

VISION-BASED FACE MASK DETECTION IN REAL TIME VIDEOS COMPUTER

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Abstract: The recent COVID-19 pandemic has highlighted the necessity of using facemasks as a preventive tool against infectious illnesses. There has been a lot of interest in developing automated systems for real-time facemask detection to monitor compliance with facemask use. This work presents a visual method for identifying masks worn by individuals in live-action footage. The proposed system utilizes computer vision methods to analyze live footage captured by a camera or online cam. Firstly, face identification algorithms are used to locate human faces in the video footage. Next, a deep learning-based classifier is used to determine whether the recognized face is covered by a mask. To train the facemask detection algorithm, a large dataset of annotated photos of people wearing and not wearing facemasks is used. Transfer learning strategies are employed to perform accurate and efficient facemask categorization by leveraging pre-trained convolution neural networks (CNNs). The trained model is subsequently integrated into the pipeline used to analyze videos in real-time, enabling instantaneous facemask detection.

I. INTRODUCTION

The emergence of COVID-19 has brought about an incredibly challenging period for the entire world. The pandemic has been a significant contributor to numerous challenges faced across the globe. Over the past two decades, many companies have had to shut down, and individuals have encountered a staggering amount of difficulties. However, with the availability of influenza vaccinations, there is a possibility that people's lives may return to how they were before the outbreak. On the other hand, from the beginning of the epidemic, medical professionals have recommended the use of face masks, social distancing, and hand sanitizing as measures to minimize the risk of contracting the virus. These are the criteria that can help in reducing the danger of getting the virus.

When it comes to fighting and curbing the spread of this viral infection, manually implementing all these measures is challenging. That's where technology comes in. Setting up a face mask identification system would make it possible for authorities to identify individuals who wear masks and those who don't. This could be a crucial aid in preventing the virus from being passed on to more people. Authorities have made significant strides towards implementing these guidelines, and it's possible that similar technology could be of great help in doing so. Additionally, those found to be in violation of these measures could be reported to the authorities for action. This system could be utilized to improve medical treatments maintained by institutions and also raise public awareness. Both of these functions have the potential to be exploited in the near future.

Problem Statement

In the wake of the COVID-19 pandemic, the wearing of face masks has become a critical public health measure to mitigate the spread of the virus. However, ensuring compliance with mask-wearing mandates in public places, businesses, and healthcare settings can be challenging. The objective of this project is to develop a robust and automated Face Mask Detection system to address this challenge

II. LITERATURE SURVEY

1. "Real-Time Face Mask Detection in Public Spaces Using Convolutional Neural Networks"

This research paper introduces a real-time face mask detection system based on convolutional neural networks (CNNs). The study discusses the architecture of the CNN model, data preprocessing techniques, and evaluation metrics for accurate and efficient mask detection in public spaces.

2. "Deep Learning-Based Face Mask Detection for COVID-19 Pandemic Mitigation"

Focusing on the COVID-19 pandemic, this study presents a deep learning approach for face mask detection. It explores the use of pre-trained models and transfer learning to develop a robust and adaptable system for monitoring mask compliance in various settings.

3. "Face Mask Detection in Surveillance Videos: Challenges and Solutions"

This paper discusses the unique challenges associated with face mask detection in surveillance videos, including occlusions, lighting variations, and crowded scenes. It presents solutions such as data augmentation, region-based detection, and temporal modeling for accurate video-based mask detection.

4. "Privacy-Preserving Face Mask Detection using Edge Computing"

Addressing privacy concerns in face mask detection, this research explores edge computing approaches that perform mask detection on-device, minimizing the need for transmitting sensitive facial data to centralized servers. The study discusses the trade-offs between privacy and accuracy in such systems.

5. "Face Mask Detection in the Era of Deep Learning: A Comprehensive Survey"

This survey paper provides a comprehensive overview of face mask detection techniques, encompassing traditional computer vision methods and deep learning approaches. It discusses the evolution of face mask detection research, benchmark datasets, and state-of-the-art models, offering insights into the field's current state.

III. BACKGROUND STUDY

COVID-19 pandemic has had a lasting impact in many countries worldwide since December 2019. It originated in Wuhan, China. The World Health Organization (WHO) as on March 11, 2020, declared it as a deadly diseases that gained its roots across the globe and severely affected 114 countries. Every medical professionals, healthcare organizations, medical practitioners and researchers are in search for a proper vaccines (Megahed&Ghoneim, 2020) and medicines to overcome this deadly disease, however no breakthrough has been reported till date. The virus spreads through air channel when an infected person sneezes or communicate with the other person, the water droplets from their nose or mouth disseminate through the air and affect other peoples in the vicinity, which demands a person to wear face masks, keep social distancing, and use hand sanitizers to wash their hands.

While other problems of social distancing and sanitization have been addressed until now, the issue of face mask detection has not yet been adequately addressed. Wearing a mask during this pandemic is a critical preventive measure and is most vital step in times when social distancing is hard to maintain. Wearing a mask is essential, particularly for those people who are at a greater risk of severe illness from COVID-19 diseases.

It is found that the spread of COVID-19 is mainly among people who are in immediate contact with one another (nearly about 6 feet), it can be spread by people who do not have symptoms and are unaware of the fact that they are infected.

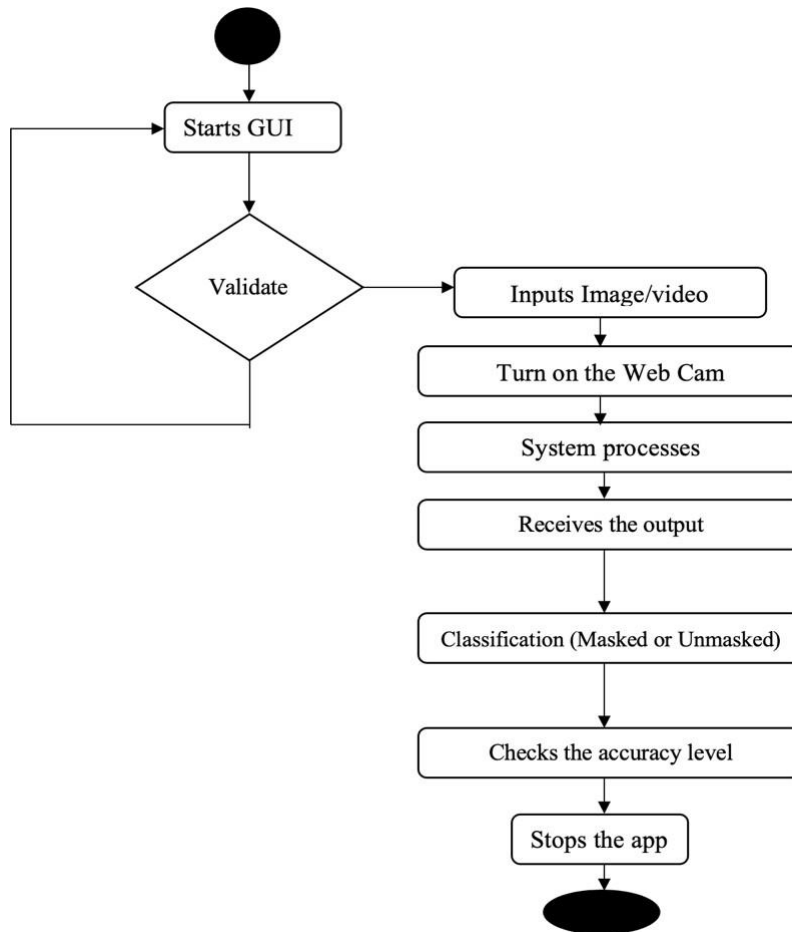
So Centers for Disease Control and Prevention recommended all people 2 years of age and older to wear a mask in public areas especially when other social distancing (Sun &Zhai, 2020) measures are difficult to maintain. Hence by reducing the risk of transmission of this deadly virus from an infected person to a healthy, the virus' spread and disease severity can be reduced to a great extent.

IV. PROPOSED METHOD

Face Mask detection has turned up to be an astonishing problem in the domain of image processing and computer vision. Face detection has various use cases ranging from face recognition to capturing facial motions, where the latter calls for the face to be revealed with very high precision. Due to the rapid advancement in the domain of machine learning algorithms, the jeopardies of face mask detection technology seem to be well addressed yet.

This technology is more relevant today because it is used to detect faces not only in static images and videos but also in real-time inspection and supervision. With the advancements of convolution neural networks and deep learning, very high accuracy in image classification and object detection can be achieved.

Probably because of the sudden emergence of the COVID-19 pandemic. To impede the COVID-19 transmission the proposed model can be integrated with surveillance cameras so that it can be used for the detection of people who are not wearing face masks.



V. CONCLUSION

Face mask and social distancing detection technology can help organizations identify people who are wearing masks, which can help curb the spread of infection. Such systems could also assist the government in implementing this suggestion. Individuals who violate the rules could be reported to the police.

During the epidemic, companies are using AI and ML to help save lives. Digital product development businesses are releasing mask-scanning application programming interface (API) services to help developers quickly create a face mask identification system for the community during this crisis.

**FUTURE ENHANCEMENT**

The developed system can detect the live video streams but does not keep a record. Unlike the CCTV camera footage the admin can not rewind, play or pause it. As whenever a strict system is imposed people always try to break it. Hence when a person is detected with no mask, the head of the organization can be notified via mail that so and so person entered without mask. The proposed system can be integrated with databases of respective organizations to keep a record of the person who entered without mask. With more complex functions a screenshot of the person's face can also be attached to keep it as a proof.

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