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Real Time Mask Detection Architecture for COVID Prevention

Vinutha K[1], Kumari Aditi[2], Mannu Priya[3], Adity Singh[4], Kruthika[5]

[1]Assistant professor, Dept. of Computer Science & Engineering, ACS College of Engineering, Karnataka, India
[2345]UG student, Dept. of Computer Science & Engineering, ACS College of Engineering, Karnataka, India

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Abstract - *The outbreak of coronavirus disease which was started in the year 2019. Itreminds that we want to require few safeguard measures against virus. One in all the effective non pharmaceutical medical intervention (NPI is that the practice of taking precaution but getting vaccinated and taking medicine is wearing mask and social distancing. This tells us that what proportion important is that we want the Real- Time Mask detection which helps in preventing the spread of the coronavirus disease. This model helps in healthcare department to observe the activity of the person by sensing a difference between wearing mask and someone not wearing mask in order that the infected person should be identified. The model relies on deep learning model where it focuses on mask identification which will classify masked and unmasked person. The model has three phases in it where it focuses on the visual representation, face detection for wearing mask or not and mask identification This whole model is examined on the premise of automatic real time video information which detects that weather the personwearing mask or not.*

Key Words: Machine Learning, Deep Learning, Convolutional Neural Network, Image Detection, COVID-19 Prevention.

1. INTRODUCTION

According to the WHO, the Coronavirus disease has caused severe respiratory syndrome which has risen to a worldwide epidemic. The sources report that on 3rd of July 2020, there were quite 100 million positive cases of Covid-19, and 500 thousand deaths. Hence, the growing numbers still remind us of the requirement to take precautions. If precautions aren't taken, it can cause higher rate of infections. Therefore, it's important to developing rapidly, the IOT measures the information collecting, sensing, managing, gathering and detecting and these became simpler. Thus, IOT has brought recovery changers to the life on people and made things easy. Because of the group, many medical precautions are taken place for instance, sterilizations, social distancing and sanitizing regularly. China is the most populated country there's interaction among people are mostly process of daily travel and or their livelihood works. Thus, it leads to prevention to prevent the spread of covid-19. Due to the pandemic online interview classroom have taken place. But there have been many difficulties with bandwidth of wide coverage and transmission. Alibaba cloud used IOT and mobile- edge computing (MEC) and provided network which is closer to the terminal, has improved the outline interactive classroom scenarios. Also Huawei had used IOT to overcome issue like Wi-Fi fiber, where it prevents the info or any information regarding the premises leaving the campus. Even within the medical department, IOT is named as IOMT; it's contributed to several healthcare programs from monitoring the sensors. Also, Deep Learning has high computational system that has implemented within the real time industry, the reduced cost and fewer power appliances like video analyzing of camera sensing device isn't handles directly on the system. Thus the video data can be transferred to cloud server program for examining by use of cloud computing, which makes the degree of examination within the short time. As the real application has very high demand for real-time based performance. Moreover within the healthcare department, there's an outsized amount of knowledge generated by the equipment, thus the video abilities examines through the cloud computing, which results for delay in identification. Thus, deep learning implements the sting computing with higher computational raised and makes the network less delay by data transmission. With the assistance of edge computing it is possible to improve the efficiency of many task performed within the system. Because of the restriction of single edge system, combined to require use of storage unit.

2. LITERATURE SURVEY

2.1 COVID-19 Rapid Growth

Protective measures are rapidly growing throughout world due to the novel coronavirus disease (COVID-19), which is a potentially lethal illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In December 2019, people exposed to a wet animal market in Wuhan City, China, were initially identified as a major source of the SARS-CoV-2 infection. It was proposed that the infection is certainly zoonotic in origin and spreads to humans through an undetermined middleman. As of (22/05/2020), the WHO has received reports of about 4,995,996 40 confirmed cases, resulting in 327,821 fatalities. Infection with SARS-CoV-2 is spread through direct contact with infected people's droplets or through inhalation. This could dwell for 2 to 14 hours or longer. SARS-CoV-2 is getting more attention than it.

2.2 IHR Ground Crossing

It is primarily directed at a wide range of audiences, including national International Health Regulations (IHR) focal points,

those in charge of regulating the IHR at ground crossings, representatives of government and non-government organizations tons, and their partners, as well as public health experts engaged in disease surveillance, information exchange, emergency preparedness and response, veterinary medicine, and environmental health at ground crossings and nearby close proximity. The course seeks to reduce COVID-19's spread including travel, trade, and transportation on and near ground crossings by Defining priority grounds crossings and towns.

2.3 Healthcare System

Diabetes patients and healthcare systems both pay high prices associated with diabetic foot ulcers (DFUs), which are frequent ailments. This evil sickness is made much more hazardous by subsequent complications like infection, gangrene, amputation, and early fatality. Diabetic limb amputations are now most frequently caused by this condition. Over the course of their lives, up to one-third of diabetics will experience a DFU. Up to one-third of the direct costs of diabetes are caused by diabetic foot problems. In patient care can cover the same or more as three- quarters of this expenditure.

2.4 IOT in Healthcare

The term "Internet of Medical Things" represents the connectivity and integration of medical devices with network technologies into broader healthcare networks. To make the patients' health better. But, due to the vital health-related systems' traits, the Internet of Healthcare Things, and current has a number of difficulties, certainly in terms of dependability, security, and safety. In this article, we provide a full evaluation of existing scholarly contributions on how to leverage the most of every Internet of Biomedical Products offered by the internet structures of conventional approaches community. We illustrate the operation of the voting society, permitting medical supplies for use by patients and health care professionals providers. Also, we emphasize undiscovered directions for research and themes that would be used to tackle unanswered problem of the study.

2.5 Implementation of IOT

Its Internet of Things (IoT) has really been implemented in a number more companies along with the development of multiple evolving methodologies & technologies, also including cloud applications, cloud applications, deep learning, and big data. Owing to the rising growth of worn and smartphones, the Online shopping of Health insurance Things, in general, has become much more significant for Human Activity Recognition (HAR). This study will focus mostly on HAR achieved by supervised learning in Complex challenging settings. For far more precision HAR, a sub-transfer learning framework is developed, and it satisfactorily employs and interprets sensor data despite insufficient labels to create the classifier teaching strategy.

2.6 Diabetic Foot Ulcers

Diabetic foot ulcers (DFU) and its sequels were some of the most severe and disabling side effects of drugs. Due to such development of the internet of Medical Things (IoMT) and devices, the medical software industry is also on the threshold of a hospice revolution. This might offer the possibility for said creation of feasible alternatives that could also potentially drastically specifically deal with DFU and preserve prostheses. This website investigates IoMT treatments apart from those involving DFU subjects.

3. CONVOLUTION NEURAL NETWORK

Convolutional neural network is a type artificial neural network which is generally used for image related processing in machine learning. A CNN takes image as input and factors it into many layers. Each layer is assigned parameters which will be used for training. A CNN model reduces the effort in parameter tuning as compared to an ANN model. A CNN uses a hierarchical network consisting of layers of inputs and outputs a fully connected artificial neural network which can be utilized for image processing. Artificial Intelligence has made critical strides in bridging the gap between human and machines. Computer vision targets to enhance the technologies which enable to analyze the environment using camera and image. For many years the researchers have been perfecting the field of computer vision. Today we can utilize many techniques devised by the computer vision researchers to create ground breaking technologies. We can create applications involving image recognition, hand gesture identification for blinds, etc.

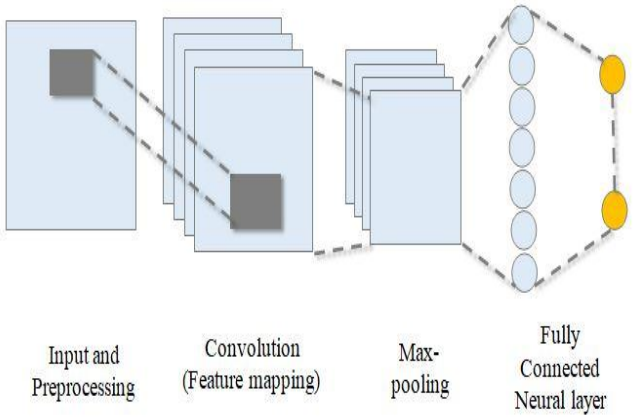

Fig -1: Convolutional Neural Network

4. METHODOLOGY

4.1 Data Collection

We have used three different kinds of images for the datasets, images consisting of mask worn properly, images consisting of mask not worn and images consisting of mask worn improperly. The dataset consist of over 2000 colored and black and white images. These images are sourced from

various repositories online e.g. GitHub, Kaggle, etc. We have also generated simulated Masked Dataset.

Fig-2: With_Mask Dataset

Fig-3: Without_Mask Dataset

4.2 Preprocessing and Augmentation of Data

The images taken are of different orientations and color combinations in order to make the model robust and avoid overfitting. We have resized all the images to same size of 256*256 pixels. Numpy and Pandas Library are used to preprocess the images for further calculations.

4.3 System Design

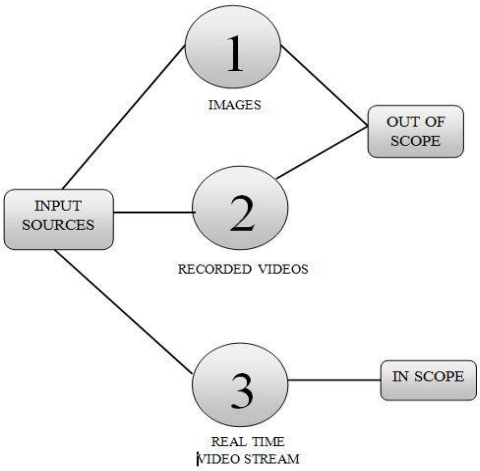

Fig-4: System Design

Our model is based on a real-time video stream. It determines whether or not a person is wearing a mask. The aim is not to identify or apprehend people who do not wear masks, but to collect anonymous statistical data that will help authorities predict possible COVID-19 outbreaks. Some restrictions can include video clarity and varying angles. To paint a more complete image, we may claim that it is used to: Detect people who move through a security-like camera in real time and recognize the use of a face mask. In the fig. 4, the scope of the project is illustrated using the flow chart. Our scope of the project is to detect mask in real time videos.

4.4 Training

In the first step the dataset is loaded to the classification trainer, two datasets are loaded simultaneously namely with_mask" and "without_mask". After this is done, the classifier takes action and starts the training process with the provided dataset of images. The training is done along with a pre-trained face detection model. The classifier takes a few hours to process the data and the output obtained is stored and serialized to disk. This would then be used in further application of the next phase at any given time.

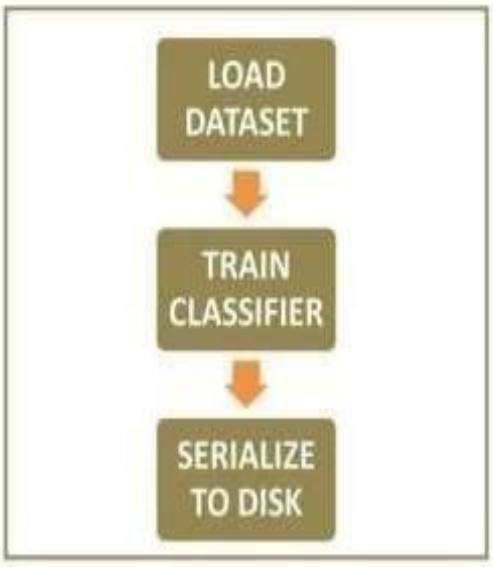

Fig-5: Training Phase

4.5 Deployment

The fig. 6 represents all the processing steps required for the deployment phase of the model. It consists of four different functionalities where each function performs a unique task to contribute to our model. In the first step, the stored trained classifier from the previous phase is loaded along with which a hardware device like a CCTV starts to scan faces of people in its vicinity in real time. The input provided by the CCTV is visualized on a monitor screen to which the trained mask detection classifier is applied. Bounded boxes of color green and red will be drawn on the monitor around the faces detected in the real time video stream.

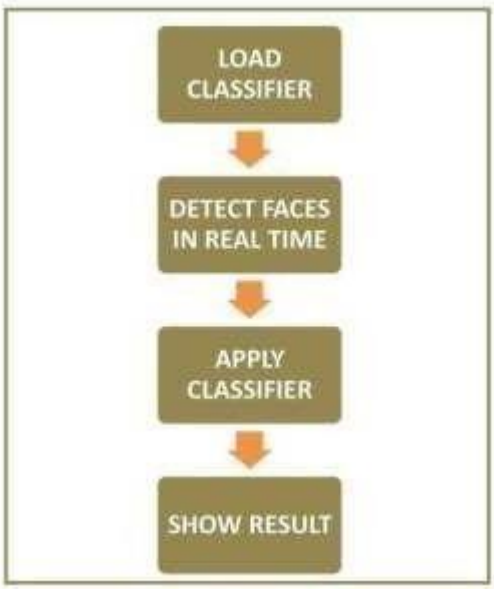

Fig-6: Deployment Phase

5. RESULTS AND ANALYSIS

Fig-7: Epoch vs Loss/Accuracy

The Model is trained for over 20 epochs. The Epoch vs Loss/Accuracy graph is shown above in fig 7.

	Precision	Recall	F1-Score
With_mask	0.99	0.86	0.92
Without_mask	0.88	0.99	0.93

Table-1: Performance Metrics

The table 1 shows the performance metrics of the machine learning model. The precision is 99% for mask and 88% without mask. The precision interprets the quality of a positive prediction made by the model. This means that our model is able to detect the mask 99% of the time when it's making a positive prediction. Our model is able to detect an unmasked person 88% percent of the time when it's making a negative prediction. The recall is 86% for masked detection and 99% for unmasked detection. The recall measures the performance of the model based on correctly classified samples.

6. CONCLUSIONS

The coronavirus COVID-19 pandemic is causing a worldwide health crisis. Our model is implemented in two phases namely, training and deployment. We used two datasets to coach & test our model. When deployed, the model is capable of detecting masked and unmasked faces in real time. The model are often implemented at various locations like schools, work places, public places like libraries, airports, bus and railway stations etc.

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