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Covid-19 Face Mask Recognition using Live Camera and Face Mask Detection Using TensorFlow and Keras

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Abstract: ***The COVID-19 epidemic has so quickly affected our daily lives and disrupted trade and movement. Wearing a protective face mask has become a new trend. In the near future, more and more public service providers will be asking clients to wear the mask properly to benefit their services. Therefore, the discovery of a face mask has become an important task of helping the international community. This paper introduces a simplified way to achieve this goal using basic machine learning packages such as TensorFlow, Keras. The proposed method detects the surface in the image correctly and indicates whether it has a mask on it or not. As a security guard, it can also detect faces and moving masks. The method achieves 95.77% accuracy and 94.58% respectively for different data sets. We evaluated improved parameter values using the Sequential Convolutional Neural Network model to determine the presence of the mask correctly without causing excessive alignment.***

I. INTRODUCTION

According to the World Health Organization (WHO) official Status Report - 205, coronavirus 2019 (COVID-19) has infected more than 20 million people worldwide causing more than 0.7 million deaths [1]. People with COVID-
19 have had a wide range of reported symptoms - from minor manifestations to serious illness. Respiratory problems such as shortness of breath or difficulty breathing are one of them. Adults with pneumonia may be more prone to COVID-19 complications as they appear to be at higher risk [2]. Other common human coronaviruses that infect humans worldwide are 229E, HKU1, OC43, and NL63. Prior to the demise of humans, viruses such as the 2019-nCoV, SARS-CoV, and MERS-CoV infect animals and turn them into human coronaviruses [3]. People with respiratory problems can expose anyone (close to them) to a contagious bead. Circumcision of an unclean person can cause human infections as droplets that carry the virus may reach nearby areas.

To prevent certain respiratory infections, including COVID-19, wearing a clinical mask is very necessary. The public should be aware that you must wear a mask to control the source or dislike COVID-19. Points may be of interest to the use of masks in mitigation the risk of injury from a dangerous person during “pre-symptomatic symptoms” and stigma against apostates who wear a mask to prevent the spread of the virus. The WHO emphasizes the prioritization of medical masks and respirators for health care assistants [4]. Therefore, the discovery of a face mask has become an important activity in today's world society.

Finding a face mask involves finding the location of the face and finding out if you have a mask. The problem is with the acquisition of a common object to determine the categories of objects. Phase identification is associated with the division of a particular business group namely Face. It has many applications, such as automatic driving, education, surveillance, and more [5]. This paper introduces a simplified method to achieve the above goal using basic Machine Learning (ML) packages such as TensorFlow, Keras.

The other paper is organized as follows: Phase II examines the related function associated with the acquisition of a face mask. Section III discusses the type of database used. Phase IV introduces the details of the packages integrated into the proposed model. Section V gives an idea of our approach. The results of the evaluation and analysis are reported in section VI. Section VII concludes and draws a line towards future activities.

II. RELATED WORK

On the way to find the face, the face is found in a picture that has a few features in it. According to [21], facial recognition studies require facial recognition, facial monitoring, and posture measurement. Looking at the picture alone, the challenge is to see the face in the picture. Face detection is a difficult task because the face changes size, shape, color, etc. and does not change. It becomes a difficult task of blurring an image blocked by something other than the camera, and so on. Authors in [22] thinks that the discovery of an invisible face comes with two major challenges: 1) the unavailability of a very strong database containing both covered or uncovered faces, and 2) extraction without the appearance of a face in a covered area.

Using a locally linear embedding (LLE) algorithm and dictionaries trained in a large pool of covered surface, the cohesive face of the earth, a few lost expressions can recover and the height of facial expressions can be significantly reduced. According to a report reported in [11], convolutional neural network (CNNs) in computer vision comes with a strict limit on the size of the input image. A common practice is to rearrange images before uploading them to the network to bypass the block. Here's a great job challenge to find the face in the photo correctly and indicate if you have a mask on it or not. In order to perform surveillance tasks, the proposed route should also see a face and a moving mask.

A. Dathaset

Two data sets were used to check the current method. Dataset 1 [16] contains 1376 photographs of which 690 photographs are of people wearing face masks and another 686 photographs of people not wearing face masks. Figure 1 usually consists of the shape of the front face with one face on the frame and the same type of white mask only.

Dataset 2 from Kaggle [17] contains 853 images and its surface is highlighted with or without a mask. On the fig tree. 2 other face masks, rotation and tilt with multiple faces on the frame and different types of masks with different colors as well.

B. Combined Packages

1) *TensorFlow:* TensorFlow, a visual interface for rendering machine learning algorithms, is used to use ML programs as art over a wide range of computer science fields, including emotional analysis, voice recognition, spatial output, computer vision, text summarization, retrieval information, computer programming. drug discovery and error detection to pursue research [18]. In the proposed model, the entire Sequential CNN architecture (containing a few layers) uses TensorFlow in the backend. It is also used to resize data (image) in data processing.
2) *Keras:* Keras provides basic demonstration and construction units for the creation and transport of ML systems at high duplication speeds. It takes full advantage of the growth power and cross-platform of TensorFlow. Keras' main data structures are layers and models [19]. All layers used in the CNN model are made using Keras. As well as the conversion of the class vector into a binary class matrix in data processing, it helps to integrate the whole model.

C. Proposed Procedure

The proposed method consists of a cascade section and a pre-trained CNN consisting of two 2D layers connected to dense neurons. The face mask algorithm is as follows:

D. Data Processing

Pre-data processing involves converting data from a specific format to an easy-to-use, desirable and highly logical format. It can be in any form like tables, pictures, videos, graphs, etc. This structured information is consistent with the information model or structure and captures relationships between different organizations [6]. The proposed method deals with photo and video data using Numpy and OpenCV.

1) *Data Visibility:* Visualization of data is the process of converting unrecognized data into meaningful presentations using information communication and coding insights. It is helpful to read a particular pattern in the database [7]. The total number of images in the database is displayed in both categories - with 'mask' and 'without mask' tuples in the form of a zip object where objects in each transferred iterator are paired together. The dynamic label decision resolution looks like this: {'mask': 0, 'without mask': 1}. Deep CNNs require an image that incorporates static size. We therefore need a standard default size of all images in the database. Using cv2.resize () the gray scale image is resized to 100 x 100.
2) *Image Resetting:* Including image reduction is a three-dimensional tensor, where each channel has a unique pixel. All images must be the same size as the 3D feature tensor. However, there are no traditional expandable images or corresponding feature tensors [10]. Most CNNs can only accept well-executed images. This creates many problems in data collection and modeling. However, resetting the input images before adding them to the network can help bypassing this restriction. Images are usually made to change the pixel width between 0 and 1. They are then converted to 4-dimensional arrays using data = np.reshape (data, (data.shape [0], img size, img size, 1)) where 1 shows a Grayscale image. As such, the last layer of the neural network has 2 effects - with a mask and without a mask that is categorized, the data is converted to category labels.

E. Model Training

Model modeling using CNN architecture: CNN has come a long way in the field of multidisciplinary computer vision [12]. The current method uses Sequential CNN. The first layer of Convolution is followed by the Rectified Linear Unit (ReLU) and the MaxPooling layers. The Convolution layer reads in 200 filters. Kernel size is set to 3 x 3 which specifies the length and width of the 2D convolution window. Since the model should be aware of the expected input position, the first layer in the model needs to be provided with information about the input position. The following layers can make natural calculations [13]. In this case, the input status is specified as data.shape [1:] which returns the data list estimates from index 1. Automatic duplication is "allowed" when the size of the space is authorized to be reduced and the input volume is zero. included. The Conv2D class opening parameter is set as "relax". Represents almost line function with all assets of line models that can be easily improved by gradient downtime. Considering performance and practice common in deep learning, it is better compared to other open-ended activities [14]. Max Pooling is used to reduce the area size of the output volume. The size of the pool is set to 3 x 3 and the result is the shape (number of rows or columns) of: output output = (input shape - pool size + 1) / steps), where the steps have a default value

Data segregation and training CNN model: After setting up a data analysis plan, the model needs training using a specific database and then tested on a separate database. Appropriate model and advanced train testing separation helps to produce accurate results when making forecasts. Test size is set to 0.1 i.e. 9

III. LITERATURE SURVEY TABLE

Title of Paper	Short Description
1.Covid-19 Face Mask Recoginition using Live Camera and Face Mask Detection Using TensorFlow and Keras.	The Paper shows us a methodology of analyzing face mask which is done by first collecting the data, Then using the live camera it Detects the person wearing the fask mask or not in the form of percentage.
2. Benefits of Face mask detection	The paper shows us the benefits of using the AI, some of them being: Data Protection – Data Protection is the major concern of most organizations and applications. Some of them being Implementation of data hashing on the device and server, use of remote wipe APIs, etc. Increased Productivity – Cloud has solved most of the time-consumption issues of software installation, maintenance of the product and backing up on a regular basis.
3. Understanding detection Testing Techniques	The paper informs us about the types of testing and also tells us why it is important to include testing in order to determine all defects in our project.
4. Response Time analysis for Versions of Linux Operating System	Taking in consideration the technologies we would be using for the implementation of this project, XAMPP is a software distribution which provides the Apache web server, MySQL database.
5. Understanding Users' Satisfaction towards Public Transit System in India	In this paper we got to know the quality of public transit system in resource constrained regions using user-generated contents. With growing urban population, it is getting difficult to manage travel demand in an effective way. .
6. Comparison of Flutter with Other Development Platforms	From this paper we got to know this flutter is a useful toolkit enables easy ways of creating new applications. The basic results in this report indicates flutter has a slight edge as compared to native application development platforms but further more conclusive tests still needs to be carried out to come to a final conclusion.
7. Measuring user influence on Face mask Detection	In this paper we have seen that the face mask detector works to analyse all types of images which are been uploaded or detected by the live camera It also analyses the real time images.

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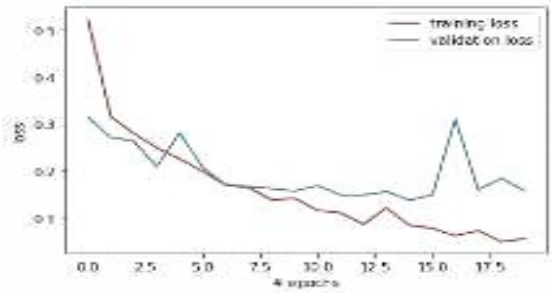
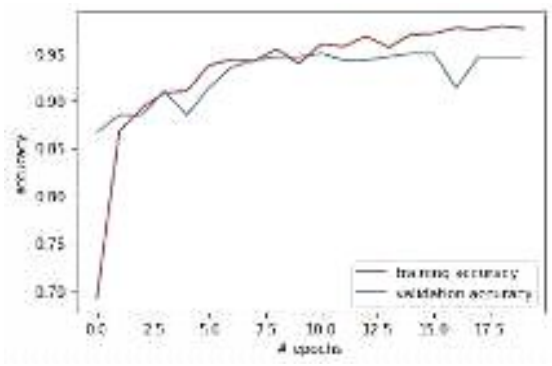
IV. RESULT AND ANALYSIS

The model is trained, certified and tested on two databases. According to data 1, the method obtains an accuracy of up to 95.77% indicating how this adjusted accuracy reduces the cost of error. Data set
2 is more flexible than database 1 as it has many faces in the frame and different types of masks of different colors as well. Therefore, the model obtains 94.58% accuracy in the database. 8 shows the difference between training and loss of validation associated with database 2. One of the main reasons for achieving this accuracy is in MaxPooling. It provides consistent translation on internal representation and a reduction in the number of parameters the model should study. This process of sample-based discretization lowers the sample input representations that comprise the image, by reducing its size. The number of neurons has a set value of 64 which is not very high. Too high a number of neurons and filters can lead to worse performance. Improved filter values and the size of the swimming pool help to filter the main part (face) of the image to determine the presence of the mask properly without causing excessive alignment.
The system can detect slightly closed face or mask or hair or hand. It looks at the occlusion degree of the four regions - nose, mouth, chin and eye to distinguish between an mask with an annotation or a face-covered face. Therefore, a full face mask covering the nose and chin will be treated only as a “mask” by the model.



epochs vs loss corresponding to dataset 2



epochs vs accuracy corresponding to dataset 2

The main challenges facing the route primarily include various angles and a lack of clarity. Blurred moving faces in video streaming make it very difficult. However, following the trajectories of several video frames helps to make a better decision - "with a mask" or "without a mask".

V. CONCLUSION

In this paper, we briefly describe the motivation for the work at the beginning. Next, we demonstrate the learning function and performance of the model. Using basic ML tools and simplified techniques the method achieves high sensible accuracy. It can be used for a variety of applications. Wearing a mask may be an obligation soon, given the Covid-19 problem. Many government service providers will ask customers to wear a mask properly in order to use their services. The model used will contribute significantly to the public health care system. In the future it can be extended to determine whether a person is well-dressed or not. The model can also be developed to determine whether the mask is viral or not, i.e. the type of mask is surgical, N95 or not.

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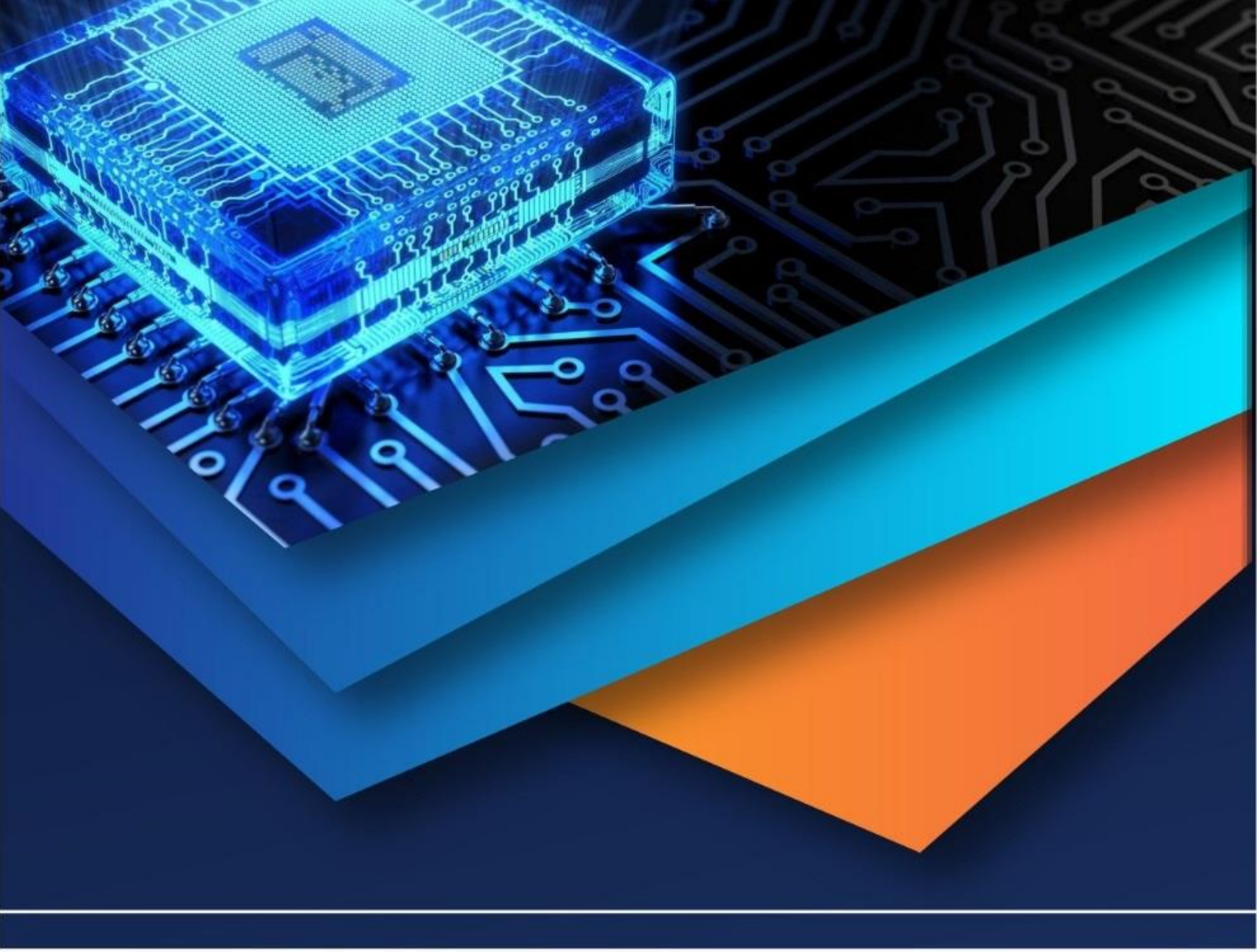

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