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Face Mask Detection

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Abstract: Global pandemic COVID-19 circumstances emerged in an epidemic of dangerous disease in all over the world. Wearing a face mask will help prevent the spread of infection and prevent the individual from contracting any airborne infectious germs. The novel coronavirus had brought a new normal life in which the social distance and wearing of face masks plays a vital role in controlling the spread of virus. But most of the people are not wearing face masks in public places which increase the spread of viruses. This may result in a serious problem of increased spreading. Hence to avoid such situations we have to scrutinize and make people aware of wearing face masks. Humans cannot be involved for this process, due to the chance of getting affected by corona, using Face Mask Detection System, one can monitor if the people are wearing masks or not.

Index Terms - COVID-19 epidemic, mask detection, face mask image, non-face mask image.

I. INTRODUCTION

The worlds has not yet fully recover from this pandemic and every few months we say a new variant of covid-19 is identifying in some part of the world. Now day's Indian government release a statement for all the state government to continuously monitoring the situation of covid-19 carefully. India has large number of population so it can be difficult to identify person wearing mask or not by the help of human power, so we developed face mask detection system for identify those people. To reduce the spread of infection, it gives a message to the people to maintain social distance and wear mask at public place.

II. LITERATURE SURVEY

COVID-19 pandemic caused by novel coronavirus is continuously spreading until now all over the world. The impact of COVID-19 has 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 restricts 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 on technology of masked Face Recognition Using Convolutional Neural Network [1]. While a person without a mask is detected, the corresponding authority is informed through the city network applying a Deep Learning based approach for classification [2, 3].

In a smart city network, an automated system to limit covid-19 using facial mask detection [4]: covid-19 is a pandemic caused by a novel coronavirus that has swept the country. Covid-19 has made a difference all around the world for a long time. Almost all aspects of development are addressed stochastic model for human face identification [5, 6]. The medical system has reached a critical point. One of them is hiding behind a mask. The several preventive steps used to keep the disease from spreading this ailment we will look into this in this project in respective of learning algorithm for face verification [7]. Our research aims to minimise the spread of this infectious disease in different parts of the world by the system with recognition over linear projection [8].

III. DESCRIPTION

On every entry gate we install face mask dictation system to check individual person who wear mask or not. We use camera for face dictation. When a person is come in front of camera, camera captor the image and process it according to its command, if it's find mask is missing it give's warning "Mask Is Missing". The block diagram and flow chart of the proposed model is illustrated in Fig. 1 and Fig. 2, respectively. An activity diagram is a behavioural diagram i.e., it depicts the behaviour of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed.

IV. FACE MASK DETECTION TECHNOLOGY

When Face mask identification is a Machine Learning (ML) analytic solution that uses algorithms and deep learning technologies to distinguish between those who are wearing a face mask and those who are not. Face recognition detection technology scans a person's facial area to quickly identify an individual who is not wearing a mask – even in a crowded situation – while machine learning and/or reference models produced by machine learning operate behind the scenes to allow correct

processing. This data may then be sent to security professionals in real time or as part of a churn report that can be used to assess processes and policy compliance.

Face mask detection has the advantage of automating and streamlining procedures by removing the need for an employee to stand at a store's door, for example. When a video management system (VMS) with face mask recognition technology identifies a person who is not wearing a mask, the system can issue an alarm through mobile push notification, email alert, or through the VMS system itself. The detection of a mask violation can be utilised to affect door access to assist contain and rectify a possible violation if the VMS is also connected or unified with access control.

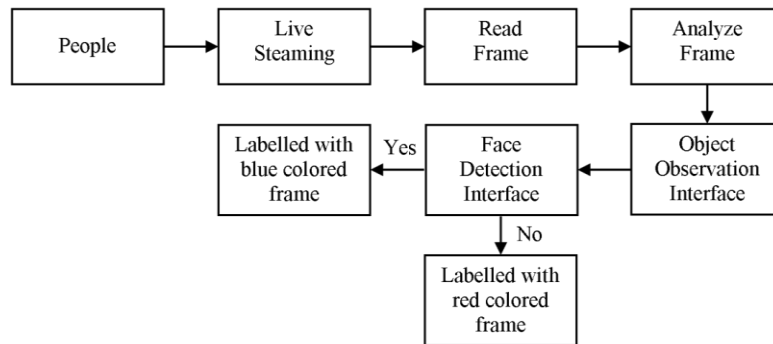


Figure 1 Proposed architecture model

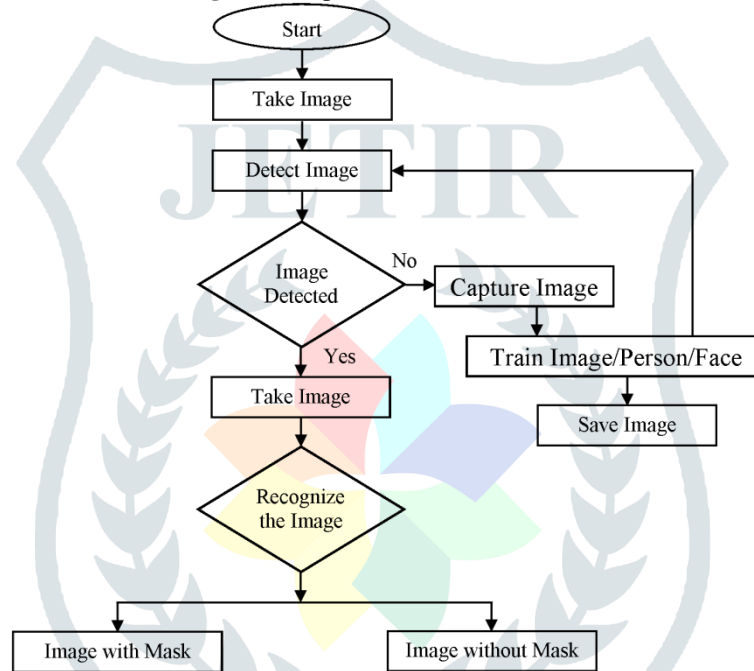


Figure 2 Activity diagram

A. TENSORFLOW FRAMEWORK

Tensor flow is a freely available software library and developed by researchers and engineers. It's a python library that supports a variety of classification and regression algorithms, as well as deep learning in general. TensorFlow is Google Brain's second-generation system, with version 1.0.0 published on February 11th. It is used for both research and production at Google. Its adaptable structure allows computing to be deployed over an extensive variety of platforms (CPUs, GPUs, TPUs), from PCs to server clusters to cellular and facet devices.

B. OPENCV

It is a cross-platform library the use of which we will expand real-time pc imaginative and prescient applications. It focuses on image processing; video recording, and analysis, with capabilities such as face and object detection. It now supports a number of programming languages, including C++, Python, and Java, and is available on a range of platforms, including Windows, Linux, OS X, Android, and iOS. The collection contains over 2500 optimised algorithms, including both traditional and cutting-edge computer vision and machine learning techniques. Algorithms can be used to detect and recognise faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken with flash, follow eye movements, recognise scenery and establish markers to overlay it with, find similar images from an image database, find similar images from an image database, remove red eyes.

C. KERAS

KERAS is a human-centric API, now no longer a machine-centric one. Keras adheres to satisfactory practices for reducing cognitive load, inclusive of supplying uniform and easy APIs, proscribing the quantity of person sports required for standard use cases, and supplying clean and actionable blunders messages. Keras includes a number of implementations of standard neural network building elements such layers, objectives, activation functions, optimizers, and a number of other tools to make dealing with image and text data easier and to reduce the amount of coding required to write deep neural network code. The source is maintained on GitHub, and community support forums include a slack channel and a GitHub problems page. Keras is a lightweight

Python deep learning package that runs on top of Theano or TensorFlow. It was developed to make implementing deep learning models as fast and easy as possible for research and development.

D. NUMPY

NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high level mathematical functions to operate on these arrays. Numeric was originally created by Jim Hugunin with contributions from several other developers. In 2005, Travis Oliphant created NumPy by incorporating features of the competing num array into numeric, with extensive modifications. NumPy is open source software and has many contributors.

E. MATPLOTT

Mat plot is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, WX Python, Qt, or GTK+. There is also a procedural "Pylab" interface based on a state machine (like OpenGL), designed to closely resemble that of MATLAB, though its use is discouraged. SciPy makes use of Matplotlib. Matplotlib turned into firstly written through John D. Hunter, has an energetic improvement network and is sent below a BSD-fashion license. Michael Droettboom turned into nominated as matplotlib's lead developer rapidly earlier than John Hunter's loss of life in August 2012 and similarly joined through Thomas Caswell. 7 3.6 IPYTHON what precisely is Python? You can be questioning approximately that. You can be regarding this e-book due to the fact you desire to analyze modifying however aren't acquainted with modifying languages. Alternatively, you will be acquainted with programming languages which includes C, C ++, C #, or Java and desire to analyze extra approximately Python language and the way it compares to these "massive word" languages.

F. PANDAS

Pandas is an open-source library that is built on top of NumPy library. It is a Python package that offers various data structures and operations for manipulating numerical data and time series. It is mainly popular for importing and analyzing data much easier. Pandas is fast and it has high-performance & productivity for users. Pandas is a python bundle supplying fast, bendy, and expressive facts systems designed to make operating with "relational" or "labeled" facts each smooth and intuitive. It targets to be the essential high-stage constructing block for doing practical, real world facts evaluation in Python. Additionally, it has the wider purpose of turning into the maximum effective and bendy open supply facts evaluation/manipulation device to be had in any language. It is already nicely on its manner in the direction of this purpose.

G. DEEP LEARNING

Deep learning is an AI function that mimics the workings of the human brain in processing data for use in detecting objects, recognizing speech, translating languages, and making decisions. Deep getting to know AI is capable of analyze without human supervision, drawing from information this is each unstructured and unlabelled.

V. EXECUTION PROCESS

Face Mask Detection in webcam stream: The flow to identify the person in the webcam wearing the face mask or not. The process is two-fold.

- To identify the faces in the webcam
- Classify the faces based on the mask.

Identify the Face in the Webcam: To identify the faces a pre-trained model provided by the OpenCV framework was used. The model was trained using web images. OpenCV provides 2 models for this face detector.

VI. EXPERIMENT ANALYSIS

Creating image datasets data-loaders for train and test using the experiments.

Training Dataset: A dataset that we feed into our algorithm to train our model and it's a series of data samples that are used to fit the parameters of a machine learning model to training it by example.

Testing Dataset: A dataset that we use to validate the accuracy of our model but is not used to train the model. It may be called the validation dataset.

Training the model: A training model is a dataset used to train a machine learning algorithm. It is made up of sample output data as well as the equivalent sets of input data that have an impact on the outcome. The training model is used to process the input data and compare the processed output to the sample output. The model is modified based on the results of this association.

Visualizing images: The graphical depiction of information and data in a pictorial or graphical manner is known as data visualisation (Example: charts, graphs, and maps). Data visualisation tools make it easy to observe and comprehend trends, patterns, and outliers in data.

VII. RESULTS AND DISCUSSION

The outcomes are more in line with what the model predicted. The mask identification is done with the help of a camera and trained model and produces accurate results. When a person's face is detected in the camera frame, the model displays a green or red frame over the face. In the camera, a person who is not wearing a mask will have a red frame over his face and statement is written "Not Mask" shown in display that is shown in Fig. 3 and Fig 4. while someone who is wearing a mask will have a red frame and statement is written "Mask" and shown in display. The outcome is also written in the top left corner of the result window with a good efficiency of the model also mention in Table 1. On the top of the result frame, there is also a percentage match. For better understanding here some pictures are attached, that how system is working.

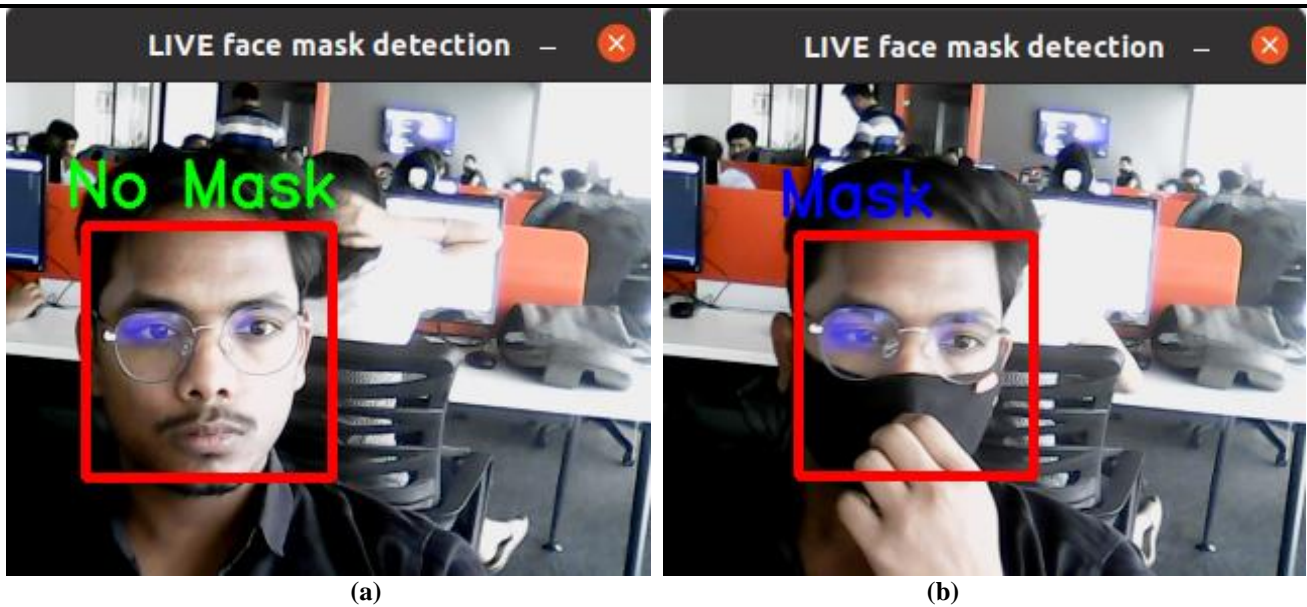


Figure 3 Live web image (a) Input image (without mask) (b) Output image (with mask)

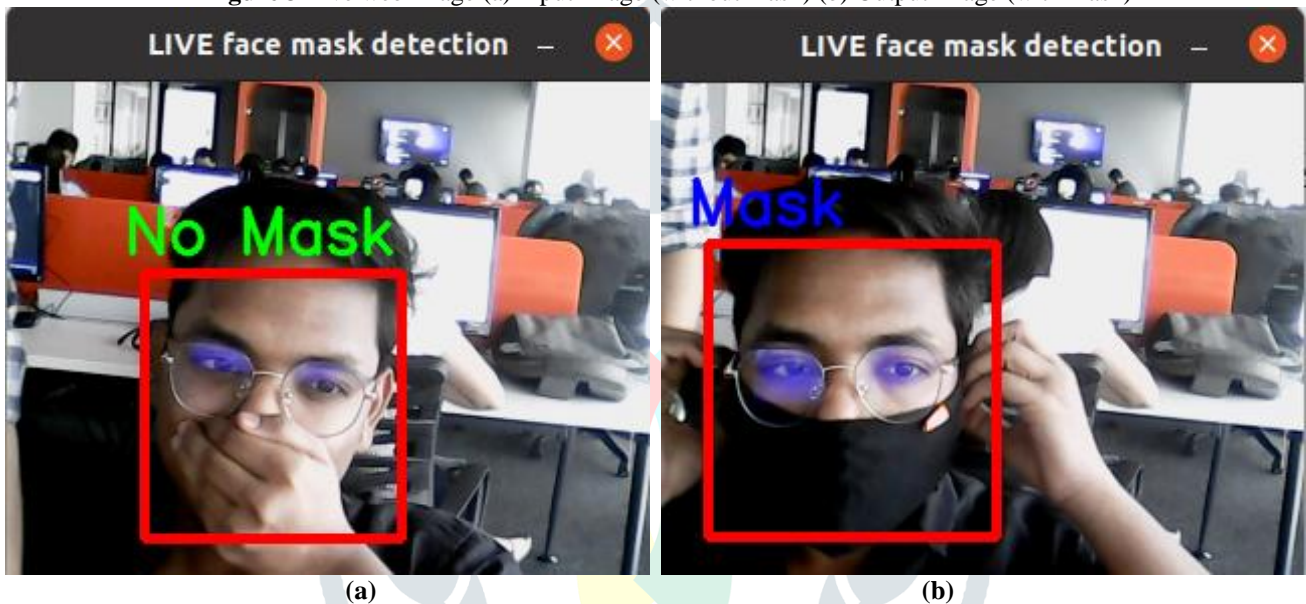


Figure 4 Live web image (a) Input image (with hand) (b) Output image (with mask)

Table 1 Rate of face mask detection

Performance metrics	Training	Testing
Accuracy	99.92%	100%
Precision	99.9%	100%
Classification Loss	0.0015	3.8168E-04

VIII. CONCLUSION

As the technology is blooming with emerging trends the availability of new face mask detectors which can possibly contribute to public healthcare. The architecture consists of mobile net as the backbone; it can be used for high and low computation scenarios. In order to extract more robust features, we utilize transfer learning to adopt weights from a similar task face detection, which is trained on a very large dataset. We used OpenCV, tensor flow and NN to detect whether people were wearing face masks or not. The models were tested with images and real-time video streams. The accuracy of the model is achieved and the optimization of the model is a continuous process and we are building a highly accurate solution by tuning the hyper parameters. This specific model could be used as a use case for edge analytics. Furthermore, the proposed method achieves state-of-the-art results on a public face mask dataset. By the development of face mask-detection we can detect if the person is wearing a face mask and allow their entry would be of great help to the society.

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