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A study on a Tensorflow/Keras-based real-time face mask identification technique based on artificial intelligence

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ABSTARCT

Due to the Covid-19 outbreak, which demands individuals to put on face masks, preserve social distance, and use sanitizers to wash their hands, face mask detection has emerged as a widely used software. A crucial preventive measure throughout this pandemic is to wear a mask. This is critically valuable when fostering social distance from other individuals is hard. It is imperative to use a mask, especially for those who are more likely to get severe illness from COVID-19 infections. Consequently, the Organizations for Disease Control and Prevention (CDC) advised everyone aged 2 and older to wear a mask in public, notably when other social distance-keeping measures are difficult to maintain. The only ways to avoid contracting the virus until universal access to immunizations is through "distance" and "wearing a mask". This paper will aid in determining whether or not a person is wearing a mask by employing the same machine learning and artificial intelligence technologies.

Keywords: Image Analysis, Face Detection, Computer Vision, Open CV, Tensorflow

INTRODUCTION:

Recent years have seen huge breakthroughs in the study of artificial intelligence (AI), particularly in the realm of machine learning. The word "AI" is inextricably linked to any recently produced technology. Wearing a face mask in public is the most effective precautionary measure, according to the World Health Organization, since the corona virus COVID-19 pandemic is causing a worldwide health catastrophe (WHO). The likelihood of transmission is greatly reduced when using a face mask at work. An cost-effective and affordable method of utilizing AI to ensure a safe working environment in a manufacturing setup. Face mask detection is an extremely difficult method. The corona virus syndrome has lately garnered a lot of attention owing to its proliferation. Face mask detection is a vital issue regarding Covid-19 security and prevention. Airports, healthcare, professions, and educational institutions seem to be just a few areas where face mask detection has been used. During the monitoring process, anyone not donning a face mask is identified. Face recognition without a mask is straightforward, whereas face recognition with a mask is more demanding because of the challenge of masked face feature extraction opposed to unmasked face feature extraction. The covered face lacks many features of the face, including the chin, lips, and nose. A substantial percentage of face masks may be discovered in two phases: Face Recognition, and Feature Extraction. Facial recognition is the preliminary step, which includes determining a person's face from a photograph. The method of extracting the sections of face that are of interest is referred to as feature extraction. Extracted image is examined with images both with and without masks using a classifier (model), that subsequently yields the outcome.

LITERATURE REVIEW:

The development of an embedded vision system that employs the Face Mask and Social Distancing Detection paradigm is the main topic of the review[1]. In this context, pre-trained models like MobileNet, ResNet Classifier, and VGG.VGG-16, ResNet- 50, InceptionV3, VGG-19, and DenseNet-169 were used, which have accuracy values of 82.1 percent, 89 percent, 60 percent, 53.4 percent, 94.52 percent, and 93.15 percent, respectively, are the two components of the proposed model. [1]. Another technique has been proposed in the review [2] that illustrates the theory underlying CNNs by developing a synthesized model that mimics the human brain's visual cortex. The primary benefit of CNNs[2] is that they can extract more vital information from the entire image than simple handwritten attributes. Researchers introduced various CNN-based deep networks, and these networks achieved cutting-edge outcomes in computer vision classification, segmentation, object identification, and localization.

Review[3] presented a machine attempting to learn visual object detection system that can swiftly evaluate photos and attain high levels of detection.

Face mask identification is implemented as a major task in one of the methods suggested in the review[5] to assist the worldwide civilization. This paper outlines a condensed method for accomplishing this goal utilising certain fundamental machine learning tools, such as TensorFlow, Keras, OpenCV, and Scikit-Learn. [5] The proposed scheme successfully recognises the face in the image and then determines whether or not it is covered by a mask. It can recognise a face and a mask moving together as a surveillance task performance. On two separate datasets, the approach achieves accuracy of up to 95.77% and 94.58%, respectively. The system, which consists of a stack of 2-D convolutional layers with RELU activations and Max Pooling, was constructed according to Review[16], which employed Gradient Descent for training and binary cross entropy as a thrashing function.The model was trained using a combination of two datasets. The accuracy of the validation and testing was 95%.

METHODOLOGY

System design

Deep learning, machine learning, computer vision, and python libraries are all essential for carrying out this project using the python programming language. Mobile Net serves as the foundation of the architecture and can be employed in both high- and low-computing scenarios. This paper utilizes CNN Algorithm

Four modules of the project are as follows:

1) **Datasets Collection** : We harvest a variety of data sets, both with and without face masks to achieve great accuracy.
2) **Datasets Extraction**: Through using mobile net v2 of mask and no mask sets, we can extract the features.
3) **Models Training:** Using open-cv and keras, the model will be trained.
4) **Facemask Detection** : Both live video and pre-processed images can be employed to detect. If individuals wear masks, they are permitted; if not, a buzzer will beep to urge them to do so in order to stop the spread of viruses.

Software

For creating a flawless model, there are numerous open-source programmes available. Some of these programmes include PyCharm, Atom, Spyder, Sublime, and Jupyter. Spyder from Anaconda was used in this project to build the model. Jupter or any other software can be used depending upon your comfort. Nevertheless, we highly urge employing Spyder for both coding and implementation.

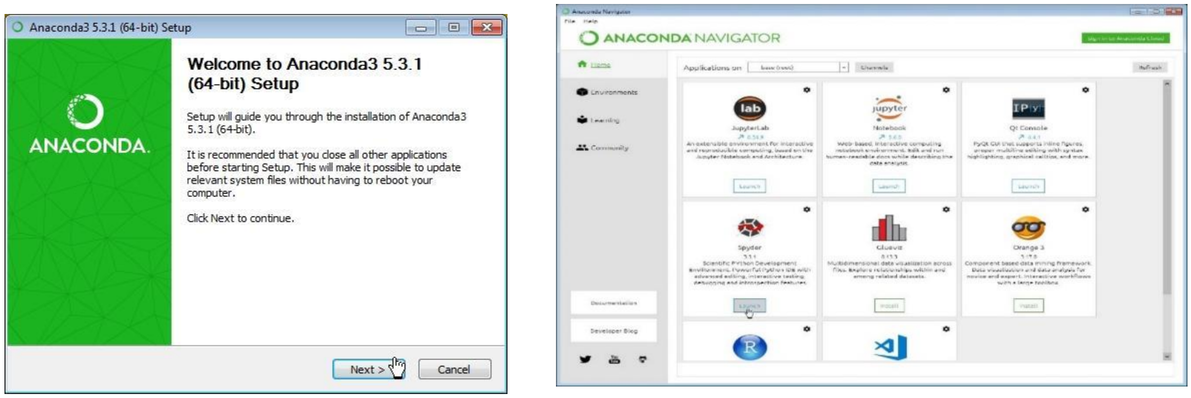


Fig 1: Installing Anaconda

This paper describes the implementation of a computer vision/deep learning pipeline leveraging a two-phase COVID-19 face mask detector.

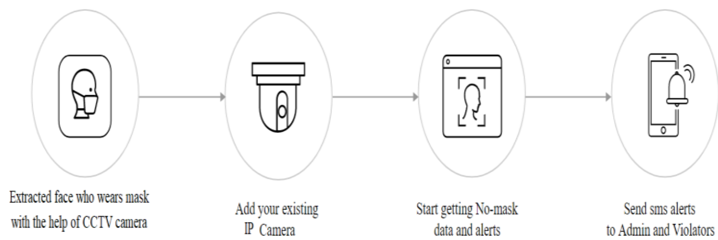


Fig 2: Pipelining illustrating implementatio

We used an Arduino uno or nano with an ESP32 CAM to programme and build the model for the project. By simply changing the characteristics at the main gates, we could use devices like metal detectors for face mask detection if we wanted to put that concept into practise on a large scale. We implant cameras in the face mask detector; if the sensor detect a user that is not wearing a mask, AI notifies the system, resulting in either a buzzer is sounding or led lights are flashing. Stop the intrusion and order the wearer of the mask to do so. He or she cannot participate until they remove their mask.

The dataset used to develop our distinctive face mask detector will then be analyzed afterwards. The next step is to demonstrate how to use a Python script to train a face mask detector on our dataset using Keras and TensorFlow. This Python software will be used to train a face mask detector, and the results will be examined.

Given the COVID-19 face mask detector that has been trained, we'll move on to construct two more Python scripts that do the foregoing:

1. Detect COVID-19 face masks in *images*
2. Detect face masks in *real-time video streams*

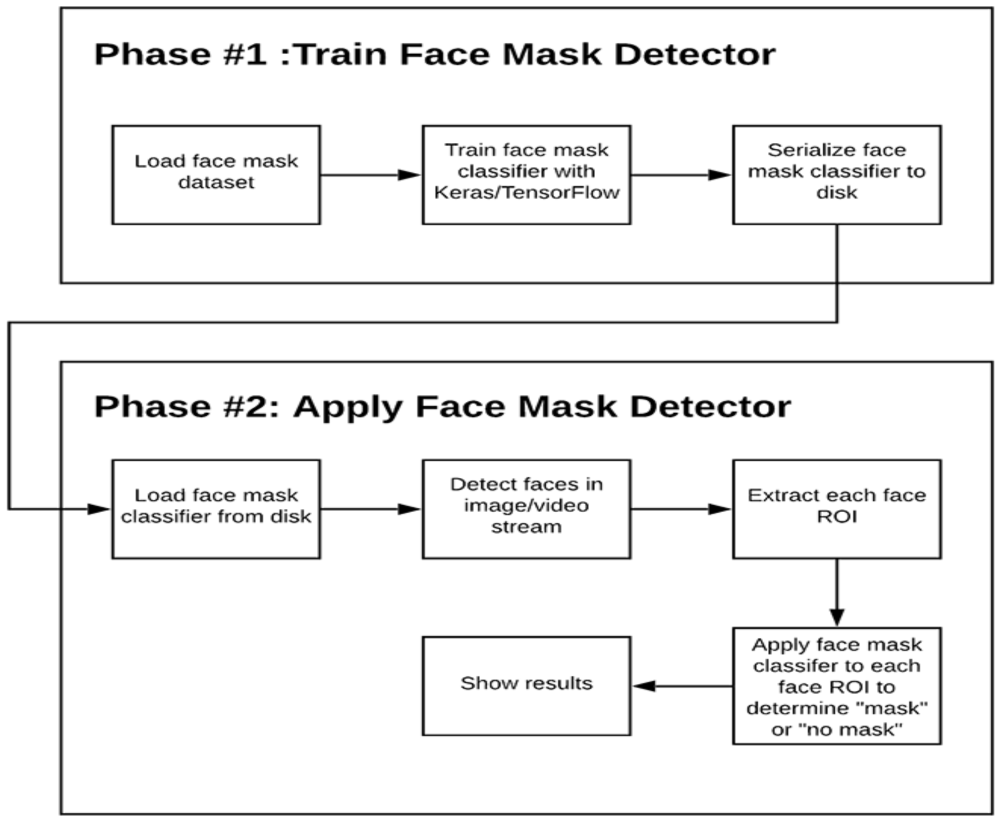


Fig 3: Phases of Face Mask Detector

We have split our project into two distinctive phases, each with a collection of linked sub-steps, in order to develop a customized face mask detector (as illustrated in Figure 3 above):

1.**Training:** We'll concentrate on loading our face mask detection dataset from disc, building a model on it (using Keras/TensorFlow), and serialising the face mask detector to disc in this section.

2.**Deployment:** We may tl ısk detector, and classify each face as sporting a m

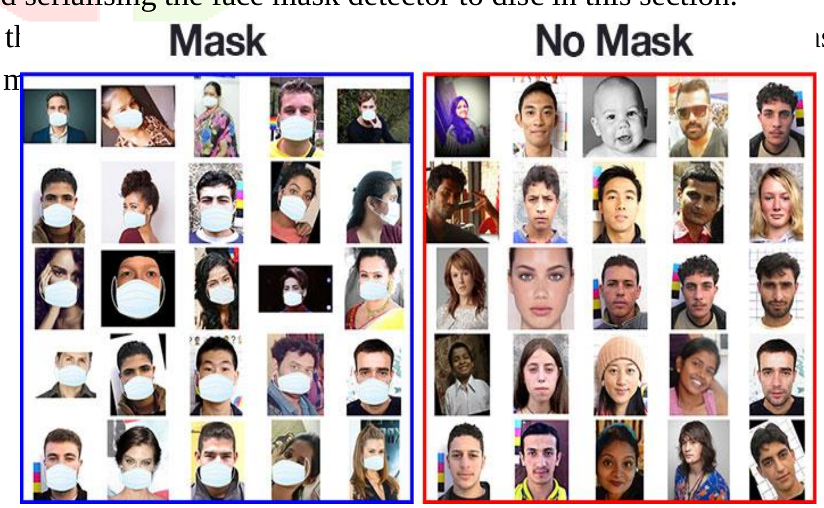


Fig 4: COVID – 19 Face mask detection datasets

A. Eyes, brows, noses, mouths, and jawlines are just a few of the face landmarks that allow us to infer the placement of facial features instinctively.
B. Begin with a picture of a person who isn't wearing a face mask in order to use facial landmarks to construct a dataset of people wearing face masks.
C. Afterwards use face detection to determine where in the image the face's bounding box is located. Face detection is the following phase.
D. Here, we've utilised OpenCV to conduct facial detection using a deep learning technique. We can extract the face Region of Interest(ROI) with OpenCV and NumPy slicing ,once we know where the face is in the image.
E. Then, using dlib, we discover facial landmarks to identify where to position a mask on the face.

Fig 6: Detection of Facial Features

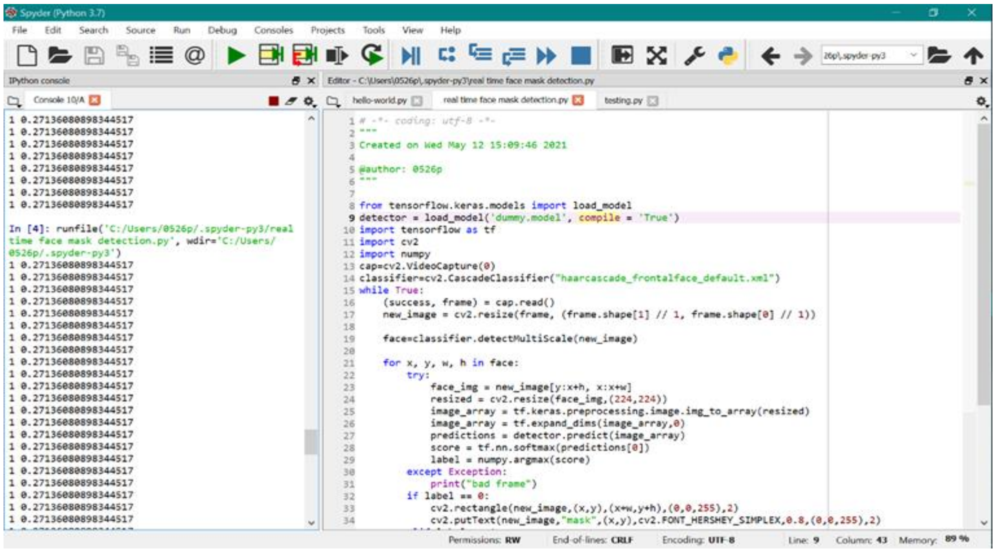
F. Then, we seek a photograph of a mask (with a transparent background) .
G. Since we are aware of the locations of the face landmarks, this face mask will be automatically superimposed on the original face ROI. The facial landmarks (namely the points around the chin and nose) will be employed to figure out where the mask will be placed on the face as this mask is applied automatically. The face mask is positioned on the subject's face in the original frame before being enlarged and rotated.

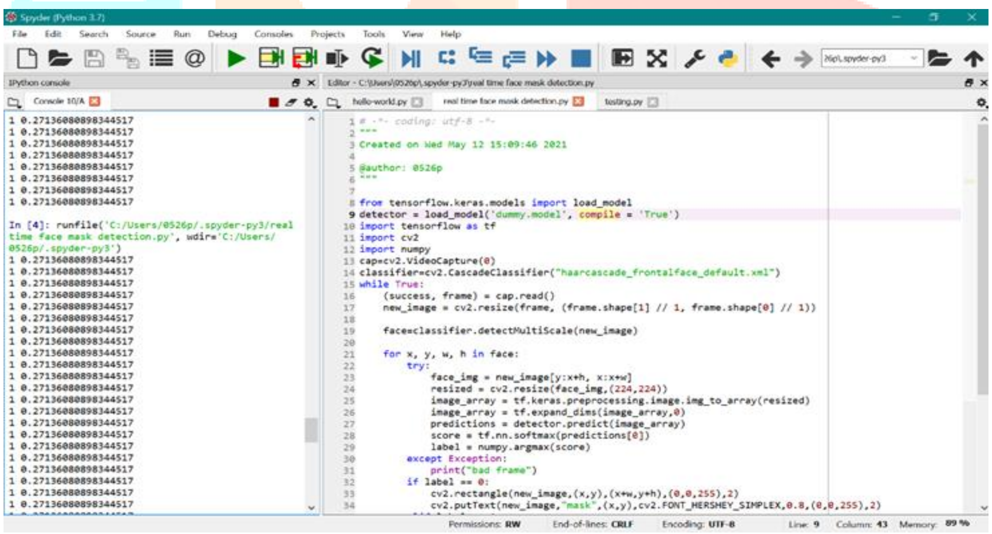
Fig 7: Picture with superimposed mask

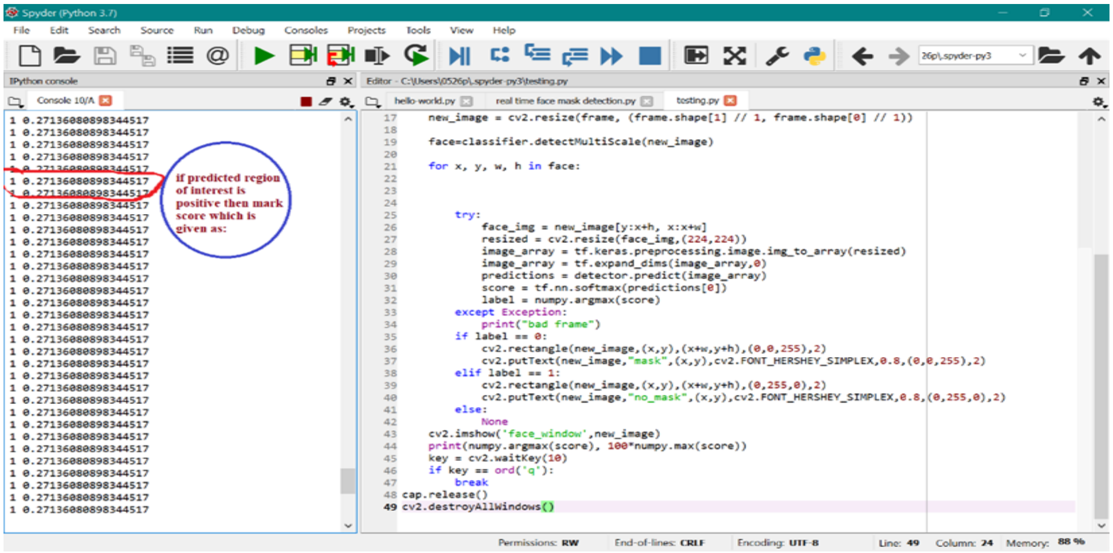
H. To produce our dataset for the synthetic face mask, this procedure is repeated for each of our input frames.

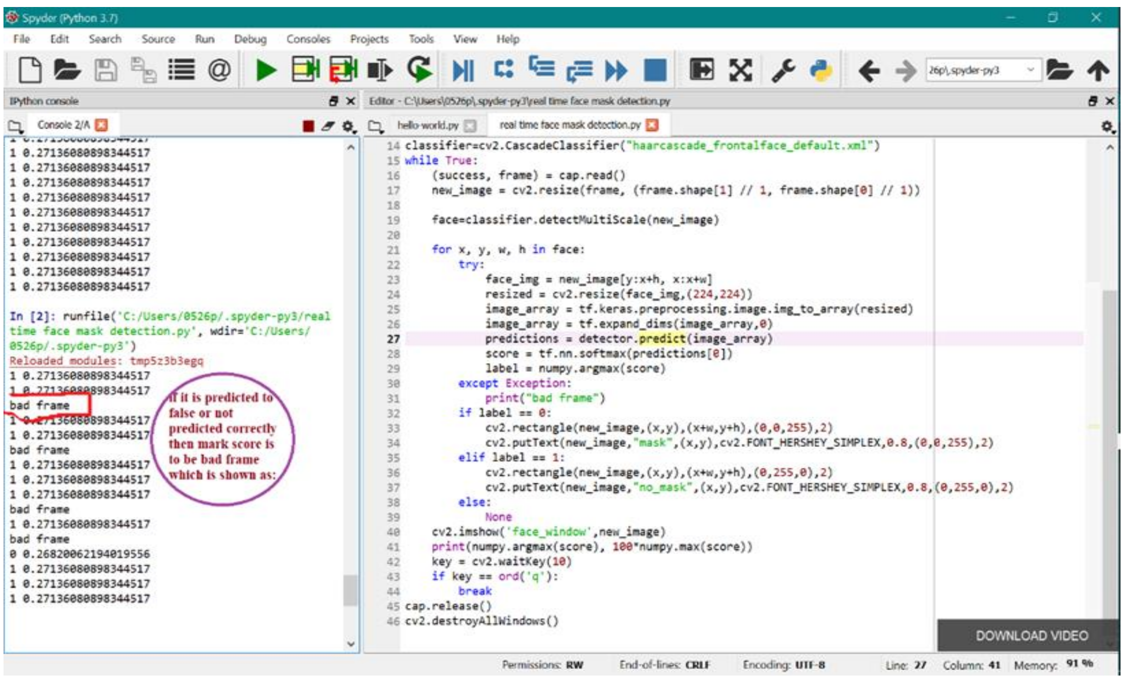
Results and Discussions

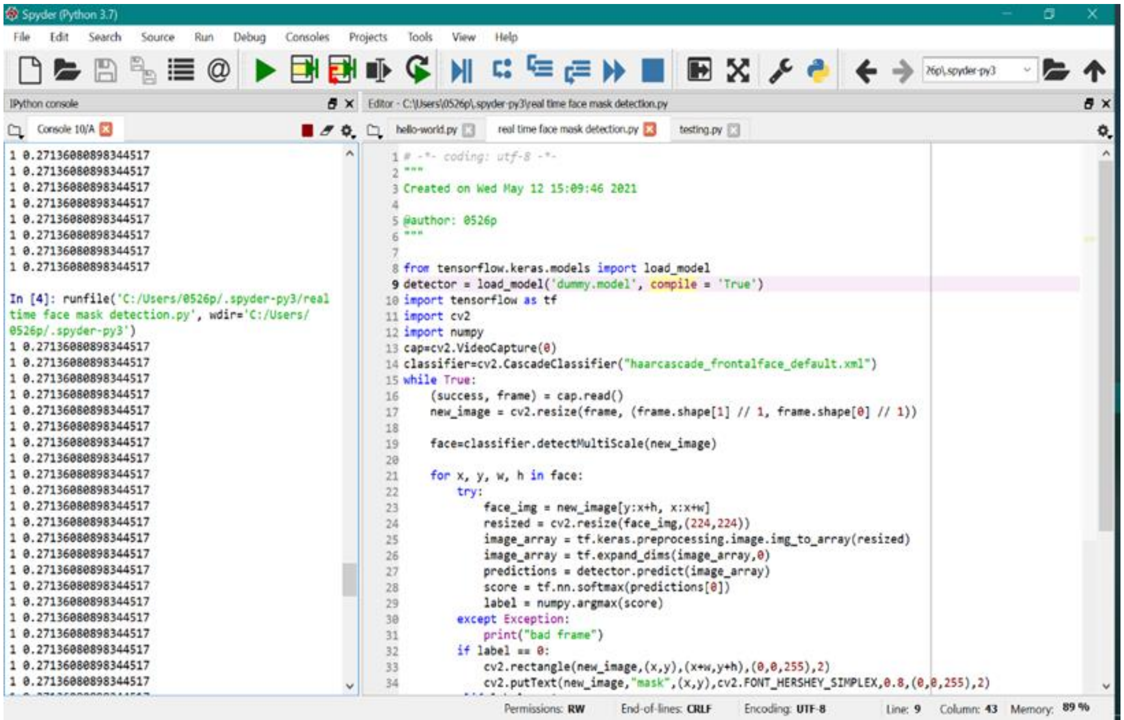
Implementing face mask detector training script with Keras and Tensorflow:

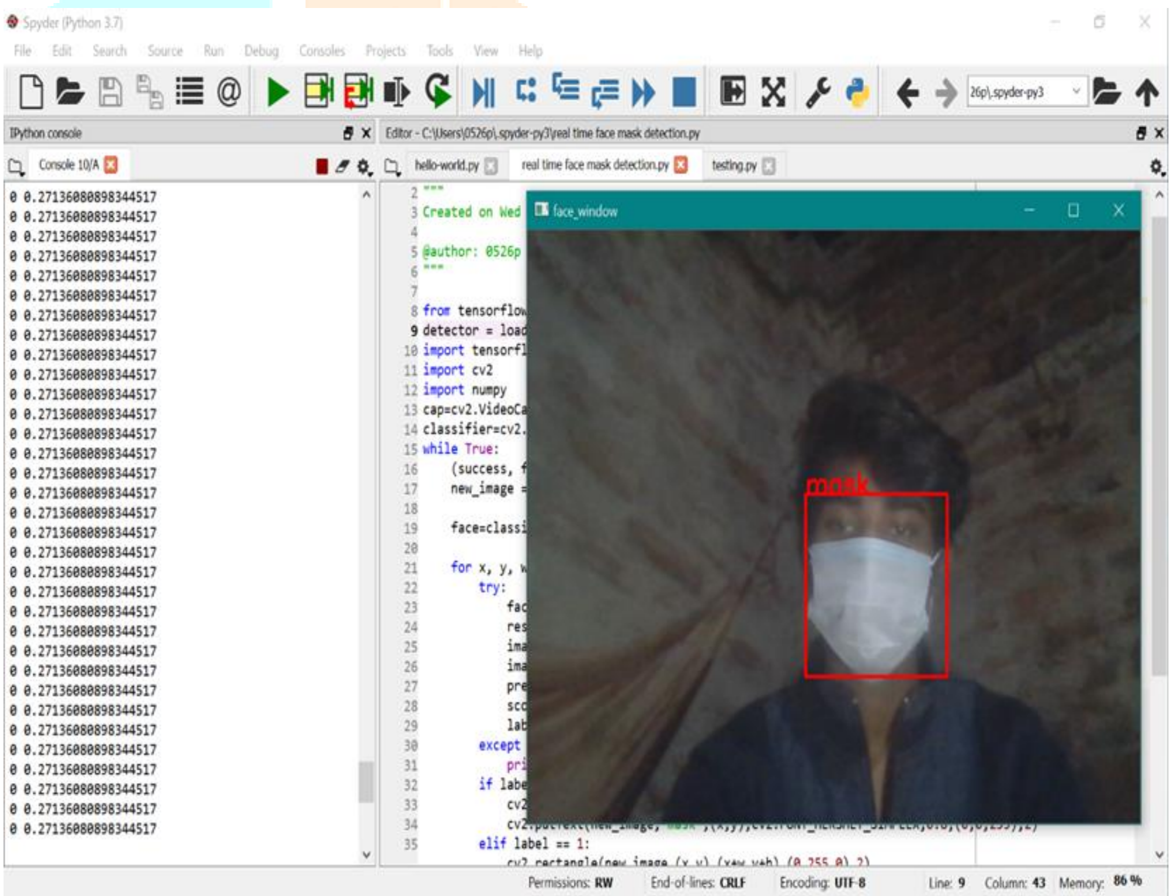


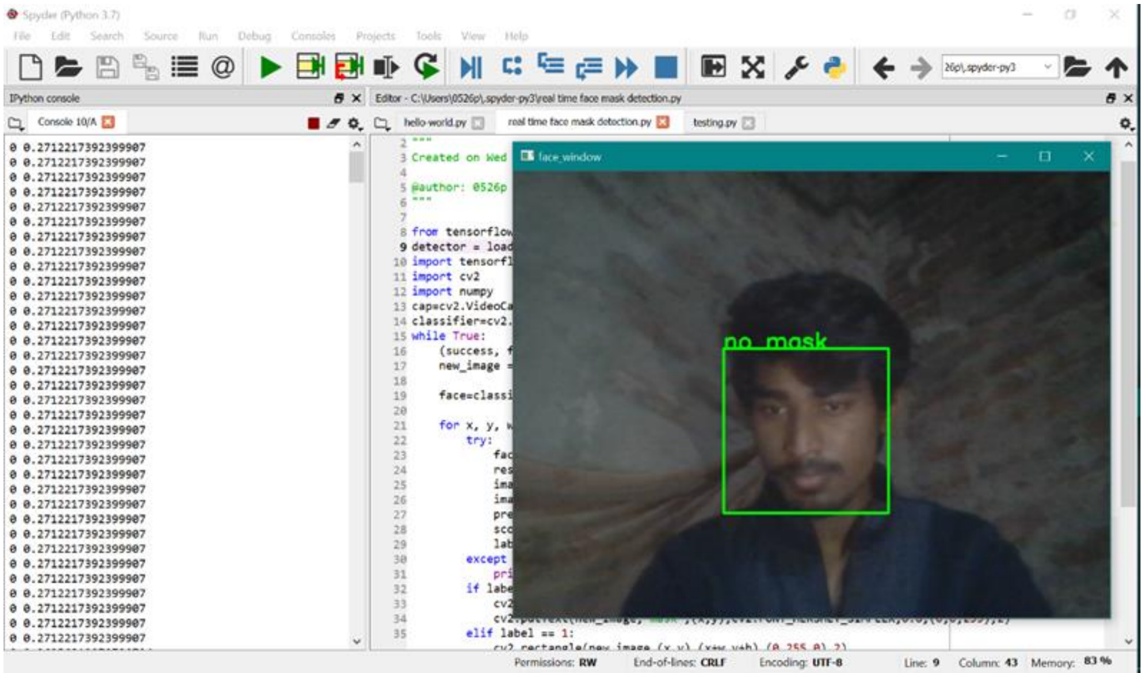



Spyder (Python 3.7)
if predicted region of interest is positive then mark score which is given as:


Spyder (Python 3.7)
if it is predicted to false or not predicted correctly then mark score is to be bad frame which is shown as;
DOWNLOAD VIDEO




face_window
mask



Conclusion and Future Scope

We developed a COVID-19 face mask detector in this model by training a two-class model of people: individuals wearing masks and those who weren't wearing masks, employing OpenCV, Keras/TensorFlow, and Deep Learning. On our mask/no mask dataset, we improved MobileNetV2 and produced a classifier that is approximately 99% accurate. Since we employed the MobileNetV2 architecture, our face mask detector is accurate and computationally economical, making it simpler to integrate the model into embedded systems (Raspberry Pi, Google Coral, Jetosn, Nano, etc.) This application can be utilized in any situation where accuracy and precision are vital to the task at hand, including open spaces, airports, corporate organizations, sidewalks, malls, and testing facilities etc. This approach could be applied to urban planning innovation and would hasten the development process in many developing nations. Our analysis of the existing scenario offers the opportunity to assess the effects of significant social change or to become better prepared for the next catastrophe.

Future Scope:

The proposed model currently provides 5 FPS inference performance on a CPU. We intend to increase this in the future to a maximum of 15 FPS, making our system deployable for CCTV cameras without the requirement for a GPU. We can adapt our architecture to work with TensorFlow RunTime (TFRT), which will improve inference speed on edge devices and improve the performance of our models on multithreading CPUs.

REFERENCES

[1] Safa Teboulbi , Seifeddine Messaoud , Mohamed Ali Hajjaji , and Abdellatif Mtibaa, "Real- Time Implementation of AI-Based Face Mask Detection and Social Distancing Measuring System for COVID- 19 Prevention-Raspberry Pi", Sousse University, Sousse, Tunisia, 2021.

[2] Sammy V. Militante, Nanette V. Dionisio, "Deep Learning Implementation of Facemask and Physical Distancing Detection with Alarm Systems", University of Antique Sibalom, Antique, Philippines, 2020.

[3] Paul Viola, Michael Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features", Mitsubishi Electric Research Labs 201 Broadway, 8th FL Cambridge, MA 02139, 2001.

[4] Shashi Yadav, "IJRASET(International Journal)-Raspberry Pi.", Department of Computer Science and Engineering, Goel Institute of Technology and Management, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, India, 2020.

[5] Arjya Das, Mohammad Wasif Ansari, Rohini Basak, "Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV", Jadavpur University, Kolkata, India, 2020.

[6] Abdellah Oumina,Noureddine El Makhfi,Mustapha Hamdi, “Control The COVID-19 Pandemic: Face Mask Detection Using Transfer Learning”, PMIC Laboratory, Faculty of Science and Technology Al- Hoceima, Abdelmalek Essaadi University, Tetouan, Morocco, 2020.

[7] Zhenfeng Shao, Gui Cheng, Jiayi Ma, Zhongyuan Wang, Jiaming Wang, Deren Li, “Real-time and Accurate UAV Pedestrian Detection for Social Distancing Monitoring in COVID-19 Pandemic”, State Key Laboratory of Information Engineering in Surveying Mapping and Remote Sensing, Wuhan University, 12390 Wuhan, Hubei, China, 430072, 2021.

[8] Sudeep Tanwar , (Senior Member, Ieee), Rajesh Gupta , (Student Member, Ieee), Mohil Maheshkumar Patel , Arpit Shukla , Gulshan Sharma2 , And Innocent E. Davidson, Nirma University, Ahmedabad, Gujarat 382481, India, 2021.

[9] Shabir Hussain ,Yang Yu Muhammad Ayoub Akmal Khan, Rukhshanda Rehman ,Junaid Abdul Wahid and Weiyan Hou, “IoT and Deep Learning Based Approach for Rapid Screening and Face Mask Detection for Infection Spread Control of COVID-19”, 2021.

[10] Mohd Ezanee Rusli, Salman Yussof, Mohammad Ali, Ahmed Abdullah Abobakr Hassan, “MySD: A Smart Social Distancing Monitoring System”, University Tenaga Nasional Selangor, Malaysia, 2020.

[11]A.Kumar,A.Kaur,M.Kumar,”Face detection techniques: A review, ”Artificial intelligence review,volume.52 .

[12] Guangchengwang, Yumiko “Masked face recognition data sets and application” National natural science foundation of china 2020

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

[14] Amit Chavda, jasonDsouza, SumeetBadgujar Multi-Stage CNN Architecture for Face Mask Detection September 2020

[15] Amrit Kumar, Bhadani, Anurag Sinha A Facemask detector using machine learning and image processing techniques November 2020 Engineering science.

[16] A.G. Sandesara, D.D. Joshi, S.D. Joshi, Facial Mask Detection Using Stacked CNN Model, 2020.