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Detection of Face Mask During Covid-19 Pandemic Using Machine Learning

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Abstract:- Every person in the pandemic has to put on a mask to stop the CORONA virus from spreading. In these difficult COVID-19 times, developing a model that detects people with and without masks in real-time is critical as a simple precautionary measure to prevent virus spread. If used correctly, this machine learning technique can help frontline warriors simplify their work while also saving their lives. Tensor Flow, Keras, and OpenCV are used in the development of a convolutional neural network (CNN) model, which helps the algorithm make the most accurate predictions. The Java-script API facilitates webcam access for face mask detection in real time. The first stage, known as pre-processing, consists of "grayscale conversion" of an RGB image and "image resizing and normalisation" to prevent inaccurate predictions. As the output layer of the proposed CNN architecture has two neurons with Soft max activation to classify the same, the suggested CNN then distinguishes between facial characteristics with and without masks. The suggested design has a validation accuracy of 96%. If anyone in the video a green rectangle is drawn around the appearance of a person using a mask, while a red rectangle with the words "NO MASK" is drawn around the face of stream.

***Keywords*:-** *CNN Model, Java Script, APIs, Deep Learning, Tensor Flow, Keras, Open CV, Pandas, Performance, System Architecture, Adaptive Models.*

I. INTRODUCTION

Real-time face mask detection uses computer vision to attempt to ascertain whether or not someone uses a face mask. After the COVID-19 epidemic, the usage of facial masks has been essential for preventing the spread of infectious diseases. Face mask detecting technology has arisen in order to enforce the use of face masks in public places including airports, hospitals, and shopping malls.

Real-time face mask detection technology uses advanced computer vision and machine learning algorithms to analyze images or videos captured by cameras and determine whether or not a person is wearing a face mask. The technology has the potential to provide real-time notifications to individuals, law enforcement, and health authorities when a person is detected without a face mask, ensuring that appropriate action can be taken to promote public health and safety.

The use of face mask detection in real time technology is expected to increase in the coming years, especially with the ongoing COVID-19 pandemic. The technology can help mitigate the risk of transmission of infectious diseases and promote public health and safety. It has the potential to become an essential tool for enforcing face mask policies in public places and reducing the spread of infectious diseases.

- *Problem Statement:*

Our habits have suddenly changed as a result of the COVID-19 outbreak. When there is a pandemic, events are restricted. If it is necessary to go out, we must wear a mask to save our lives. In this project we mainly discuss about “By creating a detector using machine learning, we detect wheather a person wearing a mask or not”. By wearing mask, we can reduce the possibility of the transfer of disease from one person to another through air.

The problem statement for real-time face mask detection is to design a system that can accurately recognise whether or not a person is wearing a face mask. It is essential that people use face masks in public places to prevent the COVID-19 outbreak from spreading. It could be tough for people or authorities to monitor who is or is not utilising a face mask.

II. TECHNOLOGIES USED

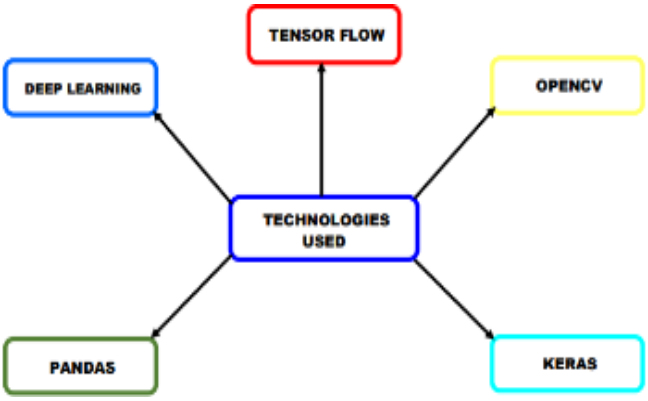

Fig 1 Technologies used

➢ *Deep Learning:*

Deep learning is a type of machine learning that includes teaching artificial neural networks with various levels to detect patterns in data. Computers may learn from enormous amounts of data and gradually improve their performance on certain tasks thanks to a type of artificial intelligence (AI).Deep learning models use layers of interrelated nodes or neurons to decode and alter incoming input, such as images, text, and sound, in order to generate predictions or categorise it.

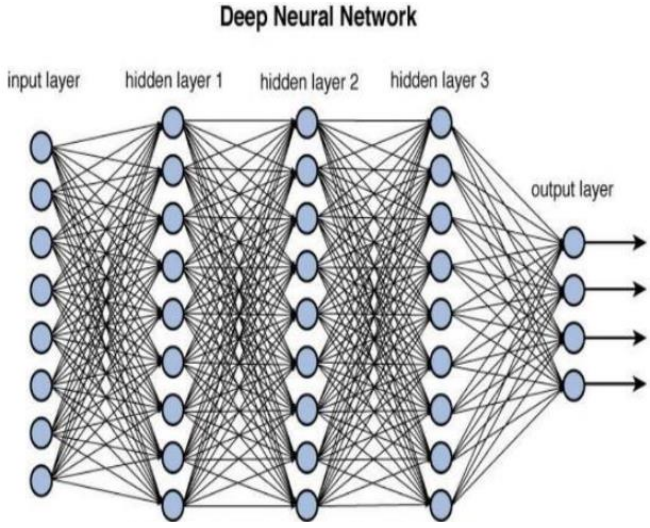

Fig 2 Deep Learning

➢ *Tensor flow:*

Tensor Flow, an open-source machine learning package, was developed by Google. Programmers may create and train complex deep learning models using one of the most appreciated deep learning frameworks. TensorFlow is perfect for a variety of applications since it is designed to work well with both CPU and GPU processors, making it suitable for everyone from mobile devices to enormous data centres.

TensorFlow provides a flexible architecture for creating and teaching deep neural networks. It offers the Keras high-level API, which facilitates the development and training of models. The network architecture and training process can also be changed in TensorFlow using a lower-level API to accommodate specific use cases.

Fig 3 Tensor Flow

➢ *Open CV:*

Open CV (Open Source Computer Vision) is a free and open-source library for image processing and computer vision. It was initially created by Intel in 1999, then Willow Garage and It seez eventually took up maintenance. In addition to providing interfaces in Python, Java, and other programming languages, OpenCV is written in C++.For computer vision and image processing, OpenCV offers a wide range of features, such as input and output for images and videos, image filtering and manipulation, feature extraction and detection.

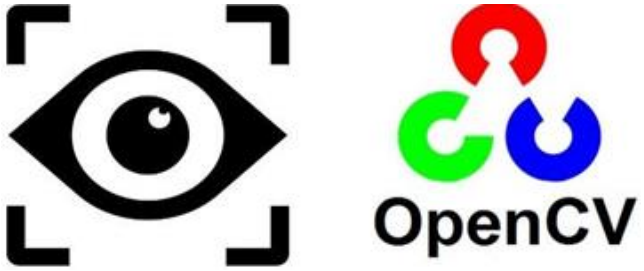

Fig 4 Open CV

➢ *Keras:*

Fig 5 Keras

Based the foundation of TensorFlow as Windows Cognitive Toolkit, Theano, or PlaidML, Keras is a high-level deep learning API created in Python. It was created to make the creation and training of deep learning models simpler. Without in-depth understanding of the underlying libraries, Keras enables developers to quickly prototype and experiment with various neural network designs and hyperparameters.

➢ *Pandas*

Fig 6 Pandas

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An open-source Python library for data analysis and manipulation is called Pandas. Working with organised and tabular data, such as spreadsheets or SQL tables, is made simple with the help of the tool's user-friendly data structures and data analysis capabilities.

Series and DataFrame are the two basic data structures that Pandas provides. A Series is a one-dimensional labelled array that may store any kind of data, including strings, floats, and various other data types. [fig.6].

III. SOFTWARE REQUIREMENTS SPECIFICATION

The system, its scope, goals, and constraints are all fully defined in the SRS. The system's characteristics and abilities are outlined, including the capacity to recognise faces and divide them into two groups faces with masks and faces without masks. It also outlines the software and hardware specifications needed to create and implement the system. It describes the development processes, tools, and techniques that will be applied.

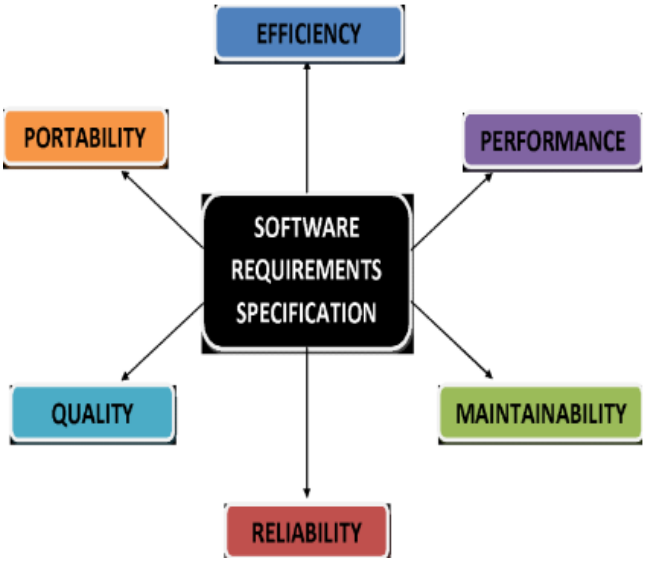

Fig 7 SRS

- *Reliability:* The quality of the training data can have a significant impact on the detection algorithm's accuracy.
- *Quality:* The quality of this project is more and the ability of the algorithm to correctly identify whether a mask is being worn or not.
- *Maintainability:* The software should have a well-organized, maintainable codebase that allows for easy modification and troubleshooting.
- *Efficiency:* The amount of time it takes for the algorithm to process an image or video frame and make a detection. The shorter the processing time, the more efficient the system will be.
- *Portability:* It would be portable on any system and free to operand in any browser.
- *Performance:* A high face detection accuracy will result in better performance for mask recognition.

IV. EXISTING SYSTEM

The current state of system depends on individuals working. 2020 is the year of COVID-19. The COVID-19 epidemic is the most life-changing tragedy to have shocked the world since the year 2000.n Existing System “A person checks wheather a person wearing a mask or not one by one in public places such as Cinema Malls, Marts, Parks and Beaches etc.” It is impossible to check all people at a time. So that we use machine learning detector to find wheather a person wearing a mask or not. It simplies our work to detect people at a time.

➢ *Disadvantages of Existing System:*

- *Inaccuracy:*
  Some existing systems may not be able to accurately detect face masks, leading to false positives or false negatives.

- *Limited Applicability:*
  Some existing systems may only be able to detect masks worn in specific ways or made of certain materials, limiting their applicability in real-world-settings.

- *High Computational Requirements:*
  Some existing systems may require significant computational resources to process the video stream in real time, making them difficult to implement on low-powered devices.

- *Privacy Concerns:*
  Some existing systems may collectand store images of individuals, raising privacy concerns and the potential for misuse of personaldata.

V. PROPOSED SYSTEM

The suggested system for actual time detection of face masks is an automated vision and deep learning-based application that seeks to quickly determine from a live video feed or picture either a person is covering their face with a face mask or not. The system is made up of a number of different parts, such as an input source, a face detector, a face mask classification algorithm, and an alarm mechanism.

➢ *Advantages of Proposed System:*

- *By requiring the usage of face masks in public locations, the suggested approach can assist limit the spread of infectious diseases such as COVID-19.*
- *The proposed system would make use of advanced computer vision and machine learning algorithms, such as Haar cascades or convolutional neural networks (CNNs), to accurately detect faces and check to see if anyone wears a face mask.*

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VI. SYSTEM ARCHITECTURE

The architecture of the system for actual time detection of face masks includes a number of components, such as hardware, user interface, alert mechanism, face detection, and face mask categorization. Different lighting situations, facial emotions, head poses, and mask types should all be supported by the system. An accurate and effective solution for real-time face mask identification in a variety of settings should be provided by the architecture. It must create an alert to alert the relevant authorities or people if a person is discovered without a mask. A user interface for the system should show the video stream and the progress of the face mask detection procedure.

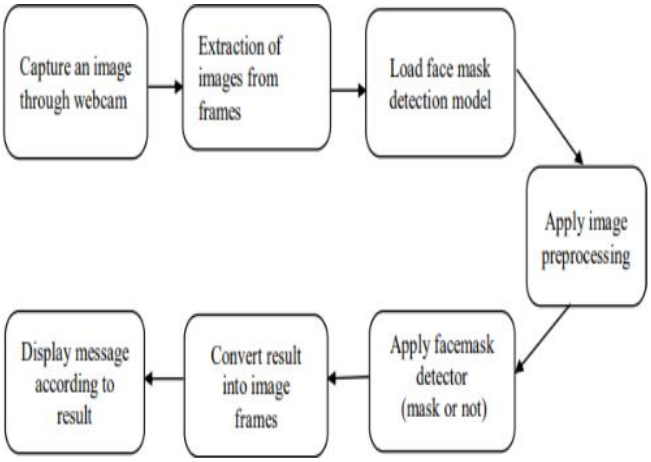

Fig 8 System Architecture

VII. FUTURE SCOPE

Detecting face masks in real time in the future looks promising, considering the many potential applications and advances on being made. Future improvements in machine learning and computer vision technologies will increase the accuracy of real-time face mask identification, reducing false positive and false negative rates. Future research may concentrate on constructing multi-task learning models capable of doing numerous tasks at the same time, such as detecting masks, tracking crowd density, and monitoring temperature. It could concentrate on creating techniques to enhance privacy protection, such as blurring or concealing faces in video feeds, or on employing computing at the edge to analyse video feeds without presenting sensitive data.

VIII. CONCLUSION

In conclusion, real-time face mask detection is an important technology that can help ensure public health and safety during the COVID-19 pandemic and beyond. To develop an effective real-time face mask detection system, several factors must be considered, such as accuracy, reliability, durability, efficiency, and performance. Utilising can enhance the effectiveness of the face mask detecting system by advanced image processing and machine learning algorithms, integrating with different types of cameras, providing real-time notifications, and fine-tuning the algorithm for the specific application and environment so that it will be used. By encouraging and enforcing the wearing of masks in open areas, a well-designed and deployed real-time face mask detection system could assist in preventing of spreading of COVID-19 and other viral illnesses.

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BIOGRAPHIES

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