REAL - TIME FACE MASK DETECTOR

[1]VOLETI LAHARI,[2]REDDEM MANISHA,[3]MALLABATINA TEJASRI

[1,2,3]*Computer Science Department, Jawaharlal Nehru Technological University Kakinada, Vijayawada*

Abstract:

.A new strain which has not previously been identified in humans is novel coronavirus (nCoV). Coronaviruses (CoV) are a wide group of viruses which cause illness that range from colds to deadly infections like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome(SARS). COVID-19 pandemic caused by novel coronavirus is continuously spreading until now all over the world .The impact of COVID-19 has been fallen on almost all sectors of development. The healthcare system is going through a crisis. Many precautionary measures have been taken to reduce the spread of this disease where wearing a mask is one of them. In this paper, we propose a system that restrict the growth of COVID-19 by finding out people who are not wearing any facial mask in a smart city network where all the public places are monitored with Closed-Circuit Television (CCTV) cameras. A face mask detection is a technique to find out whether someone is wearing a mask or not.

Introduction:

The spread of COVID-19 is increasingly worrying for everyone in the world. This virus can be affected from human to human through the droplets and airborne. According to the instruction from WHO, to reduce the spread of COVID-19, every people need to wear face mask, do social distancing, evade the crowd area and also always maintain the immune system. Therefore, to protect each other, every person should wear the face mask properly when they are in outdoor. However, most of selfish people won't wear the face mask properly with so many reasons. The year 2020 has shown mankind some mind-boggling series of events amongst which the COVID-19 pandemic is the most life-changing event which has startled the world since the year began.

Affecting the health and lives of masses, COVID-19 has called for strict measures to be followed in order to prevent thes pread of disease. From the very basic hygiene standards to the treatments in the hospitals, people are doing all they can for their own and the society's safety; face masks are one of the personal protective equipment. People wear face masks once they step out of their homes and authorities strictly ensure that people are wearing face masks while they are in groups and public places.

Literature Survey:

Object detection is one of the trending topics in the field of image processing and computer vision. Ranging from small scale personal applications to large scale industrial applications, object detection and recognition is employed in a wide range of industries. Some examples include image retrieval, security and intelligence OCR, medical imaging and agricultural monitoring. In object detection, an image is read and one or more objects in that image are categorized. The location of those objects is also specified by a boundary called the bounding box. Traditionally,researchers used pattern recognition to predict faces based on prior face models. A breakthrough face detection technology then was developed named as Viola Jones detector that was an optimized technique of using Haar digital image feature used in object recognition. However, it failed because it did not perform well on faces in dark areas and non-frontal faces. Since then, researchers are eager to develop new algorithms based on deep learning to improve the models.

Deep learning allows us to learn features with end to end manner and removing the need to use prior knowledge for forming feature extractors.

In the second project ,a dataset was created by Prajna Bhandary using a PyImageSearch reader. This dataset consists of 1,376 images belonging to all races and is balanced. There are 690 images with masks and 686 without masks.
Firstly, it took normal images of faces and then created a customized computer vision Python script to add face masks to them. Thereby, it created a real-world applicable artificial dataset. This method used the facial landmarks which allow them detect the different parts of the faces such as eyes, eyebrows, nose, mouth, jawline etc. To use the facial landmarks, it takes a picture of a person who is not wearing a mask, and, then, it detects the portion of that person's face

Objectives:

The objectives for the project are:

Given the trained COVID-19 face mask detector, we'll proceed to implement two important
Python scripts used to:
1)Detect COVID-19 face masks in images

2)Detect face masks in real-time video streams

3)Detect face masks of multiple people

Methodology:

In the proposed method we use deep learning to create a model of a pre-trained CNN which contains two 2D convolution layers. The steps for face mask detection are as follows:
A. Data   Processing
   i.Data Visualization

ii.Conversion of RGB image to Gray image

B. Training of Model
i.Building the model using CNN architecture
ii.Splitting the data and training the CNN model

Convolutional Neural Networks:

Convolutional Neural Networks (CNNs)(LeCun et al., 1998) is a key aspect in modern Computer Vision tasks like pattern object detection ,image classification,   pattern recognition tasks, etc. A CNN uses convolution kernels to convolve with the original images or feature   maps   to   extract higher-level features, thus resulting in a   very powerful tool for Computer Vision tasks.

Proposed Methodology:

We propose a two-stage architecture for detecting masked and unmasked faces and localizing them.

Architecture Overview:
.It represents our   proposed   system architecture (input image taken from the dataset by (Larxel, 2020)). It consists of two major stages. The first stage of our architecture includes a Face Detector, which localizes multiple faces in images of varying sizes and detects faces even in over aping scenarios. The detected faces (regions of interest) extracted from this stage are then batched together and passed to the second stage of our architecture, which is a CNN based Face Mask Classifier. The results from the second stage are decoded and the final output is the image with all the faces in the image correctly detected and classified as either masked or unmasked faces

The working of the project is :

In the First Phase WE first load the facemask data set into the code and then train the neural network classifier with keras and tensorflow and then serialise this face mask classifier to the disc.

In the second phase we apply the face mask detector That We trained first. We start by loading the face mask classifier from the disk after the serialisation. Then we detect the faces from the images given by the user or we detect faces from live video stream. hen we extract the face ROI of the images. ROI means region of intrest - this is just a rectangular box over the face of image which is used for mask detection. Then the next step is to apply the face mask CLASSIFIER that is the convolutional neural network on the newly taken face images to determine whether it is having a mask or no mask. At the end the prediction results are shown including the percentage of face coverage.
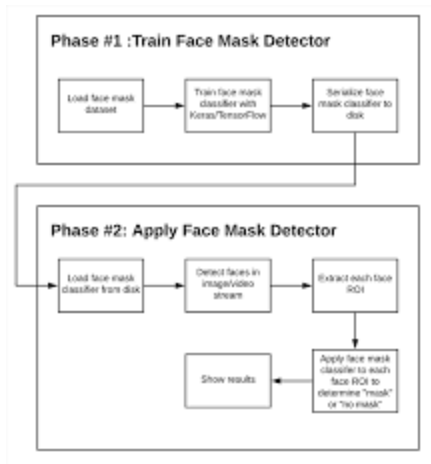

Fig: System architecture

Test cases:

Testcases for this project is as follows:

Experimental analysis and results:

.When we run the code, the system gets trained and then the webcam will be turned on automatically. after that we will get a result tab does live detection on one person or multiple Number of persons and shows whether they are having a mask or not. it also shows date and time and also this inteface has a special feature. whenever a person without a mask is present before the webcam it gives an alarming sound alerting the person to wear mask.

Fig: User interface

In our project, we used a dataset from kaggle which
consists of 1508 images of people with mask and without
mask.We then split 90% of dataset images into training set
and 10% as testing set.
The exact figures are as follows:

    Training set :   194   images
    Testing set   :   1314 images

Fig:DataSet

Execution:

To execute this code we can use many different applications like:

- Python IDLE

- Jupyter notebook

- Anaconda Command Prompt

Results:

Fig: With Mask

Fig: Without Mask

Conclusion:

In this paper, we briefly explained the motivation of the work at first. Then, we illustrated the learning and performance task of the model. Using basic ML tools and simplified techniques the method has achieved reasonably high accuracy. It can be used for a variety of applications. Wearing a mask may be obligatory in the near future, considering the Covid-19 crisis. Many public service providers will ask the customers to wear masks correctly to avail of their services. The deployed model will contribute immensely to the public health care system. In future it can be extended to detect if a person is wearing the mask properly or not. The model can be further improved to detect

if the mask is virus prone or not i.e. the type of the mask is surgical, N95 or not.

Acknowledgement:

We express our deep sense of Gratitude to our Major-Project Guide and shall remain grateful to our guide P M.PRASUNA, for her inspiring guidance throughout project and for valuable suggestions throughout my project work.

We acknowledge our indebtedness to all those scholars whose work we have drawn upon. they have not only enriched by understanding the subject but also served as a source of inspiration.

We gratefully acknowledge the support, encouragement and patience of our parents
.
We gratefully acknowledge the support, encouragement and patience of our parents.

References:

[1]. A.Kumar, A.Kaur, M.Kumar, Face detection techniques: review, Artificial intelligence review,volume.52 no.2pp.927-928,2019.D.H.Lee,K.-L.CHEN,K.H

[2]. Liou,C.Liu,andJ.Liu,Deep learning and control algorithms of direct perception for autonomous driving,2019.

[3]. Guangchengwang, yumiaoMasked face recognition data sets and application National natural science foundation of china 2020

[4]. Raza Ali, Saniya Adeel,Akhyar Ahmed Face Mask Detector July 2020

[5]. Z.-Q. Zhao, P. Zheng, S.-t.Xu, and X. Wu, Object detection with deep learning IEEE transactions on neural networks and learning systems 2019.

[6]. RSML Patibandla, AP Gopi, BT Rao (2021), Comparative Study on Analysis of Medical Images Using Deep Learning Techniques, Deep Learning for Biomedical Applications, 2021.

[7]. BT Rao, RSML Patibandla, (2021), Comparative Study on Security and Privacy Issues in VANETs, Cloud and IoT-Based Vehicular Ad Hoc Networks, 2021

[8]. A Peda Gopi, (2020)," Design and Analysis of CMOS LNA with Extended Bandwidth For RF Applications", Journal of Xi'an University of Architecture & Technology, Vol. 12, Issue. 3,pp.3759-3765.

[9]. Amit Chavda, Jason Dsouza ,Sumeet Badgujar Multi-Stage CNN Architecture for Face Mask Detection September 2020