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Face Mask Detection System

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Abstract- Efficient strategies to contain Coronavirus Disease- 2019 (COVID-19) pandemic are peremptory to relieve the negatively impacted public health and global economy with the full scope yet to unfold. In absence of highly effective drugs, vaccines, and abundant medical resources, many measures are taken to manage the infection rate and avoid the depletion of limited hospital resources. Wearing mask among the non pharmaceutical intervention (NPI) measures that could be effectively implemented at minimum cost and without dramatically disrupting social practices. Therefore, it is essential to develop a system that detects the citizens who wear a face mask and those who do not. This system is developed using Machine Learning and Deep Learning techniques and build a CNN model to detect people wearing masks and not wearing masks using an image or a video stream as input. Face mask is a part of infection control strategy to eliminate cross-contamination

Keywords – CNN model , Deep learning, Machine learning, K-Nearest Neighbors, Viola-Jones algorithm

I. INTRODUCTION

In 2020 the largest pandemic in recent history spread through world: COVID-19. As of May 1st, 2021, there have already been 152 million cases and 3 million deaths around the world. In many regions, those numbers are considerably under-counted. Beyond that, many parts of the world have slowed or stopped due to the human, economic, and social impact of distancing and protection measures. For the purpose of the ongoing pandemic and predictions for future pandemics, our project seeks to create a mask detection system that is capable of recognizing whether the people in the surveillance-type video streams are correctly wearing their masks. Given the potential benefits of saving lives, improving mental health, and keeping the world going, face mask detection technologies could play a part in bringing this pandemic to a control and preventing further spreading in the future and hence effectively improving our collective well-being

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II. PROPOSED SYSTEM

From Our proposed model is an integration between deep learning and classical machine learning techniques with OpenCV, Keras and TensorFlow. Our model consists of about 2000 images which is split into ‘faces with mask and without mask’. By using these images as dataset, we are going to build a Convolutional Neural Network model. The built model is then used to detect people wearing mask and not wearing mask from the image or live video stream The proposed system aims to detect whether a person is wearing mask or not, to contribute towards communal health by reducing the spread of Covid-19. The working modules in this system are dataset collection, extraction of datasets, training of the model and

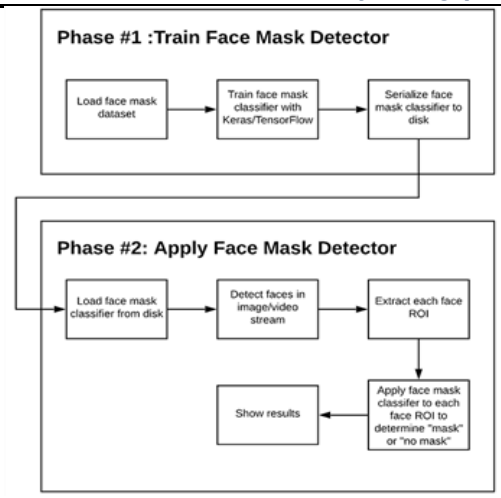


Figure 1. Working of the Face mask detector

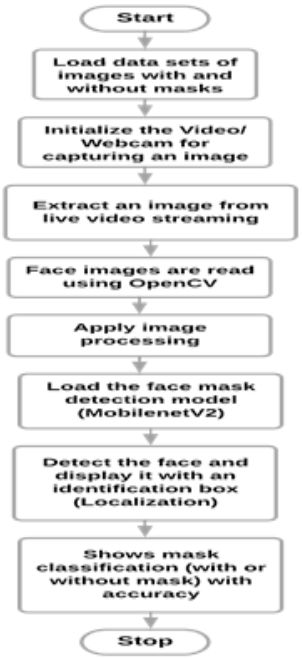


Figure 2. Flow chart of the proposed syste

III. Experiment and Result

3.1. Collecting Datasets and pre-processing

We collect number of data sets with face mask and without masks. We can obtain high accuracy depending on the number of images collected. The dataset for training contains a lot of noise and duplicates. The accuracy of the model depends on the dataset chosen for training. The dataset hence has to be pre-processed before being fed as input. The images are resized and the pixel representation of the images are converted into list format in accordance with the MobileNetV2 model. This list is then transformed to a NumPy array for quick mathematical operations.

3.2. Data Visualization

In this step we visualize the images in data set to understand the significance of data and to communicate the information clearly and efficiently. Image is viewed using matplotlib in a grid 4x4 consisting of 16 images. First 8 images consist of masked people followed by 8 non masked images.

3.3. Data Augmentation

This is a technique to artificially create new training data from existing training data. Image data augmentation is used to expand the training dataset in order to improve the performance and ability of the model to generalize. It performs shift, flip, rotate and 13 zoom operations on images to increase the number of images. Image data augmentation is supported in the Keras deep learning library via the ImageDataGenerator class.

3.4. Building CNN model

The CNN is a machine learning algorithm that can take an input image, assign learnable weights and biases to various objects in the image and be able to differentiate one from the other. Here the image dataset undergoes many layers of convolution and pooling which results in the flattening of the image. These flattened layers are fully connected in order to obtain a softmax. Features are identified and extracted during the convolution and pooling steps, whereas classification is done in the later steps.

3.5. Compiling and training the model

The model is fed with images with mask and without mask for training. Once the training is completed, the model is tested and validated.

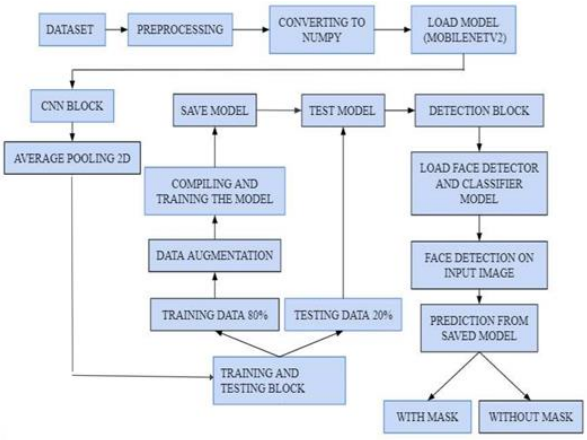
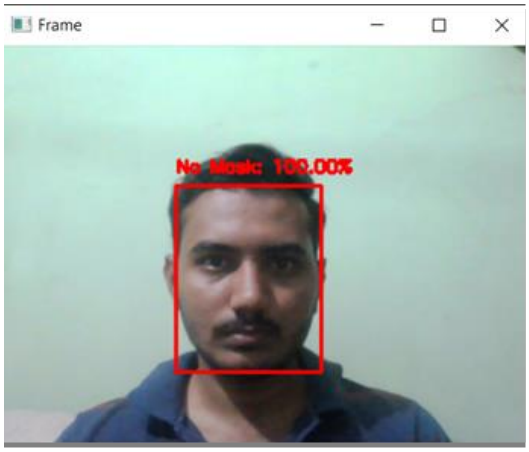


Figure 3. Working of the model



(a) Person not wearing a mask

(b) Person wearing a mask

3.6.Future Work

The proposed model gives great accuracy for single face with and without mask. It gives considerable accuracy for multiple faces too. It is compatible on any device, and doesn't need any external hardware devices or any other requirement, other than switching on the video streaming. Further, we can improve the accuracy for multiple face mask detection and enable the feature to classify the faces into three categories - with mask, without mask and improper mask by adding datasets consisting images of people wearing masks without covering their noses properly. We can also make improvement to the existing model by adding attendance marking feature using the detection of masked faces using the FaceNet model of Convolutional Neural Network

IV.CONCLUSION

The proposed model on detection of face mask is developed with the model created with CNN architecture using MobileNetV2 which gives a good result with perfect accuracy of detection. The data is trained and tested for the model to gain good accuracy while detection. The other researchers have many problems in output, using the dataset, only some were able to get better accuracy.Wrong predictions are removed successfully from this model since the dataset used is collected from various other sources. The images which is used in the dataset is pre-processed well to get better accuracy of the result.This system can therefore be used in real-time applications which require face-mask detection for safety purposes due to the outbreak of Covid-19. This project can be integrated with embedded systems for application in airports, railway stations, offices, schools, and public places to ensure that public safety guidelines are followed

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