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Comparative study of face mask detection using CNN and SVM Algorithms

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***Abstract*— During the COVID pandemic, most infected individuals develop mild to moderate respiratory symptoms and recover without develop mild to moderate respiratory symptoms and recover without the need for special care. Some, though, had gotten really ill and needed medical care. During this time, it is advised to wear a mask and maintain a proper distance to prevent the virus from spreading. This study compares and contrasts the CNN and SVM face mask recognition algorithms. This paper is divided into four sections: the introduction, the comparison algorithm analysis, and the result and conclusion regarding the content.**

Keywords- CNN, SVM, Keras, Tensorflow, VGG.

I. INTRODUCTION *(HEADING 1)*

Everyone had to wear a face mask due to the Covid 19 pandemic. Only a small portion of the population used masks in public during the early stages of this epidemic, and those who did so did so to stop the spread of diseases, allergies, and a number of other illnesses. In order to identify those wearing masks, technology must be used. Numerous technologies were created in order to recognize the face mask. The two face mask identification methods, CNN and SVM, will be compared in this study, and the optimum approach will be determined.

Artificial intelligence (AI) mimics human intelligence in a machine created to think and act like a human person. It can also be applied to a computer that possesses traits similar to those of humans, such as learning and problem-solving. The goal of AI should be to create machines that can perform tasks just like humans can, not to create clever machines that can solve any problem quickly. On the other hand, creating machines that mimic people doesn't sound all that intriguing. Modernly, when we refer to artificial intelligence (AI), we imply computers that are capable of performing one or more of the following activities: comprehending human language, performing complicated mechanical tasks, and solving complex computer issues that may swiftly gather large amounts of data.

The majority of those infected have experienced mild to moderate respiratory problems and recovered without the need for special care. However, several of them had gotten sicker and needed medical attention. People who are older and those who have basic illnesses like cardiovascular disease, diabetes, persistent respiratory issues, or malignant

development are more likely to foster severe misery. Regardless of age, anyone can contract the coronavirus, become seriously ill, or pass away [1].

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Being astute about the illness and how the infection spreads is the best strategy to stop and restrict transmission. Stay at least one meter away from others, carry a well-fitted mask, perform first aid, or use a rub that contains alcohol to prevent the spread of disease.

Once the switch is in your favor, get vaccinated and obey local instructions. When a sick person hacks, wheezes, talks, sings or relaxes, tiny fluid particles from their mouth or nose begin to transmit the virus. These particles might range in size from larger contaminated droplets to smaller vapor sprayers. On the off chance that you are ill, it is crucial to use a digestive cure, such as hacking into a bent elbow, and to isolate yourself at home till you recover. Everyone in the globe has consented to this security measure and amicable separation as a result of the current circumstances in order to stop the spread of this uncontrollable sickness. Although some regions of the world have implemented corona vaccines, their market share has not yet reached critical mass.

Therefore, using face masks frequently may be a vital perspective that will work in conjunction with the front to slow down the spread of disease and prevent the individual from contracting any different aggressive bacteria, as indicated, till his infection is completely under control[2].

Face acknowledgment frameworks will resolve the issue of obstruction. glasses[6], scarves, and caps are examples of items. The information in the main picture might occasionally be completely destroyed by an excessively large obstruction, which leads to the disappointment of a large picture being acknowledged.

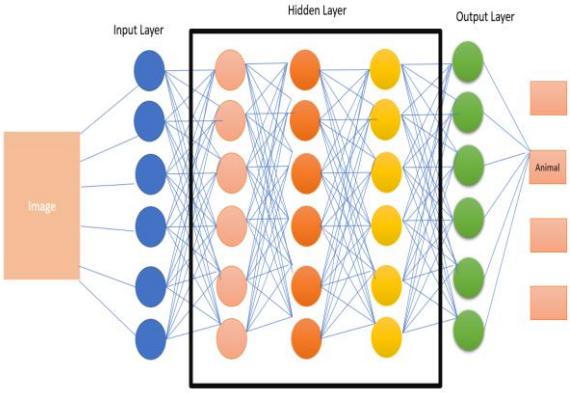
II. ALGORITHM USED

In this paper, two algorithms are discussed they are Convolutional Neural network and support vector machine. Both algorithms are from machine learning.

A. Convolutional Neural Network:

Convolutional neural networks, often known as convnets or CNNs, are a type of machine learning. It is one of a number of artificial neural network models used for various tasks and data sets. A specific kind of deep learning network design known as a CNN is used for tasks like image recognition and pixel data processing. CNNs are the chosen network architecture for detecting and recognizing objects in deep learning, despite the fact that there are several types of neural networks.

They are therefore ideally suited for computer vision (CV) activities and for applications where accurate object recognition is crucial, such as facial and self-driving automobile systems.



Fig

Figure 1.1 Deep Convolutional Network

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B. Support Vector Machine:

SVM can be applied to both classification and regression issues, however, they often perform best in the latter. They were well-known when they were developed in the 1990s, and with a little tweaking, they continue to be the preferred approach for a high-performing algorithm. The ideal dataset for SVM is compact and complex. Typically, it is best to start with logistic regression and observe how it performs. If it does not provide good accuracy, you can switch to SVM without any kernels (we will discuss kernels in more detail in the next section). Both logistic regression and SVM without a kernel function are similar, however, one may be more effective than the other depending on your features.
Types of SVM are:

- Linear SVM is one type of SVM.

A single straight line (in 2D) can divide the data points into two classes if they are perfectly linearly separable.

- SVM Non-Linear

Non-Linear SVM can be used to classify data when it cannot be divided into two classes by a straight line (in the case of

2D), which calls for the employment of more sophisticated approaches like kernel tricks. Since linearly separable data points are rare in real-world applications, we apply the kernel method to overcome these problems.

III. RESULT

The implementation of the SVM and CNN algorithm uses the block diagram.

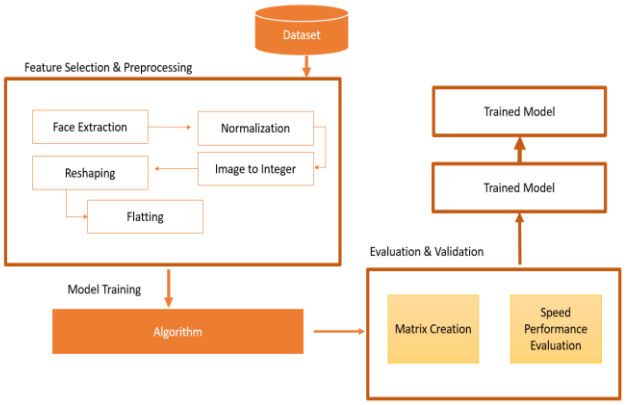

Figure 1.2 Block Diagram of the working process

In the comparative study, 7747 data were used. The data was taken from the Kaggle datasets. From the datasets, data were classified into two parts with mask images and without mask images. As both algorithms is a part of machine learning datasets. To get the best result we optimize the data. In order to reduce the loss and hence enhance the model, optimizers are algorithms or techniques that are used to modify or tune various characteristics of a neural network, such as layer weights, learning rate, etc. Adam(Adaptive Moment Estimation) is an adaptive optimization algorithm that was built specifically for deep neural network training. It can be thought of as combining RMSprop and momentum-based stochastic gradient descent. Similar to SGD with momentum, it uses squared gradients to scale the learning rate and exploits momentum by using the gradient's moving average rather than the gradient itself. Utilizing Python's Time package, the speed performance computation process is carried out.

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A. *HARDWARE REQUIREMENTS*

TABLE I. HARDWARE REQUIREMENTS

S.No.	***Requirements***	***Size***
1	Memory	8GB
2	Hard Disk	1TB
3	Processor	Intel i5

B. *SOFTWARE REQUIREMENTS*

TABLE II. SOFTWARE REQUIREMENTS

S.No.	***Software***	***Versions***
1	Window	Version 11 64 Bit
2	Anaconda Navigator	3
3	Jupiter Notepad	6.4.8
4	Keras	2.12.0

The comparative study gave the result which is represented in a tabular manner, to get the result 5 epchos are used for both algorithms.

TABLE III. RESULT

S.No.	***Algorithm***	***Accuracy***
1	**CNN**	**98%**
2	SVM	96.5%

From the result, it was found that CNN is a much better accuracy algorithm than the accuracy rate of the SVM algorithm.

IV. CONCLUSION

In order to aid in the efforts to stop the coronavirus from spreading, this research suggests a face mask detecting system. The suggested approach makes use of CNN and SVM as image classification algorithms to determine whether or not an image contains a picture of someone wearing a face mask. According to the results of the experiments, the suggested strategy was successful in achieving 98% accuracy and 96.5% accuracy respectively. In future scope along with algorithm use of PCA optimization technique can be implemented to get more accurate results.

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