A Project Report

on

FACE DETECTION WHILE WEARING MASK DIGITAL IMAGE PROCESSING

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE

Under The Supervision of
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CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled **"FACE DETECTION WHILE WEARING MASK DIGITAL IMAGE PROCESSING"** in partial fulfillment of the requirements for the award of the B.TECH CSE (3RD YEAR) submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during 23th September, 2021, under the supervision of **MR. RAJKAMAL KISHOR GUPTA**, Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida .

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degree of this or any other places.

NAVDEEP SINGH (19SCSE1010787)
SONALI KUMARI (19SCSE1010827)

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Supervisor: (**MR. RAJKAMAL KISHOR GUPTA)**

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voce examination SONALI KUMARI (19SCSE1010827) AND NAVDEEP SINGH (19SCSE1010787) of has been held on _____ and his/her work is recommended for the award of BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date: November, 2021

Place: Greater Noida

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Abstract

The purpose of face detection while wear mask is to determine if there are any faces in the photo or video. Face recognition is a method of identifying or verifying the identity of an individual using their face id. There are various algorithms that can do face recognition but their accuracy might vary. Here to describe how we do face recognition using deep learning. For example, now a days most of the people are wearing mask. While wearing mask it is very difficult to identify any individual. During the difficult time of covid -19 there was sudden increase in criminal activity, so most of the time the victim was not able to portray facial structure of the criminal then security camera around the area work on the principle of face detection can easily identify the individual weather the person is wearing a mask or not. So, with the help of this software, it is easy to identify the person under the mask.

Introduction about Project

Face detection - also called face detection - is a computer-assisted computer (AI) technology used to detect and detect human faces in digital images. Face detection technology can be used in a variety of fields - including security, biometrics, law enforcement, entertainment and personal security - to provide real-time monitoring and tracking of people. (ML) on neural networks (ANN) and cold-blood technology and related technologies; the result has been a continuous improvement in performance. It now plays an important role as a first step in many important applications - including face tracking, facial recognition and facial recognition. Face detection has a huge impact on the sequence of operations that will work in the app. In facial analysis, face detection helps to identify which parts of the image or video should be focused on to find age, gender and emotions using face. In the face recognition system - which makes mathematical facial expressions and saves data as a faceprint - facial recognition data is required for algorithms that detect which parts of an image or video are needed to make an image. Once detected, the new image text can be compared to the archives to determine if there is a match.

The virus spreads through close contact of humans and in crowded/overcrowded places. Among them cleaning hands, maintaining a safe distance, wearing a mask, refraining from touching eyes, nose, and mouth are the main, where wearing a mask is the simplest one. Unfortunately, people are not following these rules properly which is resulting in speeding the spread of this virus. The solution can be to detect the people not wearing mask and informing their authorities. the face mask detection is a technique to find out whether the person is wearing a mask or not. In medical applications Deep learning techniques are highly used as it allows

researchers to study and evaluate large quantities of data. Deep learning models have shown great role in object detection. These models and architectures can be used in detecting the mask on a face. Here we introduce a face mask detection model which is based on computer vision and deep learning. The proposed model can be integrated with computer or laptop cameras allowing it to detect people who are wearing masks and not wearing masks. The model has been put together using deep learning and classical machine learning techniques with opencv, tensor flow and keras. We have introduced a comparison between three machine learning algorithms to find the most suitable algorithm that yields the highest accuracy. The spread of COVID-19 virus has reduced but it is still not over. If everyone follows all the safety measures, then it can come to an end. This will help in lowering the cases to such a level that COVID19 virus can vanish from everywhere.

Requirements , Feasibility

I have used the following module to develop the algorithm,

- **PyTorch DataLoader** – which is used to load the data from the Image Folder
- **PyTorch DataSets ImageFolder** – which is used to locate the image sources and also have a predefined module to label the target variable.
- **Pytorch Transforms** – helped to apply the preprocessing steps over the source image while reading from the source folder.
- **PyTorch Device** – identifies the running system capabilities like CPU or GPU power to train the model. It will help us to switch the system usage.
- **Pytorch TorchVision** – it will help us to load the libraries which are created before. Like pretrained models, image sources and so on. It is one of core in PyTorch
- **PyTorch nn** – it is one of the core modules. This module helps us to build our own Deep Neural

  Network (DNN) models. It has all the libraries needed to build the model. Like Linear layer, Convolution layer with 1D, conv2d, conv3d, sequence, CrossEntropy Loss (loss function), Softmax, ReLu and so on.
- **PyTorch Optim** – help us to define the model optimizer. it will help the model to learn the data well.

  For example Adam, SDG and so on.
- **Pytorch PIL** – helps to load the image from the source.
- **PyTorch AutoGrad** – another important module, it provides automatic differentiation for all operations on Tensors. For example, a single line of code .backward() to calculate the gradients automatically. This is very useful while implementing the backpropagation in DNN.

REQUIREMENT TOOLS –

- Tensorflow
- Keras
- Numpy opencv
- Java: Java is a complete programming language such as C or C ++. It takes a complex processor to create a Java code.
- HTML: This is the standard language of documents that are designed to be displayed in a web browser.

Architecture Development

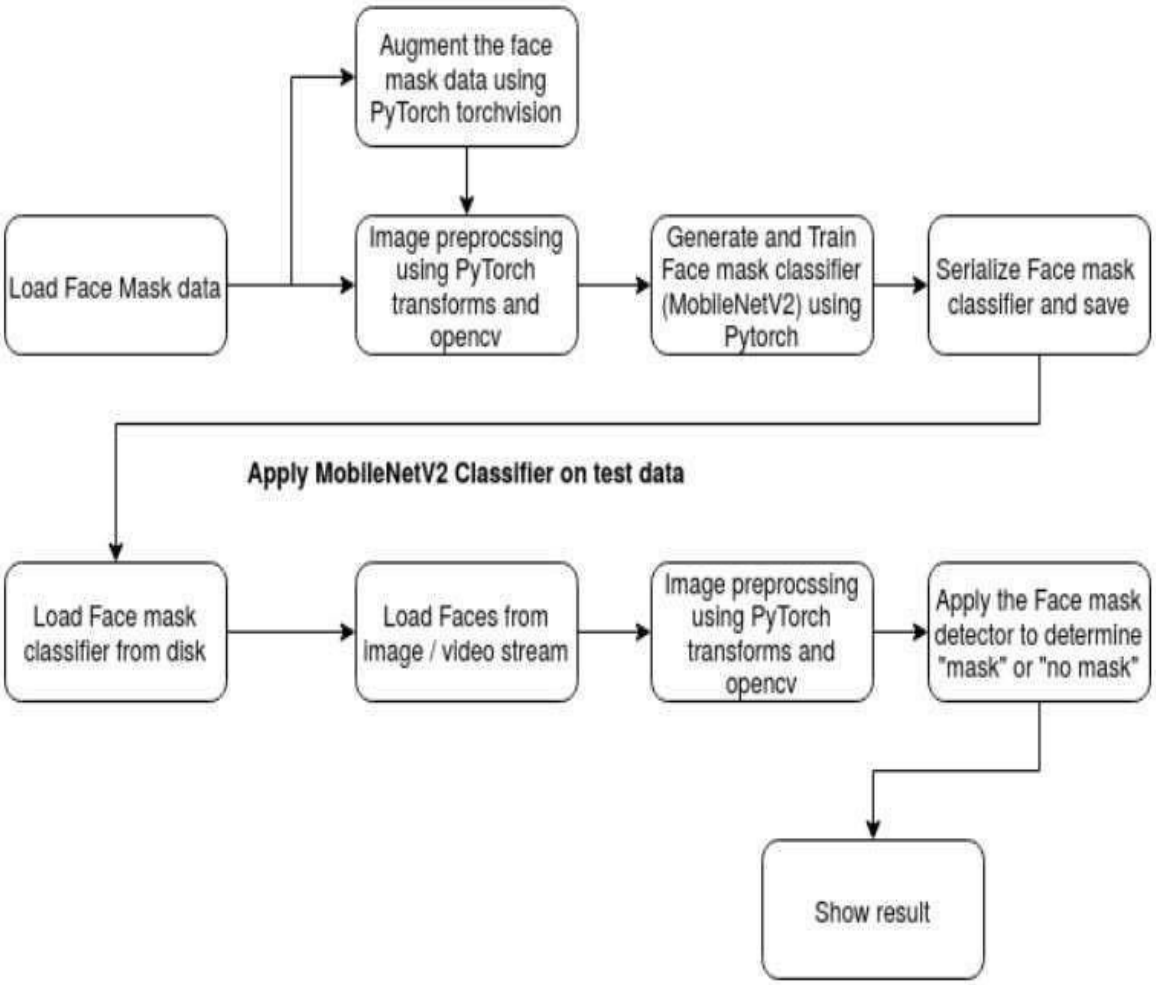
The learning model is based on CNN which is very useful for pattern recognition from images. Neural Network need to see data from both the classes. The network comprises an input layer, several hidden layers and an output layer. The hidden layers consist of multiple convolution layers. The features extracted by CNN are used by multiple dense neural networks for classification purposes. The architecture contains three pairs of convolution layers each followed by one max pooling layer. The convolution layer contains 100 kernels of window size 3x3. Max pooling layer of window size 2x2. This layer will be aggregating the results from the previous convolution layer and will be picking the max value in that 2x2 window. It decreases the spatial size of the representation and thereby reduces the number of parameters. As a result, the computation is simplified for the network. The output of the convolution layers will be flattened and will be converted into a 1-D array. Then there is one dropout layer and two dense layers. The dropout layer prevents the network from overfitting by dropping out units. The dense layer comprises a series of neurons each of them learn nonlinear features. The flattened result this will be fed to the first dense layer of 50 nodes. Then finally second dense layer containing two nodes as there are two classes.

Analysis, Activity Time Schedule (PERT)

By preserving a reasonable proportion of different classes, the dataset is partitioned into training and testing set. The dataset comprises of 1315 samples in total where 80% is used in training phase and 20% is used in testing phase. The developed architecture is trained for 10 epochs since further training results cause overfitting on the training data. Overfitting generally occurs when a model learns the unwanted patterns of the training samples. Hence, training accuracy increases but test accuracy decreases. Fig1. shows the graphical view of accuracy and loss respectively. The trained model showed 95% accuracy. Merits of Purposed System

The proposed system focuses on how to identify the person on image/video stream wearing face mask with the help of computer vision and deep learning algorithm by using the OpenCV, Tensor flow, Keras and PyTorch library.

DESIGN



Implementation and Testing

Implementation:

We have four modules

1. Datasets Collecting: We collect no of data sets with face mask and without masks. We can get high accuracy depends on collecting the number of images.

2. Datasets Extracting: We can extract the features using mobile net v2 of mask and no mask sets

3. Models Training: We will train the model using open cv, keras (python library).

4. Facemask Detection: We can detect Pre-processing image and also detect via live video. If people wear mask, it will permit them, if not then it will give the buzzer to wear mask to prevent them from virus transmission.

Limitations and Future

The developed system can detect the live video streams but does not keep a record. Unlike the CCTV camera footage the admin can not rewind, play or pause it. As whenever a strict system is imposed people always try to break it. Hence when a person is detected with no mask, the head of the organization can be notified via mail that so and so person entered without mask. The proposed system can be integrated with databases of respective organizations to keep a record of the person who entered without mask. With more complex functions a screenshot of the person's face can also be attached to keep it as a proof.

Conclusion

As the technology is booming with emerging trends therefore the novel face mask detector which can possibly contribute to public healthcare. The model is trained on an authentic dataset. We used OpenCV, tensor flow, keras and CNN to detect whether people were wearing face masks or not. The models were tested with images and real-time video. The accuracy of the model is achieved and, the optimization of the model is a continuous process and we are building an accurate solution by tuning the hyper parameters. This specific model could be used as a use case for edge analytics. By the developing this system, we can detect if the person is wearing a face mask and allow their entry would be of great help to the society.

In this work, an in-depth learning approach based on getting face masks in public places has been introduced to curb the spread of Coronavirus. The proposed process effectively manages to emerge from congested conditions using a single and two-phase detector set at preprocessing level. The combination method not only helps to achieve high accuracy but also improves the speed of recovery. In addition, the use of learning transfer in previously trained models with more extensive testing of non-biased data has led to a more robust and costeffective system. The acquisition of facial identity, which violates the practices of the mask going forward, increases the use of the system for the benefit of the community. Finally, the work opens the way for future researchers. First, the proposed process can be integrated into any high-resolution video surveillance devices and is not limited to masks acquisition. Second, the model can be expanded to identify landmarks with faces for biometric purposes.

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