Face Mask Recognition Using Open CV

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***Abstract*—Corona Virus is a big threat to mankind. In the last few years, COVID-19 pandemic has remarkably affected our day-to-day life affecting the world trade and movements. It is causing a worldwide emergency in healthcare. This virus transmits when people breathe in air contaminated by droplets and small airborne particles containing the virus. The risk of breathing these in is highest when people are in proximity, but they can be inhaled over longer distances, particularly indoors. Transmission can also occur if splashed or sprayed with contaminated fluids in the eyes, nose, or mouth, and, rarely, via contaminated surfaces. Wearing a face mask has become mandatory as World Health Organization (WHO) mentioned it limits the spread of virus. This paper presents a simplified approach to achieve this purpose using some basic deep Learning packages like TensorFlow, Keras, OpenCV. The proposed methodology detects the face from the image/video stream correctly and then identifies if it has a mask on it or not. As a surveillance task performer, it can also detect a face along with a mask in motion.**

***Keywords*— COVID-19, Tensorflow, OpenCV, Face Mask, Image Processing, Computer Vision.**

I. INTRODUCTION

COVID-19 had a massive impact on human lives. Its negative impact was felt by almost all commercial establishments, education, economy, religion, transport, tourism, employment, entertainment, food security and other industries. According to WHO(World Health Organization), 499,119,316 people were infected with Coronavirus and 6,185,242 people died because of it as of April 2022. After the person gets infected, it takes almost fourteen days for the virus to grow in the body of its host and affect them and in the interval, it spreads to almost everyone who is in contact with infected person. So, it is challenging to keep the track of the spread of COVID-19.

COVID-19 mainly spreads through droplets produced as a result of coughing or sneezing by an infected person. This transfers the virus to any person who is in close contact (within one-meter distance) with the person suffering from coronavirus. Because of this, the virus spreads rapidly among the masses. With the nationwide lockdowns being lifted, it has become even difficult to track and control the virus. Face masks are an efficacious method to control the spread of COVID-19. The persons who wore masks experienced a 70% lower risk of testing positive for SARS-CoV-2 infection. The governments, all over the world, have imposed strict rules the everyone should wear masks while they go out. But still, some people may not wear masks and it is hard to check weather everyoneis wearing mask or not. In such cases, computer vision will provide great support.

Increasing demand for a streamlined system for detecting face masks on people for transportation means, densely populated areas, residential districts, large-scale manufacturers and other enterprises to ensure safety. This project uses machine learning classification using OpenCV and Tensorflow to detect facemasks on people's face.

II. TECHNOLOGY CLASSIFIERS

A. OPENCV

OpenCV is an open-source library which is primarily used for Computer Vision Applications. OpenCV application areas include many functions and algorithms for Mobile robotics, Gesture recognition, Object Detection, Egomotionestimation, Structure from motion (SFM) and many other applications. Images and real time video streams can be manipulated to suit different needs using this library.

B. TENSORFLOW

TensorFlow was originally developed by researchers and engineers working for the Google Brain Team

within the Google Machine Intelligence research organization for the purpose of conducting machine learning and in-depth research of sensory networks, but the system is common enough to work in various other fields as well!

Let's first try to understand what the name TensorFlow really means!

TensorFlow is a software library for calculating numbers using flow graphs where: the nodes on the graph represent mathematical operations. The edges of the graph represent the same parts of the data with multiple sides (called tensors) connected between them. (Please note that tensor is the central data unit in TensorFlow).

III. WORKING

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The tools used in the algorithm are Python, Keras and OpenCV. In this part we discussed our second phase of the covid-19 face mask detector, and explained about our computer vision and deep learning was used to detect face masks. We had to use the deep learning techniques and deploy various samples to recognize and differentiate between the faces with mask and without mask.

In the second phase the face mask classifier from the disk is loaded and it detects the faces in the image and then applies ROI of each face detected and then applies face mask and shows the results.

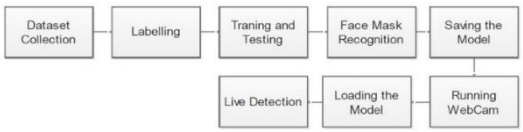
And then, we analyzed the database and we used it to up skill our custom face mask detector. After that we explained how we used the Python script to guide face mask finders in our database using Keras and TensorFlow.

We had to use Python text to train the face mask detector and analyze the final results.

For COVID-19 professional face mask detector, we had to continue launch two additional Python scripts for use:

1 Find COVID-19 face masks in photos.

2 Find face masks in real-time Video Streaming. D below for more information on proofreading, spelling and grammar.



Data set Collection - We custom feed data from a collection of training models as per the requirement to train the model to increase the accuracy of the face mask detection model.

Labelling - An image labelling or annotation tool is used to label the images for bounding box object detection and segmentation. It is the process of highlighting the images by humans. They have to be readable for machines. With the help of the image labeling tools. The objects in the image could be labeled for a specific purpose.

Training and Testing - Train/Test is a method to measure the accuracy of your model. It is called Train/Test because you split the data set into two sets: a training set and a testing set. You train the model using the training set. You test the model using the testing set.

Face Mask Recognition - With the training model we can detect whether the person is wearing a mask or not. In fact, the problem is reverse engineering of face detection where the face is detected using different machine learning algorithms for the purpose of security, authentication and surveillance.

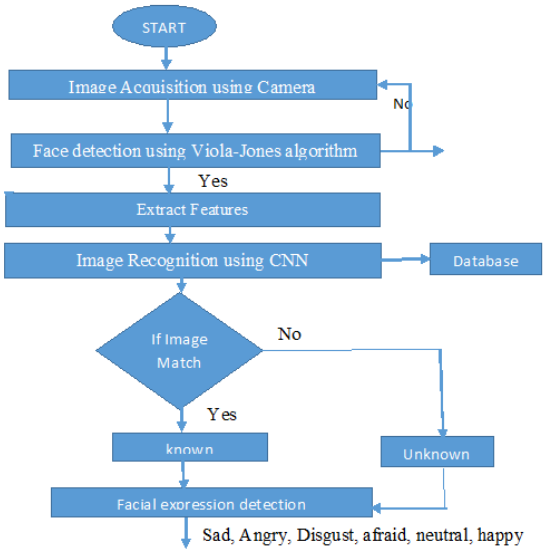
Saving the Model - After the model has been trained to detect face mask, the model saves itself to perform the same every time a image or real time even is produced to them.

Live Detection - Live detection is a technique for which we train the model to detect if the individual is wearing mask or not in a real time event.

Loading the model - A model is created and sent ahead for verification using a simple yes and no system.

Running Webcam - For Live detection we can or load the image manually for face mask detection.

Flow of Face Mask Detection Model:-



IV.CONCLUSION

As we can notice that due to the high rise of COVID case and illness caused by air transmission the use of face mask is now considered very importan in day to day life of an individual. The system can be employed in public places like railway stations and malls. It will be of a great help in companies and huge establishments where there will be a lot of workers, This and store the data of the employees working in that company and will very easily spot the people who are not using a face mask according to the new normal and thus they can provide details to those specific individuals to wear the face mask.
With such practices we can improve the habit of the crowd by promoting the use of face mask in different individuals.

V.FINAL RESULTS

The given image if inserted into the model will be rejected because the image shows a person who is not wearing a face mask, the trained model is capable enough to process this function with minimal error.

As we can notice here that the given image displays a person wearing a face mask, the model is capable enough to approve this person as the individual is detected using a face mask, with the accuracy of approximate 80% positive result, this can be done in real time as well.

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REFERENCES

[1] A. G. Howard, M. Zhu, B. Chen et al., "Mobilenets: efficient convolutional neural networks for mobile visionapplications," 2017, https://arxiv.org/abs/1704.04861.

[2] Wei Wang, Yutao Li, Ting Zou, Xin Wang, JieyuYou,Yanhong Luo, "A Novel Image Classification Approach via Dense-MobileNet Models", Mobile Information Systems, vol. 2020,ArticleID 7602384, 8 pages, 2020. https://doi.org/10.11 55/2020/7602384

[3] I. B. Venkateswarlu, J. Kakarla and S. Prakash, "Face mask detection using MobileNet and Global Pooling Block," 4 2020 IEEE 4th Conference on Information & Communication Technology (CICT), 2020, pp. 1-5, doi: 10.1109/CICT51604.2020.9312083.

[4] M. S. Ejaz and M. R. Islam, "Masked Face Recognition Using Convolutional Neural Network," 2019 International Conference on Sustainable Technologies for Industry 4.0 (STI), 2019, pp. 1-6, doi: 10.1109/STI47673.2019.9068044

[5] Changjin Li, Jian Cao, and Xing Zhang. 2020. Robust Deep Learning Method to Detect Face Masks. In Proceedings of the 2nd International Conference on Artificial Intelligence and Advanced Manufacture(AIAM2020). Association for Computing Machinery, New York, NY, USA, 74–77. DOI:https://doi.org/10.1145/3421766.3421768

[6] Jeong-Seon Park, You Hwa Oh, Sang ChulAhn, and Seong-Whan Lee, Glasses removal from facial image using recursive error compensation, IEEE Trans. Pattern Anal. Mach. Intell. 27 (5) (2005) 805–811, doi: 10.1109/TPAMI.2005.103.

[7] C. Li, R. Wang, J. Li, L. Fei, Face detection based on YOLOv3, in:: Recent Trends in Intelligent Computing, Communication and Devices, Singapore, 2020, pp. 277– 284, doi: 10.1007/978-981-13-9406-5_34.

[8] A. Nieto-Rodríguez, M. Mucientes, V.M. Brea, System for medical mask detection in the operating room through facial attributes, Pattern Recogn. Image Anal.Cham (2015), pp. 138-145, 10.1007/978-3-319-19390-8_16

[9] M.K.J. Khan, N. Ud Din, S. Bae, J. Yi, Interactive removal of microphone object in facial images, Electronics 8 (10) (2019) , Art. no. 10, doi: 10.3390/electronics8101115.

[10] S. A. Hussain, A.S.A.A. Balushi, A real time face emotion classification and recognition using deep learning model, J. Phys.: Conf. Ser. 1432 (2020) 012087, doi: 10.1088/1742-6596/1432/1/012087.

[11] Z. Wang, et al., Masked face recognition dataset and application, arXivpreprint arXiv:2003.09093, 2020.

[12] prajnasb, "observations," observations. https://github.com/prajnasb/observations (accessed May 21, 2020).

[13] E. Learned-Miller, G.B. Huang, A. RoyChowdhury, H. Li, G. Hua ,Labeled faces in the wild: a survey, M. Kawulok, M.E. Celebi, B. Smolka (Eds.), Advances in Face Detection and Facial Image Analysis, Springer International Publishing, Cham (2016), pp. 189-248 [16]P. Khojasteh, et al.Exudate detection in fundus images using deeply-learnable features Comput. Biol. Med., 104 (Jan. 2019), pp. 62-69, 10.1016/j.compbiomed.2018.10.031Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].