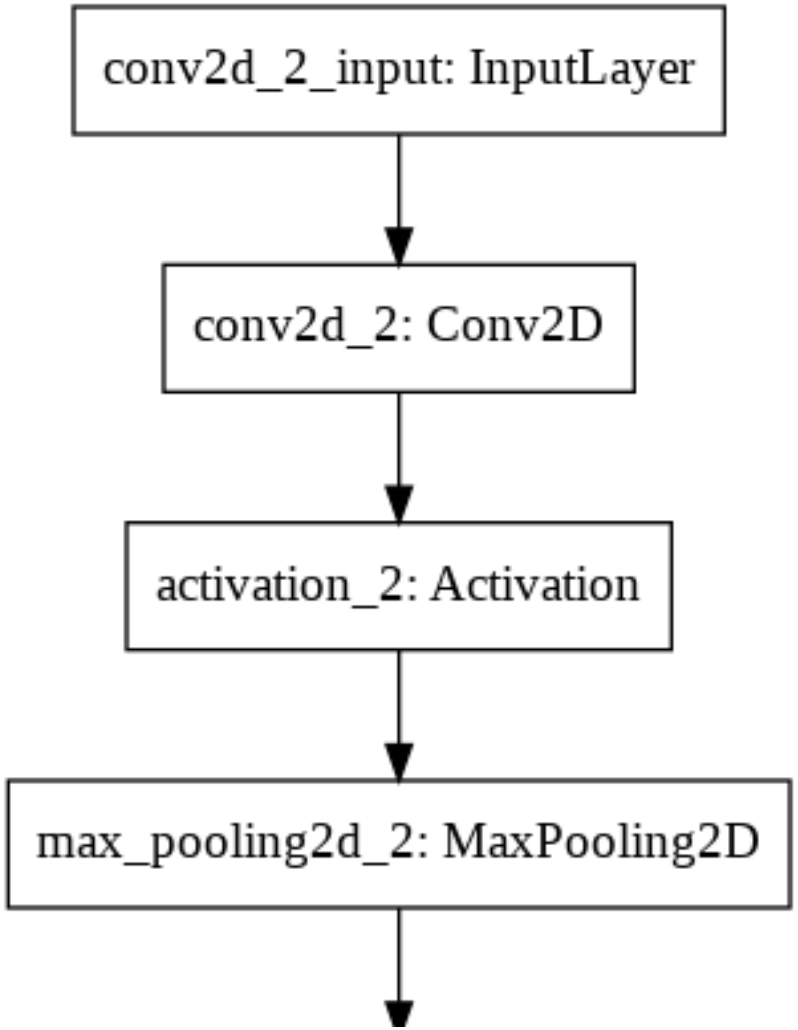
Build CNN Model using Sequintial API

-First layer containing convolution, Relu and Max Pooling layers

- Con2D(64,(3,3))
- Activation using 'Relu'
- Max pooling (2,2)

-Second layer containing convolution, Relu and Max Pooling layers

- Con2D(128,(3,3))
- Activation using 'Relu'
- Max pooling (2,2)



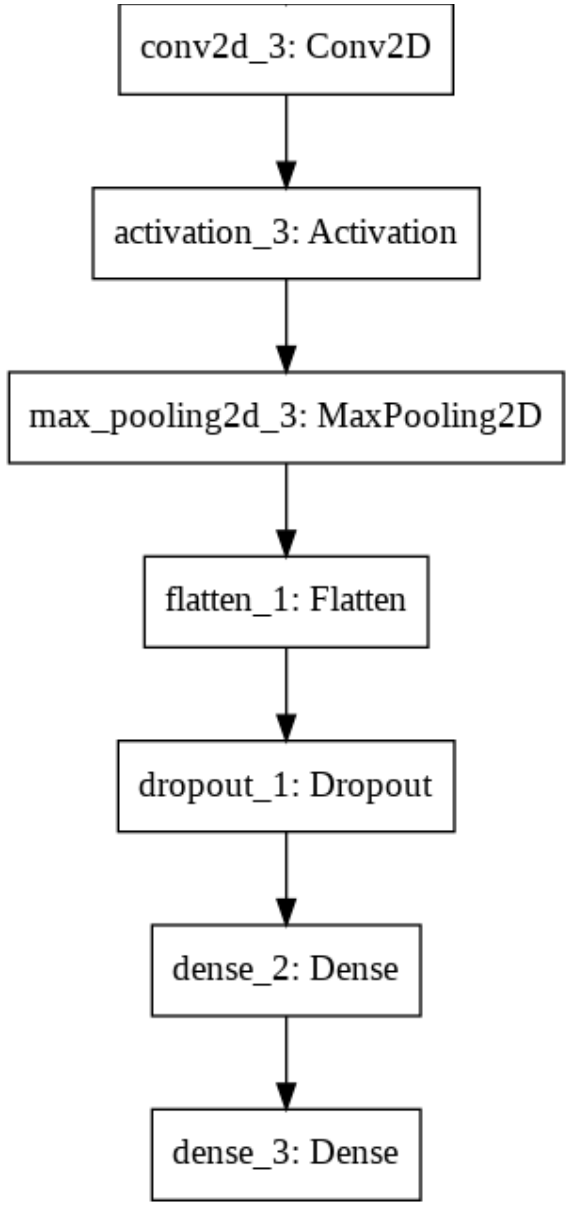
CNN Architecture

-Flatten layer

- Stack the output convolutions
- Converts the data into a 1D Array for inputing it to the next layer.

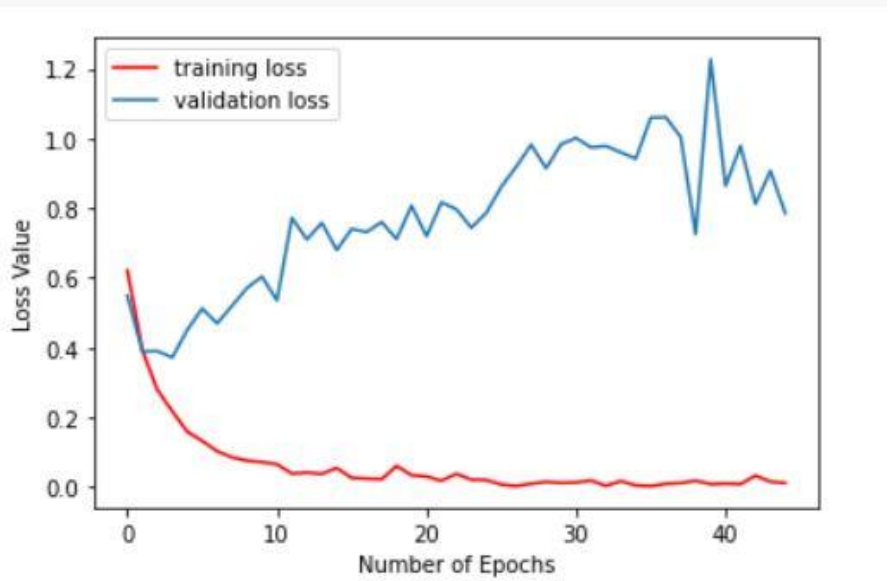
-Dropout layer

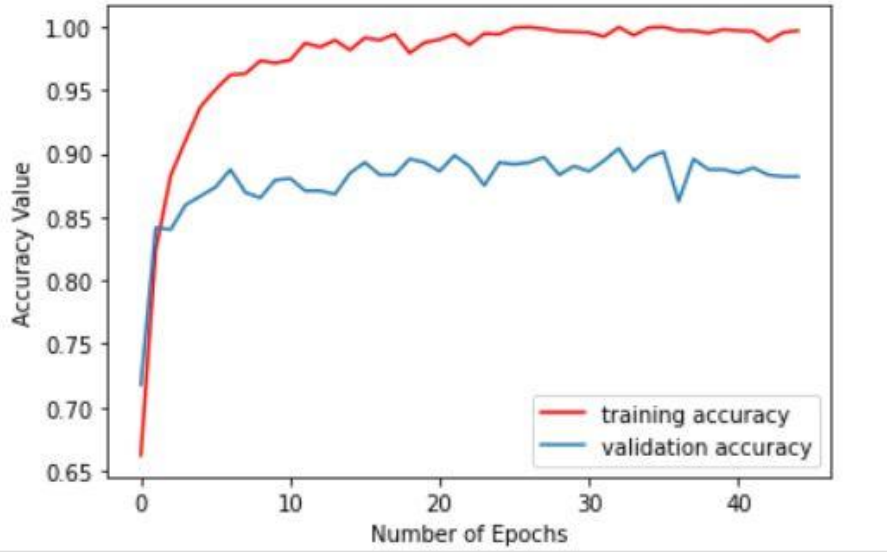
- This layer is used to avoid the overfitting problems.



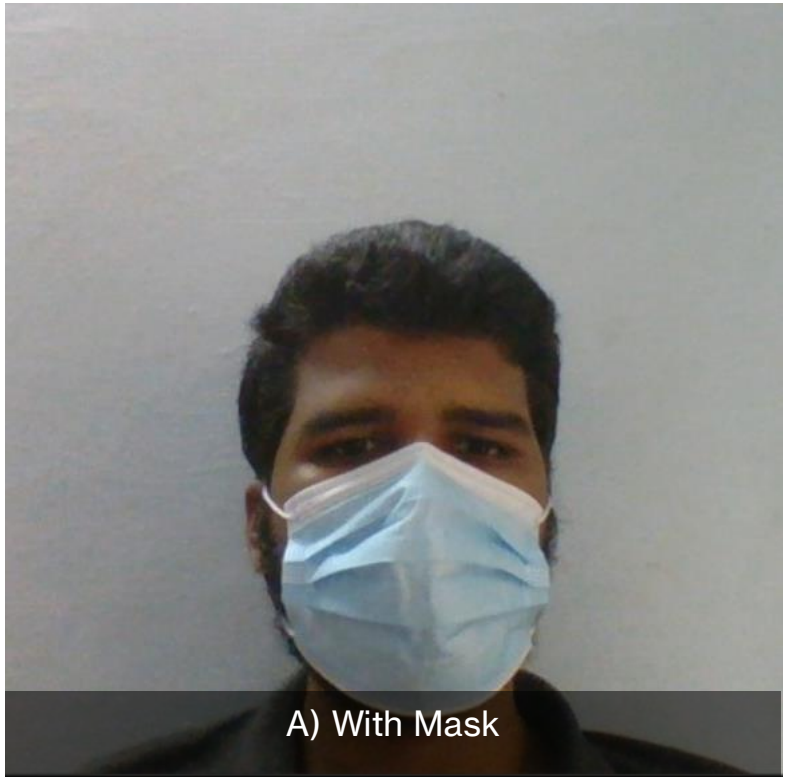
Training loss & Accuracy

- The Model seems a bit overfit but it perfoms at well in the purpose it is used. It acheieves an accuracy of 99.7% and val_accuracy of 88.8%

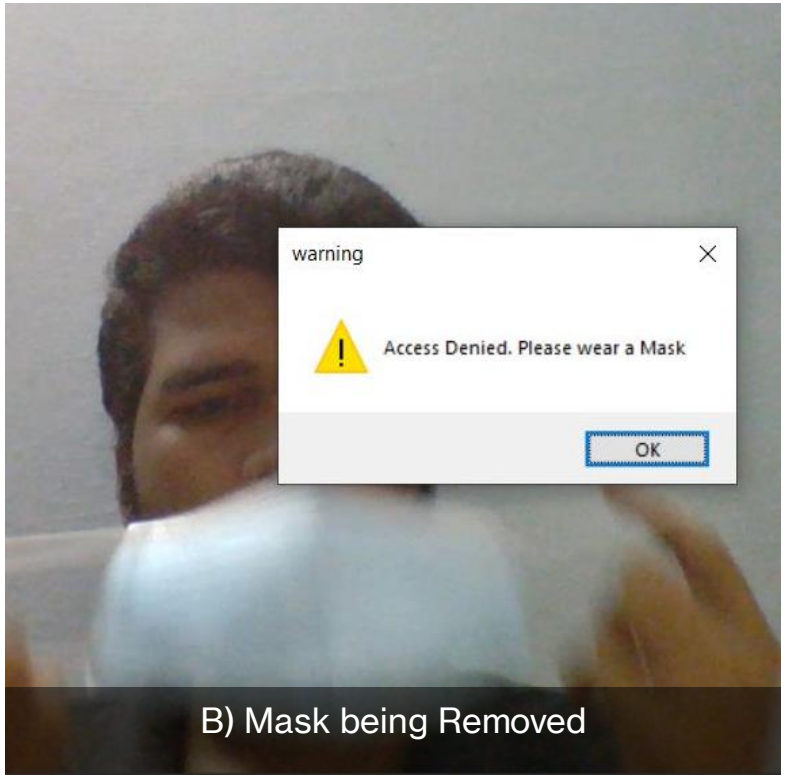




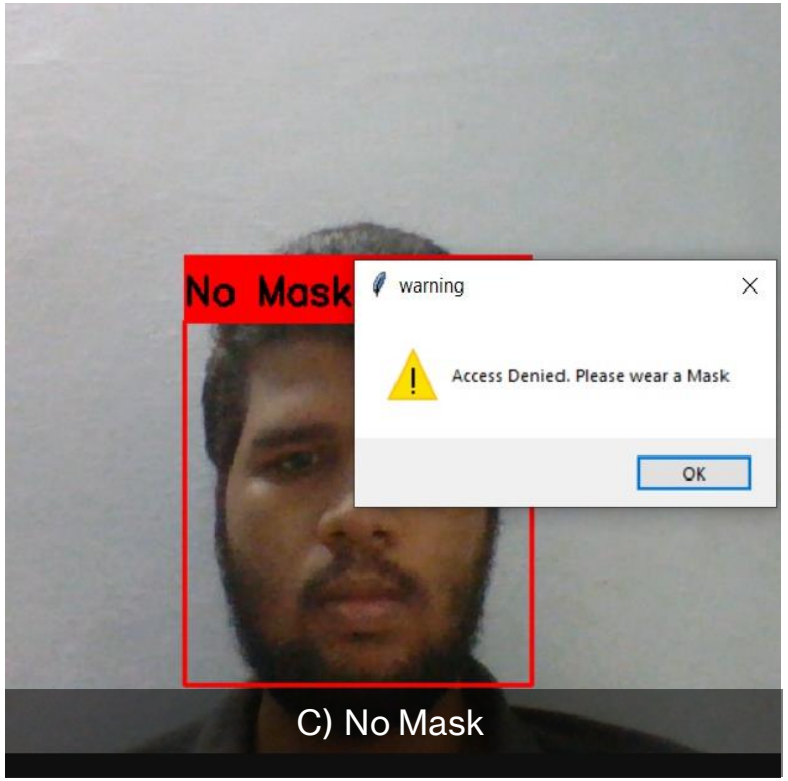
Evaluation



A) With Mask



B) Mask being Removed



C) No Mask

Alert as Email

WARNING!! Inbox ×

nelsonjoseph286@gmail.com

to bcc: me

One visitor violated Face Mask Policy. See in Camera to recognize the user

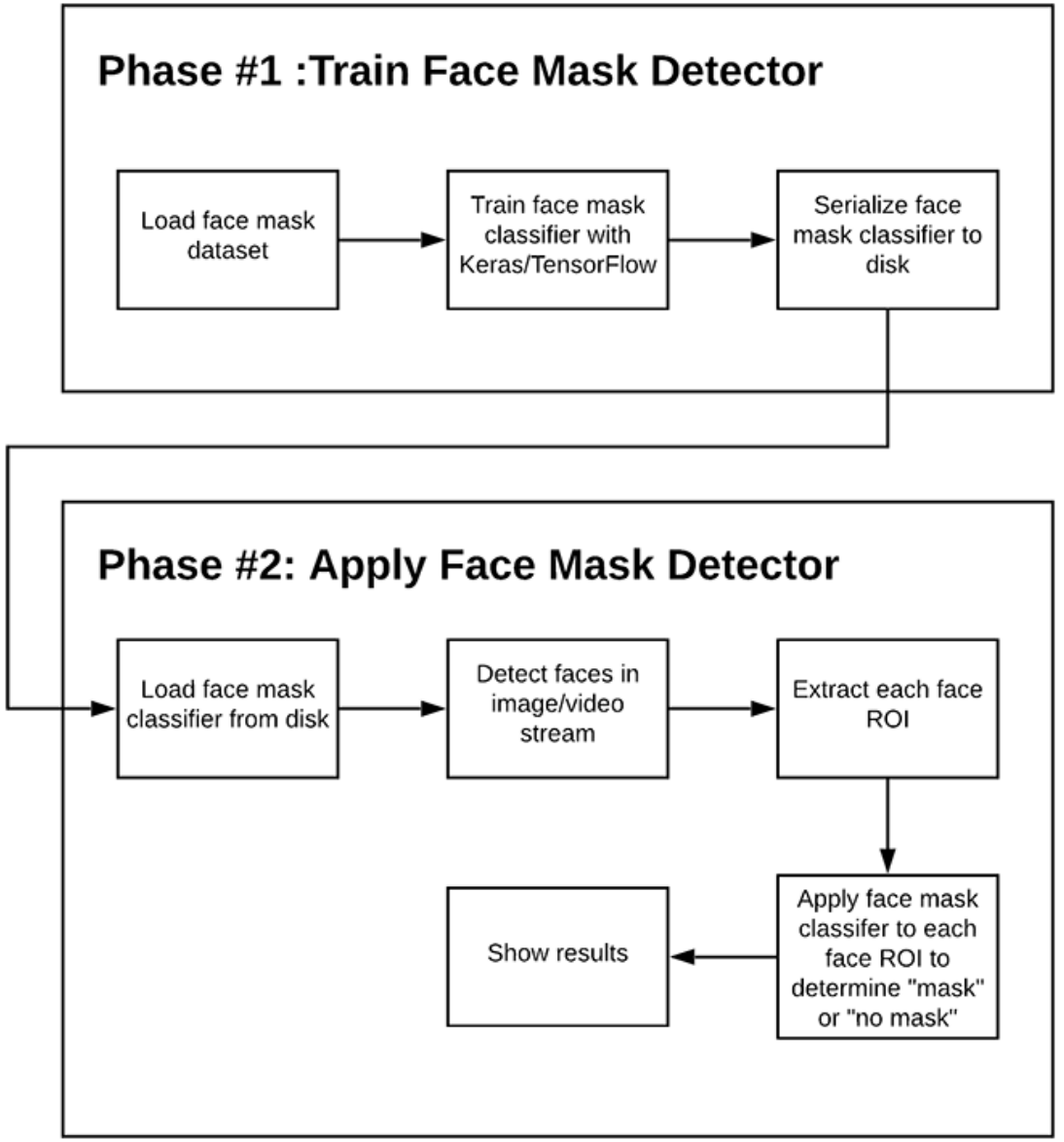
Reply Forward

Real-Time Mask Detection(2nd Level Safety Detection)

Deep Learning : The model is trained against data set containing several images of people with mask(1915) and without mask(1918). In order to train a custom face mask detector, we need to break our project into two distinct phases, each with its own respective sub-steps

- **Training:** Here we'll focus on loading our face mask detection dataset from disk, training a model (using Keras/TensorFlow) on this dataset, and then serializing the face mask detector to disk
- **Deployment:** Once the face mask detector is trained, we can then move on to loading the mask detector, performing face detection, and then classifying each face as with mask or without mask

BLOCK DIAGRAM



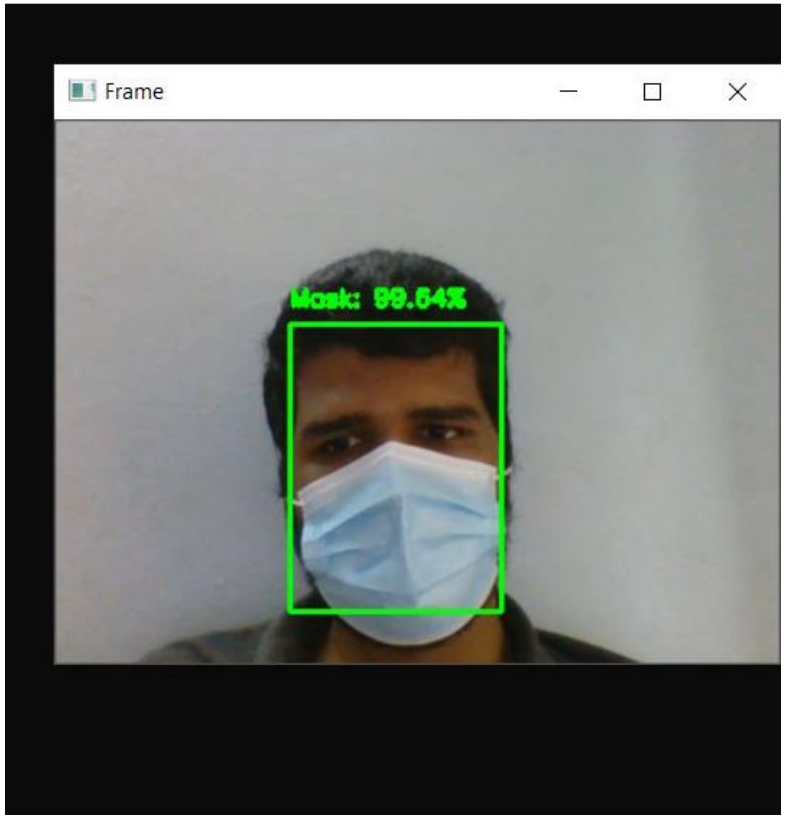
Working

- Directory and Categories are combined together.
- All images are converted to 224x224 and we convert the images to array, Pre-processing is done inorder to use MobileNetV2 Architecture.
- After the input image is processed as an array it is then send to MobileNetV2 instead of Convolution.
- Then Max Pooling is done and Flattened to get the Fully connected layer and output can be determined. Model is saved and loaded on face detector to determine the prediction.

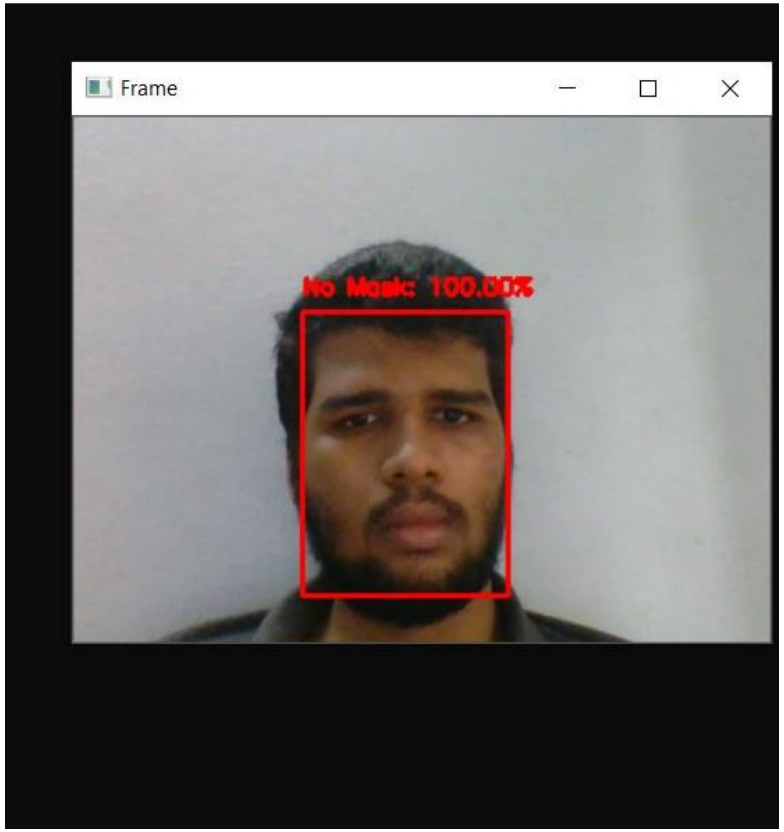
Training loss & Accuracy

- The Model shows a good fit and we achieved an accuracy of 98% on Mask and 96% on No Mask.

Evaluation



A) With Mask

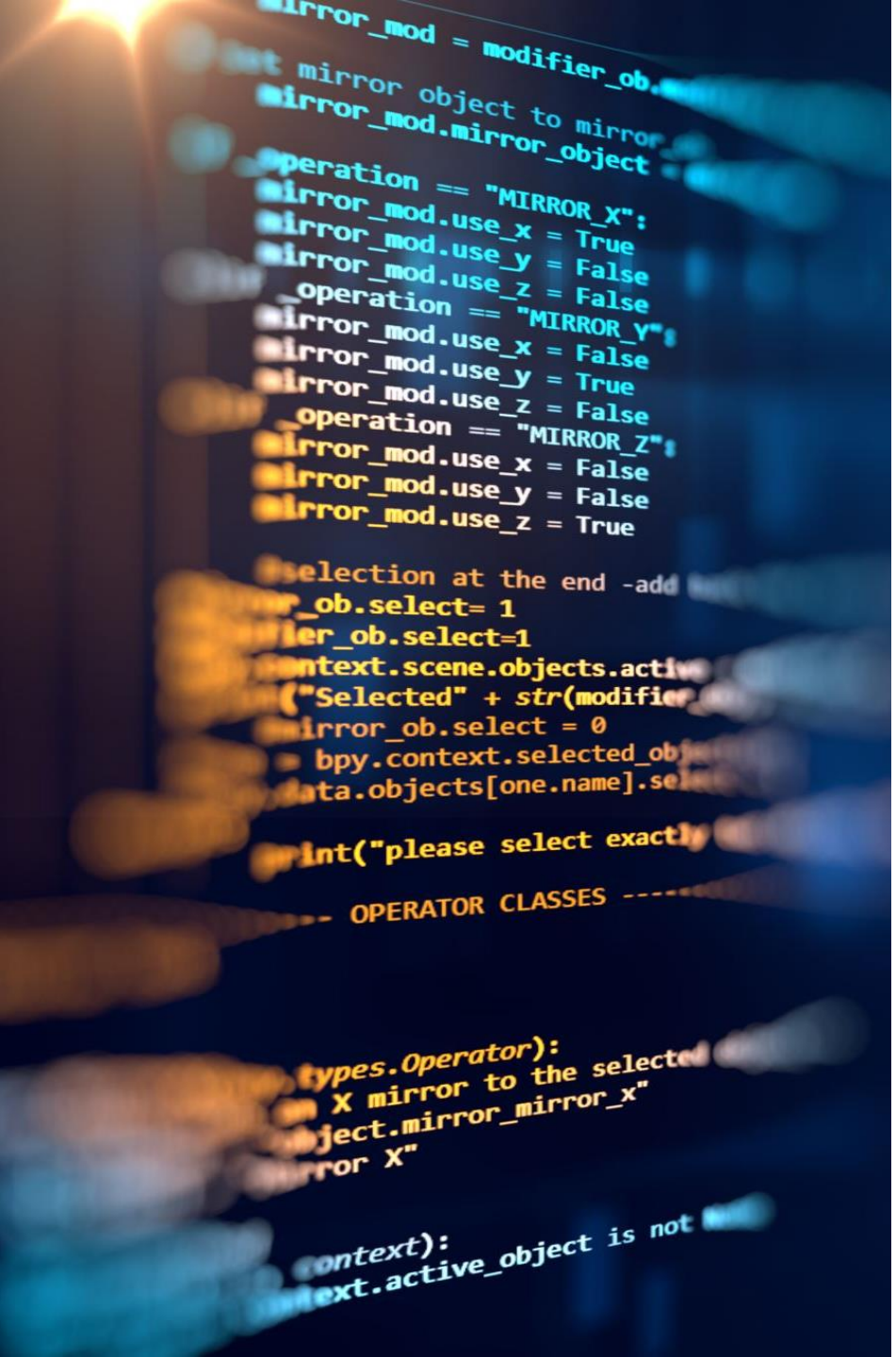


B) Without Mask

C) Test Image

FEASIBILITY STUDY

- The system is easy to implement in any existing organizational system.
- No need to install any hardware as the system can be connected with your existing surveillance system only.
- The system can be used easily with any camera or hardware like surveillance cameras.
- The system restricts access for those not wearing the masks and notifies the authorities.
- You can customize the face mask detection system based on your business requirements.
- You can check the analytics based on the system generated reports.
- Easy to access and control the movements from any device through face mask detection applications.
- Partially occluded faces either with mask or hair or hand, can be easily detected.



BUDGET

- The project is zero budget as there is no need to install any hardware as the system can be connected with your existing surveillance system only.

CONCLUSION

- Corporate giants from various verticals are turning to AI and ML, leveraging technology at the service of humanity amid the pandemic. Digital product development companies are launching mask detection API services that enable developers to build a face mask detection system quickly to serve the community amid the crisis. The technology assures reliable and real-time face detection of users wearing masks. Besides, the system is easy to deploy into any existing system of a business while keeping the safety and privacy of users' data. So the face mask detection system is going to be the leading digital solution for most industries, especially retail, healthcare, and corporate sectors.