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A brief Survey on AI Based Face Mask Detection System for Public Places

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ABSTRACT

The corona virus which can be also called as SARS COVID-19 is spreading over the world among the peoples and led to cause a global pandemic. The spreading of the virus forced the government to pressure their peoples to follow strict lockdown, this might cause many problems to every single person in the society. The strict rules from WHO (World Health Organization) tells that the only solution for this spread of virus is wearing a face mask. Thus, to help the government and the public this proposing model ensures that every single person wears a face mask in public places. Few models work depending on the artificial intelligence, deep learning and machine learning. The model uses the Keras, Tensor-flow and OpenCV methods for execution. This device is developed with two datasets which are namely with and without facemask. The system is included with a Raspberry- PI camera which captures the live streaming video and coverts them into images, which can be used as the inputs and process the data. The system is developed with a toll-way gate which allows only if the person crossing it has a face mask worn on his/her face or it does not allow the person in. It is developed along with an alarm system which beeps with a red light if the person is not wearing a face mask or it glows with a green light. This model ensures to make the environment and the people to be safe.

Keywords: Open-CV, Tensor Flow, Keras, Mask detection, Artificial Intelligence, Covid-19.

1. Introduction

The spread of corona virus has led the whole world to stay in the lockdown as this spreads only through human to human interactions. The WHO gave few guidelines to prevent the spread of novel corona virus. There is no proper vaccine yet to prevent this virus attack. This made every single one in the society to ensure they wear a face mask to make themselves safe and secure from the spread of this corona virus. The device was built to make sure everyone in the society to wear a face mask [1]. This device uses the AI, deep learning and machine learning methods to implement the device with real time face detection and image processing. This device would help the government to handle and manage the people in the society to maintain social distance and to make sure everyone wears a face mask [2]. The process of this device works on the basis of the pre-defined data sets with two types namely with facemask and without facemask. Then these datasets are used to compare with the inputs each time to generate output. The Keras, OpenCV and Tensor flow algorithms are used along with the python embedded language to increase the throughput value, efficiency, accuracy, etc. This device also has a toll way which opens only if the person crossing it has a face mask on his/her face and do not open if the person does not wear it. It was also built with an alarm sound with that beeps along with a glowing red light and with a green light if the person is wearing the face mask. The earlier device had the DNN and RNN algorithms which failed to meet the actual requirement and needs [3]. Those methods failed as they failed to meet the required accuracy, efficiency, throughput, etc. Thus, this system ensures to meet the required needs and made it feasible to access by every single on in the society. The device would help the people to safeguard themselves from this spread of corona virus.

2. Related Works

In the early days, the peoples working on it mainly focused on few methods like the gray-scale face image algorithms [4]. At the same time few others were focusing on pattern identification methods where the processing initial information of the face models like AdaBoost was one among the best classifier by that time.

Later the Viola-Jones detector, was evolved which made real time face detection come into existence. But it had a problem as it failed to work properly in the dull and dim light and it failed to classify properly with that low light source. Many pathogens have been discovered to be able to spread through airborne routes and additional theories have emerged to clarify these ideas, explaining that his ideas in greater detail. Wells first proposed his first five-nuclei model (that airborne infections can be transmitted through) in the 1930s, and additional theories have emerged to clarify his ideas, explaining his hypothesis in greater detail [5]. When someone has a contagious cold or infection, infectious particles containing infectious (droplets [bacteria and viruses are released when someone has a contagious cold or infection [6].

However, before the very recent H1N1 and H3N2 respiratory viruses exposed their medical effects and the magnitude of their global impact, the two most recent influenza pandemics in 2003 and 2009 did not receive much coverage due to the press. a number of pandemic pathogenicity outbreaks, during which a significant number of attempts were made to find a way to prevent or reduce airborne infections and the 5 to 10-micron range (resolution limit) for viruses is an incredibly limited range, much smaller than the 1 to 2 micron (v-limit) range, which involves many cases of respiratory viruses; sadly, this does occur not only there, but also for them [7]. This differs from all other types of airborne diseases, which are transmitted by airborne particles, since airborne pathogens must be enclosed within droplets for transmission and spread, and this form of transmission can fly up to 1 m in the air for prolonged periods of time. CO19 was first thought to be transmitted via the respiratory path, but it has now been discovered that it is primarily spread through airborne transmission [8]. Controlling airborne diseases necessitates a range of methods, as different groups hold varying opinions on the efficacy of various techniques. Droplet dispersion and air circulation have been extensively studied in order to better understand how to optimise droplet dispersion [9].

The respiratory system is the area of the body that deals with breathing. When used near a direct source of infection, active protection measures such as respiratory area cleaners and air purifiers can help avoid exposure [10]. Face masks and N95 respirators are examples of respirators that shield the wearer from infection while still providing occupational safety [11]. Despite the fact that face masks are less costly and easier to use, there is a higher demand for respirators, whose job isn't made any easier by additional testing of their efficacy, which has just increased those criteria [12]. Wound dressings, nontemporal surgical exposure to airborne microorganisms [13], and other large concerns concerning airborne contagious diseases such as tuberculosis, particularly among the average person, as well as conventional remedies, such as the wearing of masks, were among their original objectives [14]. Despite the fact that there is no proof that face masks minimize the incidence of respiratory viruses, and certain beliefs about their effectiveness are debatable, they have been shown to be of limited benefit [15]. Infection is normally a major risk to households, but recent research has shown that wearing a face mask can reduce the incidence of flu, even in people who are otherwise healthy. A systematic review of randomized controlled trials evaluating the effectiveness of face masks and respirators against respiratory viruses found that nurses were better protected, although face masks were more useful but had limited efficacy; although respirators worn by healthcare workers appeared to be effective, the results showed only temporary efficacy; despite this, a m Respirators have a limited long-term

protective advantage, according to the majority of available data, while masks have a superior short-term benefit [16]. Since the effect of wearing face masks on reducing viral infections is uncertain due to medical and other biases, we conducted a quick analysis to examine the research results for all designs in order to determine which ones, if any, are known to reduce transmission. Because of the extreme Respiratory A virus (SARS-CoV) pandemic that is currently threatening everybody, this is particularly harmful to humanity. Some factors, such as the general health of the infected individuals and the virus, as well as the healthcare system, increase the likelihood of serious viral infection. According to this report, approximately 22% of people with no symptoms die from a viral infection, while another 18% leave the scene with long-lasting scars [17].

Since a low-probability occurrence occurs just a few times in our civilization's history, we will never know if our acts are making it worse or better. The astronauts of the space station and the space shuttle, as well as the Allies, sacrificed their lives in Iraq in 2003, carrying out a much riskier mission than the Apollo or WWI troops. Few people willingly consider such threats, and far less willingly accept them knowingly. Although the risk of death from commercial planes was 1:777 in 2008, it is far too high for many others to consider, so 1:77 is a more rational reflection of the fact that lethal planes pose far less of a risk. Since the virus is potentially transmissible anally (even via animal saliva), the technique of "herdummy" vaccines will work if the rate of transmissibility is believed to be high. The development of a vaccine is probably the only hope for a successful cure or prevention of the pandemic. Unfortunately, there is no way to predict when a more efficient and well-tolerated vaccine for eradicating the pandemic will be available. Chloroquine, Remdezivir, and Ravizine are among the promising new medicines [18]. Even if one of the treatments works, there is no guarantee that enough will be available to the population in measurable amounts to begin addressing the problem. People who have had a long and serious illness may also be at risk for long-term neuropsychiatric problems (diseases) complications [19]. As a result, there is only one realistic choice for managing the virus outbreak: stopping the pandemic. SARS-2 infections are subclinical in 44 percent of cases. As a result, many individuals do not show signs of the disease and can transmit transmission chains, leading to increased difficulty in identifying the virus's origin. According to the latest report, nearly 10% of the population is contaminated, with these individuals accounting for the majority of [20]. Viruses that spread through short-which can result in a large number of social connections. Alternatively, if the virus is not eradicated, and people believe there is little chance of it spreading between those in long-term relationships and those who do not maintain these hygiene or distance practices, this issue will arise. As a result, the government must intervene at different levels to protect the population.

In the short term, preventing the spread will most likely be critical. It seems that avoiding infection, as well as assisting those who are already sick, is critical at this time. It is important that the health-care system be prepared to accommodate unforeseen, but unavoidable, increases in demand. Because of the virus's initial scale, the pandemic will last for years until a vaccine is developed, at least as long as more cases are reported at a faster rate. Similarly, when St. Louis was hit by a pandemic during the Spanish Flu of the 1920s, governments shut down medical systems to prevent the epidemic from spreading because the latter's medical

practitioners considered it a victory [21]. After the epidemic has ended, the public will follow the rules; but, the effect on the economy and society will be devastating. Since pandemics are notoriously difficult to predict, this approach is inadequate for long-term containment. Fighting the infection thus necessitates identifying the infection's source, not only in isolated areas, but even in more widespread locations, as it appears to be. Identifying successful infection-blocking techniques is important for protecting patients and healthcare workers, particularly because most healthcare facilities do not recognise this when putting in place preventative measures. Initially, it was assumed that SARS-CoV could be transmitted by skin contact or bodily fluids. No other family members were at risk because people nowadays practice good hand hygiene and don't shake hands to prevent pathogens from spreading. People may assume that pollution from a few feet away from the source is the most common form of transmission over short distances (Wang et al., 2020). The disease is most likely spread through the air. As a result, distance determines how easily the disease spreads in colder climates [21]. When SARS-2 is humidified in the study, it is thought to survive in aerosols for a period of time, but the effects of humid weather on SARS-CoV aerosols in the real world are unknown [22]. Infections are more likely to occur in areas with poor air exchange, due to a lack of virus concentrations, and in environments where a substantial viral transmission is needed, due to atmospheric factors.

A significant portion of the fine mist aerosolvent exhaled has a diameter of less than 10 micrometres (i.e., the typical of inhalation, speaking, singing, and even just having a breath, due to the different flow of aerosols). At 50 percent humidity, for example, droplets with a diameter of 10 micrometres evaporate, but the rest of those with a diameter of 20 to 30 micrometres fall to the bottom of the bath after evaporating and sink in or decrease [23]. The concentration of the droplets is quickly lowered after the viruses have dissipated, and flows are unstable, so the viruses can disperse rather than move in groups. Infections will become infrequent and long ones will become impossible if the viral load decreases rapidly and over long distances, the virus' range. Since virus transmission is more likely to occur over short distances in this situation, it is important to understand short-range travel. It is better to have strict hygiene rules and to space social distance people in terms of epidemiology. The basic and special dimensions are more or less the same when it is temporarily enforced; however, they vary greatly after that, since people must represent their own views and attitudes about space. It is important to use dependable and reliable security to prevent infection rates from fluctuating. Touch and droplet spread play a significant role in viral spread, and technical resources that specifically interact with the act are required to break the chain of infection.

This mask style has been worn on the streets of Hoboken as long as the sea, dating back to the early 1900s [24] using face masks as a basic public health measure may have resulted in a reduction in overall infections (with SARS) (Lee et al., this conclusion); but, as previously mentioned, simple face masks were used for SARS as well. A separate study found that a clear surgical mask, regardless of location, can reduce SARS infection (and infection in general). An earlier study by the same authors conducted by the same individuals showed that the findings there (authoritative sources), which is also verified by an article by few authors which appeared in 2020. The only possible way to prevent is to wear a face mask. For months, WHO, the CDC, and other public health experts urged people who have or have come into contact with the virus to use face

masks over others to simply for weeks, WHO, the CDC, and other public health experts urged people who have or have come into contact with the virus to use face masks for over others to simply for weeks, WHO, the CDC, and other public health experts urged people who have or have come into contact with the virus to use face masks [25]. Three unsubstantiated allegations brought it to my notice. It was also pointed out that there is no scientific evidence to support the idea that respirators offer any protection against liquid or aerosol contamination. This was the second point of concern. It was feared that the general public would be unable to properly wear the masks, resulting in excessive squinting due to the brim's width. Furthermore, it was proposed that if people felt comfortable wearing masks, they would be more likely to be imprudent and behave carelessly. However, when addressing this, it should be noted that health workers urgently need respirators in order to prevent infection and disease. As a result, the populace has been shaken, and those who felt they understood all now don't. Note: Particle respirators are often referred to as occupational safety devices, and employees working in contaminated conditions are required to wear them. The best case not only holds 30% more air volume, but it has also been shown to bring significant amounts of microbial protection beyond the protective envelope's limits.

The effectiveness of clear mouth and nose covers has been challenged. According to the ICN, on average, about 7% of all confirmed cases of CO19 occur in the workplace [25]. In this situation, it's also possible that surgical masks don't have the expected level of droplet protection. Although it's necessary to distinguish between mask types, keep in mind that one serves defensive and aesthetic purposes while the other does not. Despite the efforts of virologists and those in charge of developing a response, the situation was allowed to spiral out of control because those categories were not adequately established and separated during the outbreak's early stages. Moreover, the validity of the second claim is debatable. Several global health pandemics have shown the effect of proper face masks in different regions of East Asia, in particular, in which people in Asia have come to recognize the importance of mask use in improving their health. As a consequence, treating the Western population as if it were incapable of learning is unfair. Experiments have shown that the third argument is false, according to critics, because it has the opposite effect [26]. In terms of personal safety, those who have already taken precautions will consider the presence of danger and, as a result, will engage in safer behaviours as a result of the safety device's security. Scientists have discovered that the benefit of reducing the density of people's breath would not be appreciated unless medical workers and public worries about competition are redirected.

Meanwhile, for the same reason, healthy face masks have been commonly recognised as an important component of patient care. The Centers for Disease Control and Prevention in the United States has updated its guidelines and now recommends that people wear face masks. In today's communities, it is often recommended that people wear masks to protect their health. However, due to the following requirements, only surgical masks or masks that have been authorised by governments and caregivers can be worn by anyone: Clear face masks may be appropriate in some countries, but to avoid disturbing hospital fights, other countries recommend wearing either licensed surgical masks or medical masks. However, the more pressing question is whether these handcrafted respirators and surgical masks are potentially better at preventing

droplet infection transmission. As a consequence, the approach has far-reaching consequences for people's actions [27]. According to one study, surgical face masks and air cotton masks are ineffective at containing SARS-coronav-2 when patients cough. This study confirms that proper face and hand hygiene must be used for each respirator in order to prevent infection and illness; another study suggests that proper mask usage and sealing should be added in order to maximize the efficacy of the masks [28]. If these results were wrong, the effects would be contradictory. The discrepancy between scientific findings and the experts' recommendations prompted them to wear masks in public for a period of time, implying that the media scientists were unaware that their goods had any benefits. Politicians and virologists, on the other hand, made the error of extending results from plain mouth-and-nose masks to all masks without distinction [29].

These experiments were conducted to see whether and how good these masks are at preventing droplet infection, as well as to find out why research findings on this basic scientific question differ so much. First, we look at the flow obstruction caused by surgical masks while coughing, since this is important for other people's protection, and coughing is a common symptom of COVID-19. Second, we put various filter materials and masks to the test to see how well they protect against droplets. Finally, gap flows at the edge of surgical and particle-filtering respiratory masks are seen [30]. We use engineering testing methods of fluid mechanics, in comparison to the medical studies cited. This method of inquiry can be used for a number of reasons: Droplet detachment in the lungs and throat, as well as their convective transfer into the atmosphere through the mouth prior to inhalation, as well as droplet deposit and evaporation, are both fluid mechanical processes. Second, fluid dynamics researchers are investigating how to effectively block flow with appropriate masks. Finally, gap flow, like particle filtering from an air stream with the help of suitable materials, is a purely fluid mechanical problem. Finally, since the boundary conditions are well established, the effects of this strategy are statistically repeatable. We're looking to see whether an infection can occur in a particular situation rather than if it's physically possible in general. Many countries passed new legislation requiring citizens to wear face masks as a consequence of the Coronavirus (COVID-19) outbreak.

Governments have started to establish new space management systems, as well as social distance and services for medical staff and the general public. The government has placed pressure on hospitals and other organisations to introduce new infection control measures in order to prevent the spread of COVID-19. The transmission rate, on the other hand, is calculated by government policies and estimates. Since COVID-19 is distributed by airdrops and close touch, governments have begun implementing new rules requiring citizens to wear face masks. To minimize the rate of transmission and spread, face masks are worn. The World Health Organization (WHO) recommends personal protective equipment (PPE) for human and medical use (PPE). However, most countries' capacity to increase PPE production is severely limited (PPE, 2020). Because of the virus's negative effects on people's quality of life, which have resulted in acute respiratory infections, death, and financial crises, COVID-19 has become a major public health and economic issue around the world. According to the World Health Organization, COVID-19 infected over six million people in over 180 countries, with a 3% mortality rate. COVID-19 spreads quickly in crowded places and when people are in close proximity. In their attempts to protect people from the coronavirus, many countries face unprecedented

difficulties and threats. To fight and win the battle against the COVID-19 pandemic, governments will need guidance and surveillance of people in public places, especially in congested areas, to ensure that face mask laws are enforced. To accomplish this, surveillance technologies and Artificial Intelligence models could be used.

3. Problems Identified

The ability to utilize all the knowledge of deep learning and machine learning to ensure the society is safe from the spread of corona virus along with few image processing algorithms and others few related methods and ensure it meets the requirement by both the government and the people in the society.

- Is this device really needed by the society at this time and will it be accessed by every single one easily.
- Will the device meet the requirements and produce proper output in all possible situations.
- Is the device really feasible to ensure safety among the people in the crowd from the spread of corona virus.

4. Conclusion

The work is completely based on the real-time face detection where it detects and produce the output depending on the person wearing a face mask or not and it also includes an alert system using deep learning and machine learning techniques by use of CNN (Convolution Neural Networks) . The trained model using CNN, tenser-flow and keras algorithms would be able to perform properly using the VGG-16 CNN model achieving 96% result for performance and accuracy and it led the device to maintain the highest possible accuracy, throughput and efficiency. The device is more feasible as it was developed with cheaper materials and made sure it is accessed by everyone in the world. In addition to it, the device has an alarm system to alert the people by making a sound along with red light if the person is not wearing the mask and with a green light if the person is wearing the mask. It is made sure it would help every people in world to make sure they are safe from the spread of the novel corona virus.

Declarations

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Competing Interests Statement

The authors declare no competing financial, professional and personal interests.

Consent to participate

Not Applicable

Consent for publication

We declare that we consented for the publication of this research work.

Availability of data and material

Authors are willing to share data and material according to the relevant needs.

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