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FACIAL EMOTION AND FACE MASK DETECTION

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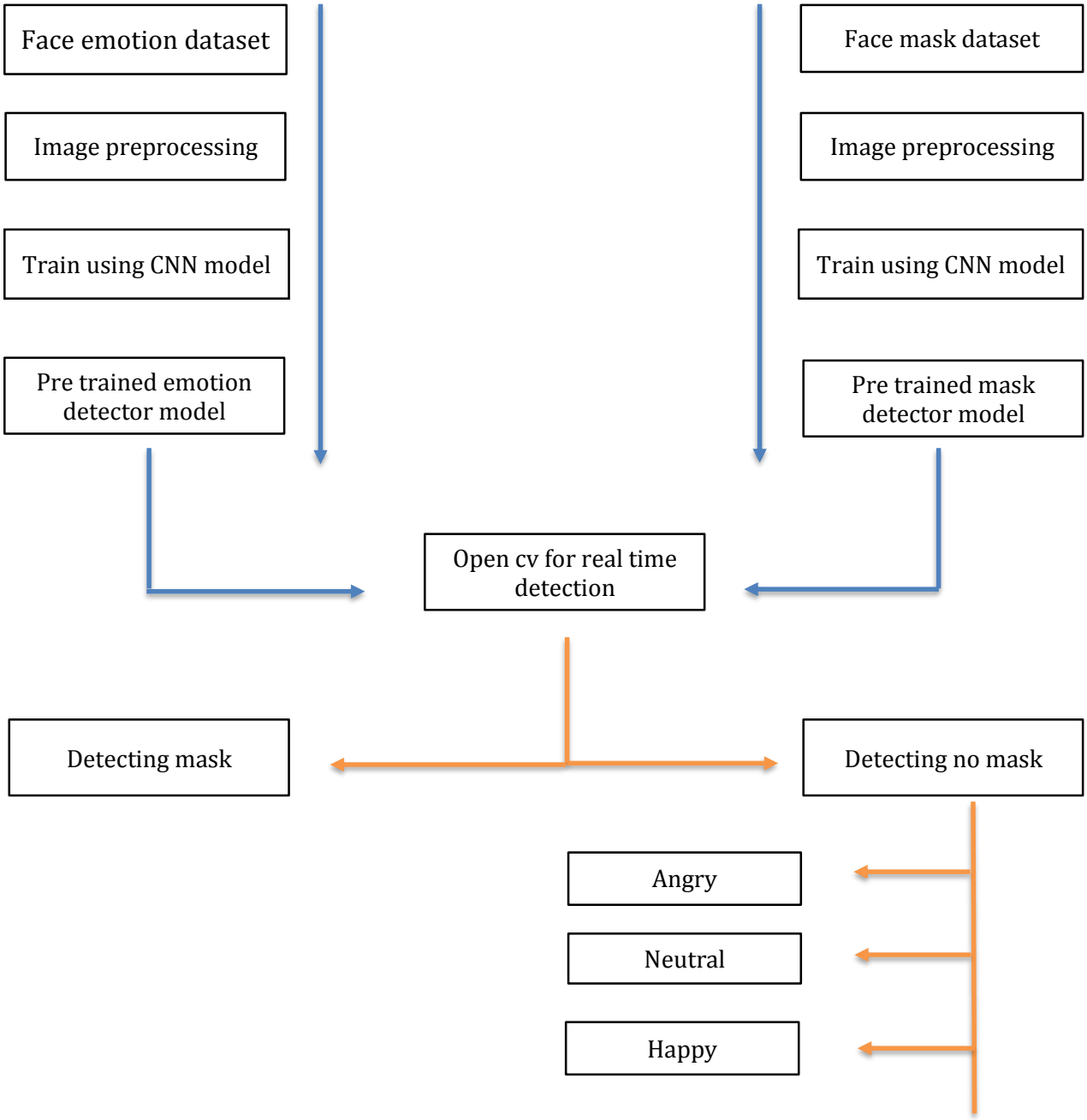
ABSTRACT
In today's world mostly work is going through the machine and their uses are increasing constantly they are helping in manpower and making our work easy and faster. Machine learning is giving the machine a perception, which can lead them to do a variety of tasks such as the variety of detections regarding human face like face mask detection combined with facial emotions. During the development of this project, we used deep learning neural network over images for clarification for different emotions and with masks, without masks. Our model will detect a person is wearing a mask or not if ‘yes’ it will detect the mask and if ‘no’ it will detect emotion in a face.

INTRODUCTION
In this pandemic, we need a detection system that will give awareness to people about wearing the mask and in case people are not wearing a mask it will detect the emotion of that human face. For the training purpose, we used a powerful deep learning algorithm, convolutional neural network (CNN) and we used the transfer learning method. We trained the face mask model using ‘mobile net V2’ and ‘VGG 16’ and we trained our face emotion model using ‘sequential’ and later we combined both models into a single screen using OpenCV real time detection.

The face emotion system is used for detecting a variety of facial expressions generated from a human face and we trained the model with 7 emotions (angry, happy, fear, disgust, sad, neutral, surprised) by which a machine will be able to understand the current ‘emotion statuses of a person [1] . The face mask system is used for detecting is a person wearing a mask which is a very important thing to do in this pandemic so the camera can detect live whether a person is wearing it or not [2] . The main aim of this project is for combining the model for combining purpose we again trained the face emotion model with 3 emotions because of limitations of data in the dataset and also for achieving good accuracy in this final model the machine will detect a person ‘with mask’ or ‘no mask’ if no it will detect emotion [3] .

METHODOLOGY



For facial emotion, we used a 'sequential model' by using learning rate: 0.001, batch size: 64, epochs: 100 and also, we used early stop and reduce learning rate and for face mask we trained using two models 'VGG16' and 'mobile net v2' by using learning rate: 0.001, batch size: 12, epochs: 20.

SOFTWARE USED

Jupyter notebook

- Python
- Anaconda navigator
- OpenCV
- Keras
- Tensorflow

HARDWARE REQUIRED

- OS - Mac / windows
- Ram - 16 GB / 8GB
- Built in or external camera for laptop
- Processor - intel i7
- GPU - AMD radon / Nvidia GTX 1060

PROPOSED SYSTEM

The system will detect if an employee or a client in an office is wearing a mask if 'yes' is good and if 'no' it will give a warning sound for wearing a mask at the same time if the person has no mask, it will detect the face emotion of that person. The system will be capable of detecting more than one employee/client/student at the same time. And it will be capable of detecting from different angles.

APPLICATIONS

- Can use as a face mask detector in office.
- Can use as a face mask detector in school.
- Can be used as a mood detecting device.
- Can be used as a face mask detector in public place.

ADVANTAGES

- It saves time.
- Reduce man power.
- Give awareness for self-protection.
- Easy to use.
- Efficient and reliable.
- Easy to manage

DIS ADVANTAGES

- Less emotions.

RESULTS

Table 1. Training and validation accuracy table

Detectors	**Training accuracy**	**Validation accuracy**
Face mask	VGG16 - 99 % MobilenetV2 - 95 %	VGG16 - 92 % MobilenetV2- 85 %
Face emotion	Sequential - 76 %	Sequential - 65 %

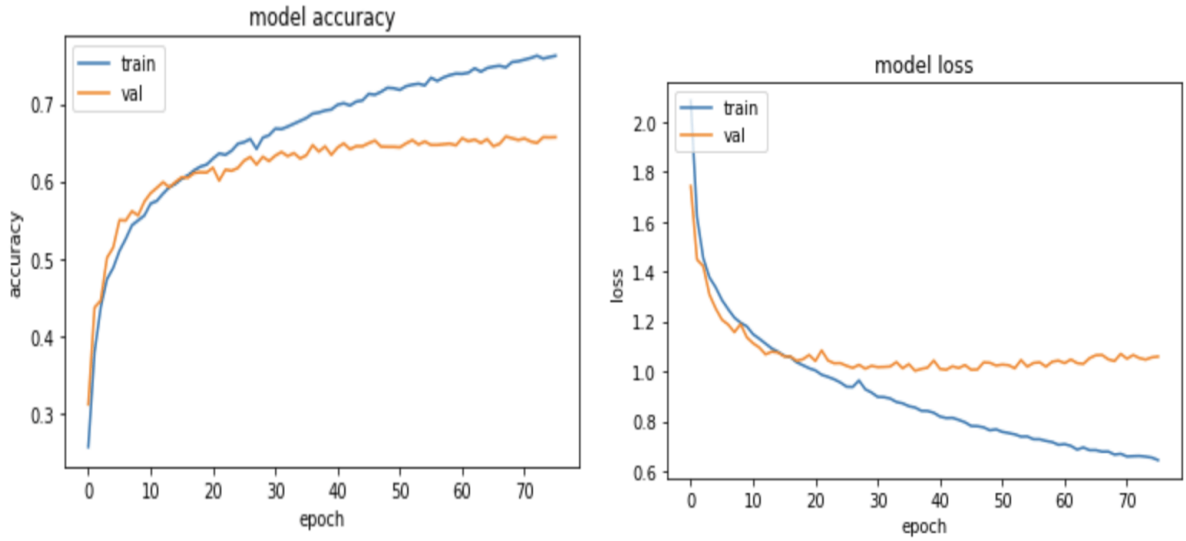


Figure 1 : Model Accuracy/ Loss graph

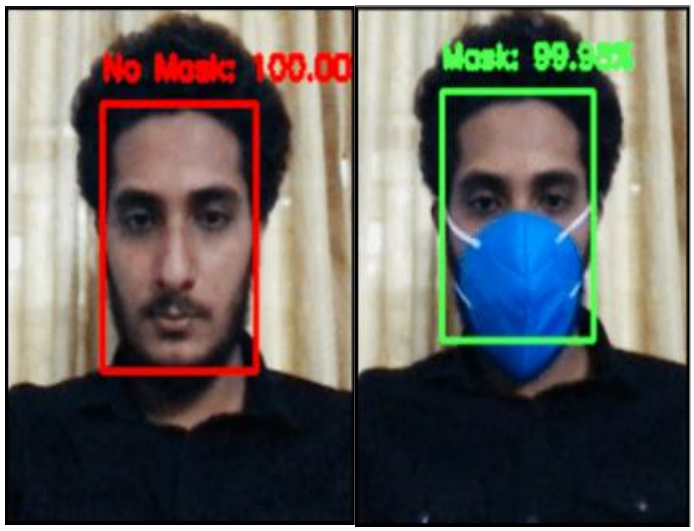


Figure 2 : Output MobileNet v2

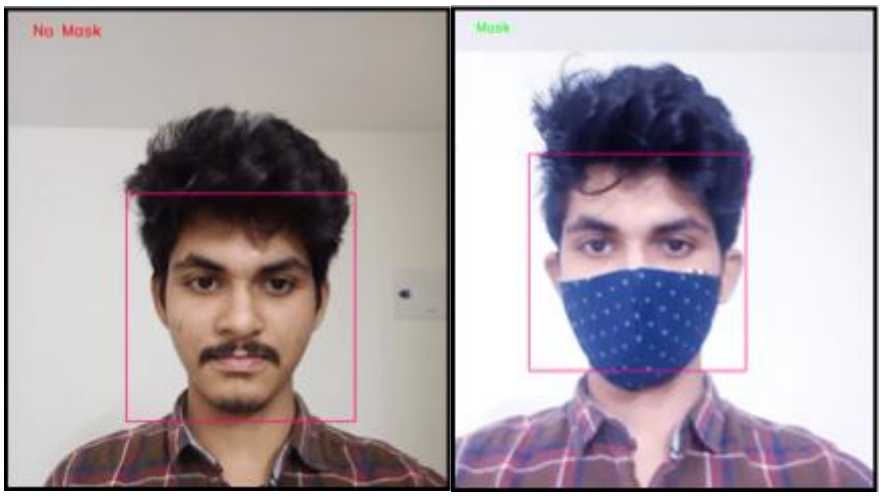


Figure 3: Output VGG16

Figure 4 : Final output (combined model)

CONCLUSION

The experiment is implemented successfully and hence shows the proposed system can be successfully exploited for face mask violation detection with emotions. It is able to process on real-time images and video streams which makes it applicable in the real world as it can work on limited computational capability devices also. We all know technology is emerging with trends do our project may possibly contribute to the public health care in this pandemic.

FUTURE SCOPE

We are planning to improve our face mask with an emotion tool that can be released as an open-source project, and our software can be equated to an existing USB, IP cameras, and CCTV for further progressed detection which can make a drastic change in the public health care.

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