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Real-Time Approach to Reduce Infections through Face Mask Detection

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***Abstract:** There is one problem in India right now that is the actual suffering of people due to coronavirus infections growing rapidly throughout the whole States of the nation. Thus, all this pandemic one must implement a breakthrough solution that is thought upon with hard effort and attitude without any discrepancy of race and gender. One solution that our group has researched on the real time analysis of face mask using image processing. This method uses the field of deep learning and the field machine learning to successfully attain the mastery or identification or detection of something that has no mask worn. Are Idea utilizing Perfect Combination of the webcam, and also platform to process data which is the computer. Now coming to solve in the real-time problem, we ensure that the project is having a good amount of accuracy without any loss of awareness and ability to discern one data set to another.*

***Keywords:** Artificial Intelligence, Deep Learning, Face Mask, Machine Learning, Neural Networks.*

I. INTRODUCTION

It all started with one variant of SARS Virus. Which procedurally started to mutate in millions of cycles and causing a lot of damage to the biological protection that the humans usually have from epidemics like these. Due to this breakdown of the barrier viral load have grown up into many people in such a large amount that people could not be able to even breathe in a proper manner. The first calamity struck when a lot of people started to immediately fall into fatal situations of health in Chinese province called Wuhan. This was not immediately identified by the Action Committee called in World Health Organisation, causing loss of life in large numbers and magnitudes all over the country of China which was then realised as a mistake because there was destruction all over the world in terms of biological half and in overall health deterioration. Coming to the problem SARS had in the previous few years, is that a province in China is very popularly known for its food of diverse animals that is consumed by people of the rich and foreign classes.

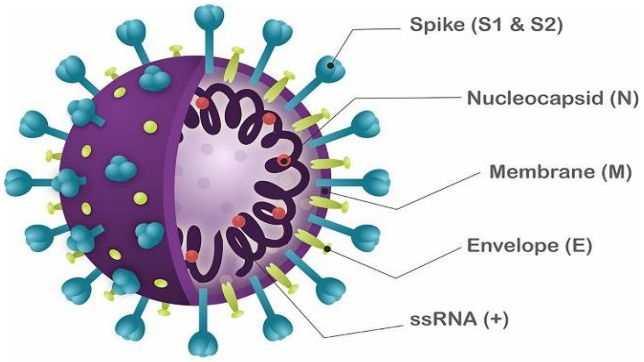

Fig. 1 SARS

It might seem unusual to have an epidemic arise out of wet shops such as these, but once you closely look at the situation develop the one can understand why it happened so. The main reason of such an epidemic is that these animals also suffer from various types of diseases that can be drawn parallel to humans alike. So now you can understand where the situation happens to develop. These animals are stored in a confined and an untidy area, causing them to fall in and not be taken care of properly or handled in unhygienic manner. So, the net result of this situation is that many animals fall sick and develop various types of viral infections that can be for that moment only transmitted to other animals.

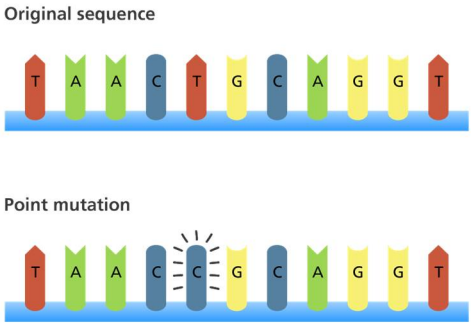

Fig. 2 Mutation Sequence

Now one has to appreciate the timescale of this happening. This has not arisen an in just a year or decade, this has been progress in over multiple decades of sweatshops and meat sales all over the world. It is only that the triggering point was in China because the amount of consumption of such entities is very high in China especially so due to this reason, we encountered a case where the mutation of a virus that infected and animal jump from one level of b into another configuration of biology. So, the patient zero as one might call it, had arisen only due to a cross infection from an animal to man. This is not the only one case that happened to infect a human being from a lower animal species. Take the case of HIV that was actually from a certain species of monkeys and was transmitted from different species until it came in contact with the person who was present in the sanctuary with this said infected species. COVID-19 is a disease that spread from human to human which can be controlled by ensuring proper use of a facial mask. The spread of COVID-19 can be limited if people strictly maintain social distancing and use a facial mask. Very sadly, people are not obeying these rules properly which is speeding the spread of this virus. Detecting the people not obeying the rules and informing the corresponding authorities can be a solution in reducing the spread of coronavirus. As far as coronavirus is concerned, it has been one of the deadliest virus pandemics of the decade. It is not the time to judge or take sides but, it is time to research and be a part of solution but not the problem. To be able to do this we have made and equally usable solution that can be effective in identifying a certain aspect of community that rejects wearing face mask and further accelerate the epidemic, cause in larger loss of life and distress in general.

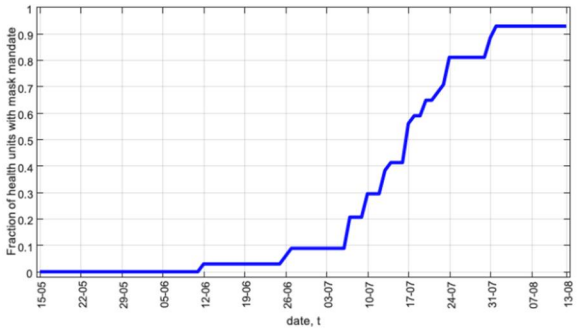

Figure 3: Face Mask Slowing the infection

The main reason face mask is very effective in defeating the transmission of virus is because our respiratory system is mainly dependent on entities such as our nose and mouth breathing free air in an uninterrupted manner. The problem arises when the virus is airborne or when the human being is talking with another person who is infected and infects the person being talked due to the air molecules arising from his legs relation that are there inhaled by the other person respectively. Now that we understand the basic vulnerability of human beings towards the virus infecting us, we can now decode the concept of blocking virus transmission within communities and groups of human beings. The answer is very simple, it is that one must wear something block the inlet or outlet of human transmitted air mixture. This can be done by using an object called face mask. Face masks are of multiple types.

1) *Cloth Masks: Worn during normal conditions*
2) *Surgical Masks: One time use. Can be effective for a short span of time.*
3) *N95 Masks: Very effective in blocking the spread of viruses.*

II. RELATED WORKS

Meanwhile, people have developed various types of resources that can be helpful to tackle the spread of Covid. For example: DRDO Based Immunizer: This checks the immunity of a Covid recovered patient, and also the immunity of a susceptible human being. This machine has proven very helpful in identifying areas and sectors of communities that are very prone to being infected of the virus with a very less magnitude of viral load completely.

Figure 1: DIPCOVAN made by DRDO

Another example is the portable sanitization machine that does a sanitization of any object with the use of multiple angles of lasers attached within the confined space present in the product.

Figure 2: Laser-Based Sanitizer

III. LITERATURE SURVEY

A. AI-Based, Face Mask Detector Application for COVID-19

The Developer Blog of NVIDIA contained essential info regarding image processing and their application (SDK) used in real life. A. Das, M. Wasif Ansari and R. Basak, "Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV," 2020 IEEE 17th India Council International Conference (INDICON), 2020, pp. 1-5, doi: 10.1109/INDICON49873.2020.9342585. This paper presents a simplified approach to achieve this purpose using some basic Machine Learning packages like TensorFlow, Keras, OpenCV and Scikit-Learn. The proposed method detects the face from the image 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.

IV. METHODOLOGY

Basically, what happens is the following:

1) Image Preprocessing
2) Deep Learning Model Dump
3) Identification of people without MASK
4) Alerting the relevant authorities

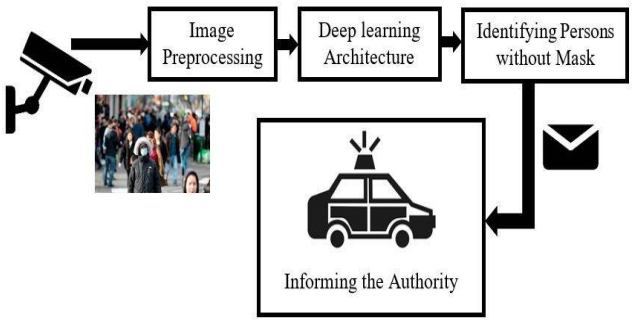

Figure 3: Block Diagram

Now the defaulters are identified and their data is sent to people to target them for fines.

A. Imaging

1) Utilize camera for real time analysis
2) Send source as a frame-by-frame model
3) Analyse each frame
4) Check for Image stability
5) Re-read the Image for conformal analysis

B. Deep Learning Architecture

It is mainly used for training models and programs to act the way they're supposed do. It is further divided into

1) Dataset Collection: - Write the dataset into model to be analysed
a) Collected data will be classified using classifier packages respectively
b) The classifier sends information to parser, to activate it and reframe the data for reconfiguration.

Figure 4: Dataset Samples

V. SOFTWARE AND HARDWARE SPECIFICATIONS

A. Software Used

1) OpenCV
2) Application- Windows 7 (or) 10
3) S / W Tool- Anaconda for Python Libraries

B. Hardware Requirements

1) Desktop,
2) Any 2-4GB Graphics Processing Unit,
3) 4-8GB DDR5 RAM
4) Monitor/Tablet.

VI. RESULTS AND DISCUSSION

Our system is useful in areas with high degree of cluster (DoG). Which is a term to identify crowded areas in cities or towns. Although it is better suited for cities, crowds gather in various places irrespective of city or village. So, our method will perform good anywhere. This can also be said that, in the future, our model can be upgraded to identify masks and categorize them such as:

A. Single Layered Mask
B. Wrongly Worn Mask
C. Cloth Mask

		Prediction	
		Nil Mask	Positive Mask
True	Nil Mask	0.67	0.67
	Positive Mask	0.85	0.85

Table 1: Statistic Conclusion

VII. CONCLUSION

As the technology are blooming with emerging trends the availability so we have novel face mask detector 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 verylarge dataset.

We used OpenCV, tensor flow, keras , Pytorch and CNN 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 casefor edge analytics. Furthermore, the proposed method achieves state-of-the-art results on a public face mask

VIII. FUTURE SCOPE

Today, along with drones, AI and IoT, facial recognition technology is also defining our millennium. Facial recognition is a biometric technology used for authentication and examination of individuals by correlating the facial features from an image with the stored facial database. Face Recognition is one of the most popular applications of image analysis software and no more considered as a subject of science fiction. Earlier, this technology was only used for security and surveillance purposes, but it has safely transitioned to the real world in recent times. Today, companies are pitching facial recognition software as the future of everything from retail to policing.

IX. ACKNOWLEDGEMENT

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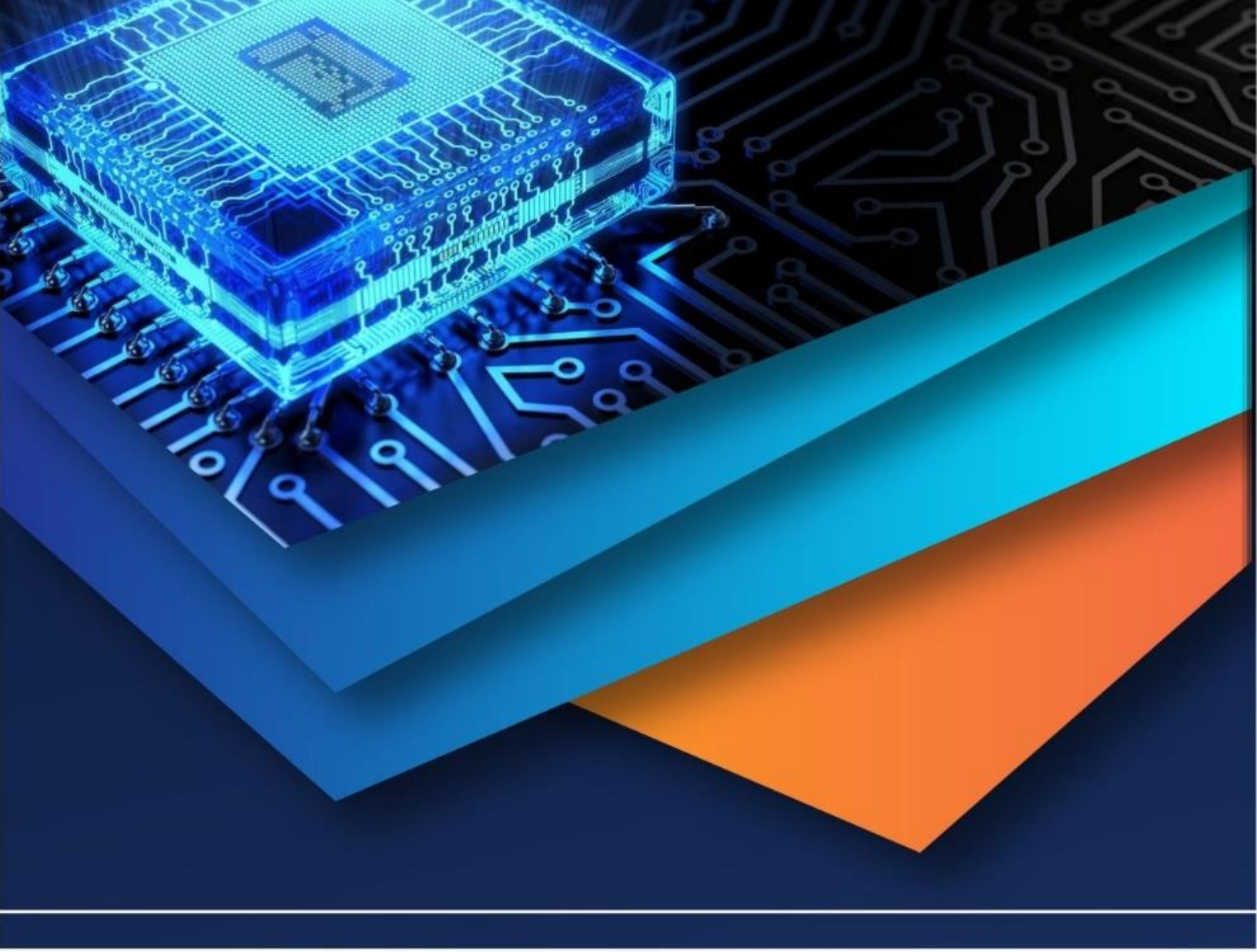

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