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COVID19 Prediction using Machine Learning

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ABSTRACT

At this year's COVID 19, researchers are emphasizing the use of machine learning to improve techniques for recognizing face masks. There are now several specialized machines for use in the area of machine learning. There is, nevertheless, a need to improve the accuracy and efficiency of machine learning methods. This work proposes a deep learning-based strategy for recognizing disguised identities in public contexts, with the aim of minimizing the spread of Coronavirus among communities. An ensemble of single and two-stage detectors is used in the proposed method to efficiently handle various occlusions in congested environments. The detection process should go much more quickly using the ensemble technique without sacrificing accuracy. As part of its analysis, the study considers prior work on the Internet of Things, pattern rearrangement, and face mask detection in order to pinpoint issues that need to be addressed. The work proposes a novel approach by combining compression, edge detection, and CNN, which has the potential to improve both performance and accuracy. Measures of efficacy and precision including the f-score, recall value, and precision are being calculated in related research.

Keywords: CNN, Machine Learning, Face mask Detection, Covid 19, IoT.

INTRODUCTION

Researchers at COVID 19 are focusing on refining machine learning techniques for face mask recognition. There are a variety of approaches to machine learning. Though, machine learning processes may be made more accurate and efficient. This work proposes a deep learning-based technique for recognizing veiled faces in public situations with the goal of reducing the spread of Coronavirus throughout populations. To efficiently handle various occlusions in a densely populated region, the proposed model uses a multi-stage detector and a series of single-stage detectors. Using an ensemble approach should also greatly speed up the time it takes to make a detection. With an average inference time of less than 0.05 seconds per image, the model is anticipated to have a mask detection accuracy of more than 98.2 percent. It is expected that by using these procedures, the proportion of imbalance would decrease. Additionally, transfer learning and a bounding box affine transformation were used in the realization of this highly efficient model. When used with mask detection, the modified bounding box should improve localization accuracy. Transfer learning models have been successful when they are built upon a strong, pre-trained model that was first trained on a big dataset, like ImageNet. Experiments were conducted using ResNet50, AlexNet, and Mobile Net, three of the most common baseline models, to evaluate the effectiveness of the plug-in for achieving high accuracy with lowered inference time. It has been

shown that this approach can achieve an accuracy of around 98.2 percent when tested on ResNet 50.

MACHINE LEARNING

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Because of AI's potential to boost productivity, it might significantly alter several industries. The reliance on machine learning will grow in tandem with the growth of processing capability. In the future, computers may be more intelligent than humans. Computer algorithms are more accurate than radiologists in detecting cancer. Radiology, on the other hand, is a relatively new scientific discipline. If AI and automation become widespread, it might threaten the livelihoods of millions of people. In this context, "learning" software refers to any kind of programmed that may improve its functionality over time without human intervention. In the context of big data analytics and data mining, the phrase "machine learning" is often used to denote a wide range of software. In order to make accurate predictions, most predictive programmed rely on machine learning algorithms. Among the many types of machine learning technologies is deep learning. [6,8]

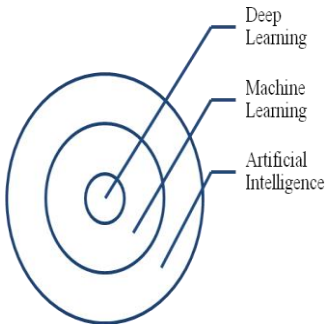

Figure 1: Depicts interrelationship among AI, ML and Deep Learning

WORKING OF MACHINE LEARNING

In most cases, the predictive power of traditional ML algorithms is used to define this domain. Although supervised learning is often employed, unsupervised practice has become more popular as a means of education. Researchers think that by analyzing historical data, algorithm selection might be predicted.

Working of Supervised Machine Learning

Data scientists must provide both labelled inputs and anticipated outputs for supervised machine learning to work. Supervised learning approaches are optimal in these circumstances.

1. When there are only two distinct classes from which to choose, we employ a method called binary classification.

2. To be able to classify things into more than two groups is called multi-class categorization.
3. Continuous value predictions may be made using regression analysis.

Working of Unsupervised Machine Learning

Unlike supervised methods, in unsupervised machine learning, labels are not required. Information that lacks labels is analyzed for patterns that may be utilized to classify it. Unsupervised learning techniques excel in the following scenarios:

1. A strategy for breaking down complex datasets into more manageable chunks based on their shared characteristics.
2. Anomaly detection may be used to isolate out-of-the-ordinary details in a dataset.
3. To this end, association mining seeks for groups of data elements within a dataset that are often seen to co-occur.

Uses of Machine Learning

These days, machine learning may be used in several fields and professions. The News Feed recommendation mechanism on Facebook chooses articles to show people. The recommendation engine will give more weight to a group based on how often a person reads the posts there. The engine works invisibly in the background to encourage the user's regular online actions. As soon as a user opts out of receiving group updates, their News Feed will be adjusted accordingly.

Causes & Precautions

Newly identified corona virus COVID-19 has been linked to a broad variety of diseases. Most persons infected with this virus will feel OK after a few days of having a mild to severe respiratory ailment. In instance, if you have a chronic health problem such as diabetes, heart disease, lung disease, or cancer, your risk of developing a new illness increases as you age. Acquiring as much information as possible about the COVID-19 virus, the sickness it produces, and the ways in which it spreads is the best method to reduce or interrupt its transmission. Washing your hands often or using an alcohol-based hand sanitizer is suggested to limit the transmission of illness. The effects of COVID-19 on various persons vary widely. Generally speaking, hospitalisation isn't necessary for even the sickest of patients. The most typical flu symptoms include a high body temperature, dry cough, and intense exhaustion. Numerous other symptoms may also present themselves, although aches and pains, sore throat, diarrhoea, conjunctivitis, and headache are among the most common. It is the COVID-19 virus that is produced when the SARS-CoV-2 strain of the virus infects a human being.

Transmission

Transmission of COVID-19 occurs by aerosolization of respiratory secretions, such as those produced by coughing, sneezing, singing, talking, or breathing. Anyone whose mouth, nose, or eyes come into contact with the infected person's respiratory droplets or aerosols is at risk of contracting the virus via close contact. On average, 1,000 infected SARS-CoV-2 respiratory droplets are needed for transmission between humans. A surgical mask or respirator may be used to prevent the spread of disease by droplets of liquid. Maintaining a well-functioning heating, ventilation, and air conditioning system and throwing open the windows more often may help reduce transmission within the structure.

Virology

Newly discovered strain of corona virus causes severe acute bronchospasm. Recent cases of severe respiratory disease in Wuhan have been linked to the first three cases of pneumonia in the city. Similar to other corona viruses, the SARS-CoV-2 virus lacks any unique structural features. The hundreds of SARS-CoV-2 variations have been aggregated into clades to make study and inquiry easier. Various suggestions have been made regarding

clan designations. The Next strain only includes five of the seven clades seen in GISAID.

Precautions

Frequent hand washing is recommended for reducing the spread of COVID-19. Use either soap and water or a hand massage lotion with alcohol to clean your hands. Stay away from anybody who seems to be unwell. When you can't go as far away from the situation as you'd want, it's best to cover your face. Keep your hands away from your face and especially your eyes, nose, and mouth. If you have to cough or sneeze, cover your mouth and nose with your elbow or a tissue. In order to recover from a cold or the flu, one must relax at home. If you have a high body temperature, a persistent cough, or difficulty breathing, you should see a doctor. Make sure you're heading to the appropriate hospital by calling ahead. This is the safest and most effective way to avoid becoming sick and to help contain any outbreaks that may occur. It's possible that protecting yourself from the virus by donning a mask might slow its spread. Keep your distance, often wash your hands, and use a face mask to reduce your risk of catching COVID-19. You should follow the advice of the local health department.

CHALLENGE & ISSUE

Possibly slowing or stopping the disease's spread is public education and awareness. Components of this effort include mapping out hotspots, educating the public, and putting a halt to the spread of disease. Education and preventive actions are crucial if the illness is to be contained. In Indian society, everyone from close relatives to casual acquaintances depends on one another. Since intimate physical interactions like as crowded housing, frequent hand-holding, and the odd bump were so common during this epidemic, "social distance" was advised. While the curfew was in force, many people were seen rushing into places of worship, transportation, and bars. Disparity in India is caused by "vertical distancing," and its adoption of horizontal distancing following COVID19 has made the problem worse.

Those who would be most vulnerable during a lockdown would have little protections in place, which is a double tragedy. Current government efforts are laughably inadequate to tackle the scale of the problem. Due of the lockout, low-income families are at a higher risk of malnutrition. The Food Corporation of India has supplied 12,965,000 metric tonnes of food grains under the Pradhan Mantri Garib Kalyan Anna Yojna as part of the Indian government's attempt to fight the spread of the COVID19 virus (PMGKAY). How practical and successful this plan for food distribution will be remains to be seen.

Atmospheric remote Sensor

The goal of Atmosphere Remote Sensing is to provide a forum for discussing how remote sensing may be used to improve our understanding of atmospheric dynamics. Atmosphere Remote Sensing is always on the lookout for innovative remote sensing tools, techniques, and retrieval algorithms, as well as methods for testing and evaluating them. Science experts in the field of the atmosphere should use remote sensing data and techniques. Cameras and aerial photography are the simplest and oldest sensors that may be employed for remote sensing of the Earth's surface. Light from the ultraviolet (UV), visible, and near-infrared (NIR) ranges may all be captured by photographic film (NIR).

Remote sensing instruments are of two primary types:

- In certain cases, sensors may be equipped with light-emitting diodes and other forms of active power sources that may illuminate the surroundings they see.
- However, passive sensors detect by picking up electromagnetic waves emitted or reflected by the item under examination.

These sensors can capture high-resolution photos in an instant from many angles. Predictions are made based on analysis of these photos. Multiple methods are used to compress the images, bringing the total data size down considerably. Accessories like these make it possible to take pictures with the Covid-19.

A lot of money has been put into security equipment in recent years so that guards may be alerted to suspicious activities or photographs can be taken using city. However, they have decided not to take legal action against the thief. An "INTELLIGENT SECURITY SYSTEM" might be put into place to deal with this problem automatically with little to no involvement from humans. A few seconds later, it will communicate the order to the burglar. MILITARY ROBOTS use sophisticated defensive systems that can detect an attack and immediately pivot to fire at the source. Its installation might help improve security at museums. As of the post-COVID-19 era, healthcare professionals use a mix of image processing and CNN to make prescriptions. A touchless sanitation system may benefit from using AI for picture analysis. Smart sanitization considerably minimizes the potential for the transmission of viruses by reducing the need for hand-to-hand contact. It is common practice to install sensor-based sanitization systems in public buildings to reduce the transmission of disease. Security cameras detect and record when someone is carrying hand sanitizer.

Face Mask Detector

For security purposes, neural classifier technology has been used to determine whether visitors are wearing disguises. When a portrait of a face is captured, semantic segmentation is performed. The face neural classifiers may be used to determine the mask's contours. Nowadays, sophisticated video surveillance systems can even identify whether a person is wearing a mask. This would pave the way for the implementation of an IoT-based mask-absence notification system. For reasons of security, the cameras are linked to the web. When an IoT device detects a deviation from the expected mask pattern, it may trigger an alert and send a signal to nearby security personnel. Installations of cutting-edge CCTV systems with artificial intelligence capabilities have increased.

Role of Smart IOT Based Camera Surveillance System

More efficient and effective IoT solutions have been achieved by integration with a video surveillance system. Counting the number of people in a given area is a common usage for these kinds of gadgets. Alerts or alarms may be sent out if someone is seen in a busy area without a face mask or standing too near to other people.

This technology has the potential to identify individuals who aren't concealing their identities by wearing masks. Improved efficiency in video surveillance systems has resulted from the use of many technologies working in tandem. To gauge the current level of foot traffic, such devices are often installed in public spaces. A face mask detecting gadget is linked to the sophisticated video surveillance system. The availability of this information paves the way for the creation of a sophisticated warning system for use when masks are not accessible. We use web-connected cameras to keep an eye on things. If the mask pattern is not recognized, sophisticated machinery sounds an alert to indicate the presence of an exposed person. Increased use of intelligent surveillance technologies is a growing trend. The public spaces are likewise monitored by the AI system. It is difficult for many individuals to make regular trips to the doctor or clinic due to financial or time constraints. Additionally, it might make you ill if you come into contact with it. It has been shown that intelligent prescription is an effective diagnostic tool. Instead, by visiting the server where the results of routine testing that reveals positive instances have been recorded, infected individuals may be located with more ease. Close contacts of an affected individual may be able to detect the illness. The isolation of an infected individual might be greatly aided by Internet of Things (IoT) technology. A new artificial intelligence-based programmed, Aarogya Setu, has been created by the Indian government to track the spread of

COVID-19. Scientists are considering employing AI to tackle the COVID-19 pandemic.

Image proceeding technology

Camera or sensor-captured images sent directly to a satellite without any further processing are called "Image Proceeding." These advancements have helped everything from everyday photographs to spaceships. Now a day's researchers may choose from a wide variety of image processing techniques. Nearly all of these techniques have been put to use to enhance the pictures taken by spacecraft. A comparable picture may be taken by a spaceship or a military jet on a flight monitoring mission. As personal computers have improved in power, so too has the appeal of these graphical analytic methods. The usage of high-capacity memory cards or specialized graphics software are two more elements that may impact performance.

Role of image processing and machine learning in face mask detection

Typical uses of image processing include altering the size or resolution of a graphic's constituent parts, making comparisons between two or more images, or doing any number of other similar tasks. Convolutional neural networks, a kind of machine learning, might be used to analyse photos of individuals in masks (CNNs). CNN-based classification is helpful, but it isn't without its flaws. During the current COVID-19 epidemic, there were no efforts taken to enhance face mask detection. Despite extensive research in the area of image processing, it has been established that the amount of time needed for anticipation is excessive. Visual content also tends to be rather bulky. The goal of the proposed study is to reduce the number of resources (both temporal and spatial) needed to make reliable predictions. Current limitations in image processing have been identified and addressed as a key focus of research. The research recommends using an edge-based convolution neural network approach for face mask identification. Time spent applying Convolutional Neural Networks has been reduced because to the removal of unnecessary elements from the graphical representation. Further, this meant that less room was needed to keep the visual dataset. Inevitably, as more data sets are collected, it becomes more difficult to draw meaningful comparisons between them. MATLAB is intended to play a significant role in the actual implementation of the proposed strategy. Simulations are used to compare the effectiveness of the new approach and algorithm to that of the established one. It has been shown that traditional techniques for detecting face masks are inefficient. To improve convolutional neural networks' ability to generate valid inferences is the focus of the proposed research for COVID-19. The proposed method is supposed to improve upon the previous one in terms of precision. Integrating the CNN method with edge detection methods is advised to improve face mask recognition performance.

These devices, when linked to intelligent video surveillance systems, may sound warnings whenever a mask is not present. Any time a mask pattern is not identified, an alert is triggered to indicate the presence of an exposed individual.

LITERATURE REVIEW

A lot of study has gone into the question of how to identify a mask's wearer. The use of Semantic Segmentation [1] and prior work in the field were analyzed to better understand the field of Facial Mask Detection. Smart Video Surveillance was developed using IoT, and a neural classifier was enhanced using the data it collected to better determine the geometry of micro screws [3]. Security solutions for smart surveillance based on the Internet of Things (IoT) that center on the Raspberry Pi and priorities data privacy and security for IP cameras have proven particularly popular [5, 6]. Previous studies have elucidated the technology, applications, and consequences of smart surveillance [8]. There have been calls from academics for the use of high-tech solutions for public space surveillance [9], [10]. Numerous researchers have

considered the prospects of vision-based intelligent home automation and security systems. As part of this study, we reviewed the existing literature on both digital image processing [14] and flexible, high-performance CNNs for graphical categorization [15]. Handwriting recognition using convolutional neural networks (CNNs) has been studied [16] and is the subject of ongoing research [17]. Deep Convolutional Neural Networks (CNNs) [19], a subset of CNNs that can recognize faces, were used in ImageNet classification experiments [18]. Several edge detection algorithms, histogram-based picture enhancement, and a hybrid approach to face feature optimization using Bezier curves were examined in this study. L Guo et al. completed research on an FDTD method using a recurrent convolutional neural network in 2019. Because of the model, CNN's decision-making process has been much improved. In 2018, CNN and RNN were utilized to enhance Bug Localization [24] at the character level. An emotion recognition approach using convolutional neural networks (CNNs) was proposed by B Abdul Qayyum et al. [25] in 2019. In most cases, people will only use their voices to convey their thoughts and feelings to one another. In 2020, G. Lou et al. [26] developed a system for identifying individuals in pictures using convolutional neural networks (CNNs). The use of facial recognition in research was a major topic. It was decided that a convolutional neural network (CNN) would be the most effective tool for characterizing features. In 2019, Almakky et al. [27] conducted research on text localization using deep convolutional neural networks. Medical journal articles were mined for data for the study. However, this study only looks at how textual information may be used. In 2019, Samudre et al. [28] developed a computational technique to increase a CNN's efficiency, and P. An EDA-based approach for detecting edges in graphics was suggested by S. U. Lihua and colleagues published their findings in 2010 [29]. When conducting this study, we used a novel approach to the feature selection procedure. Red blood cells and video graphics edge detecting operators were compared in S.'s talk. (2013) In a nutshell, Suwanmanee et al. The discipline of visual image processing has benefited greatly from extensive research. E. suggested using multi-level morphological fuzzy edge detection in colour graphics. Perumal et al. [31] published their findings in 2017. Fuzzy logic relies on a 1-or-0 approach to draw conclusions. Q took use of real-time flood monitoring in research done in 2019. In a nutshell, Zhang et al.

	Camera Surveillance	**Conventional Neural Network**	**Face mask Detection**	**Security**	**IoT**
[4]	N	N	N	N	Y
[5]	Y	N	N	N	Y
[6]	N	N	N	Y	Y
[8]	Y	N	N	N	N
[9]	Y	N	N	N	N
[10]	Y	N	N	N	N
[12]	Y	N	N	Y	Y

Table 1: Comparison of feature chart

PROBLEM STATEMENT

Various algorithms, such as SVM, CNN, and Random Forest, have been shown to be effective in pattern recognition. Many of the goals of earlier studies were accomplished here. It was a test of the accuracy of the data organization. The algorithms' respective efficacy and efficiency have been evaluated based on their consistency in producing accurate outcomes. The literature analysis we conducted led us to the conclusion that SVM is best for evaluating and classifying textual data, whereas CNN is best suited for visual data. Despite CNN's many advantages, further study of pattern detection methods is required. Despite these restrictions, the current CNN paradigm still has a lot of room for

development. In-depth analysis of visual material takes a lot of time. As a result, it's important to improve the effectiveness of the standard CNN model. In order to reap the advantages of CNN to their fullest extent, more study into a pattern identification model is necessary. It has been pointed out, however, that prior CNN-based experiments only scraped the surface in terms of accuracy and performance.

NEED OF RESEARCH

Using convolutional neural networks, researchers have explored both pattern recognition and the Internet of Things. This investigational work led to an examination of the problems that surfaced. Researchers in this field must find a way to close a performance and accuracy gap. Once an efficient learning model has been created from the compressed data, it may be used for edge detection. Next, we conduct an analysis of how well the suggested model performs in terms of accuracy and efficiency. Images captured by satellites, space probes, aero planes, and in daily life may all benefit from a method known as "Image Processing." In the previous four or five decades, there have been several developments in image processing techniques. Images may have useful information removed so that they may be manipulated. Considerations of color, pattern, limits, rigidity, and shape are among those that must be made while attempting to define an object's nature.

PROPOSED WORK

The proposed work investigates current methods for detecting and handling face masks. Examining the weaknesses of conventional pattern identification methods is an important part of every successful research project. In this study, we present a technique for detecting masks using a CNN that focuses on data at the network's edges. The purpose of this suggested effort is to use MATLAB to realise the recommended technique. The suggested approach and algorithm have been compared to the standard algorithm. There is an expectation that the suggested work would be more productive than conventional approaches.

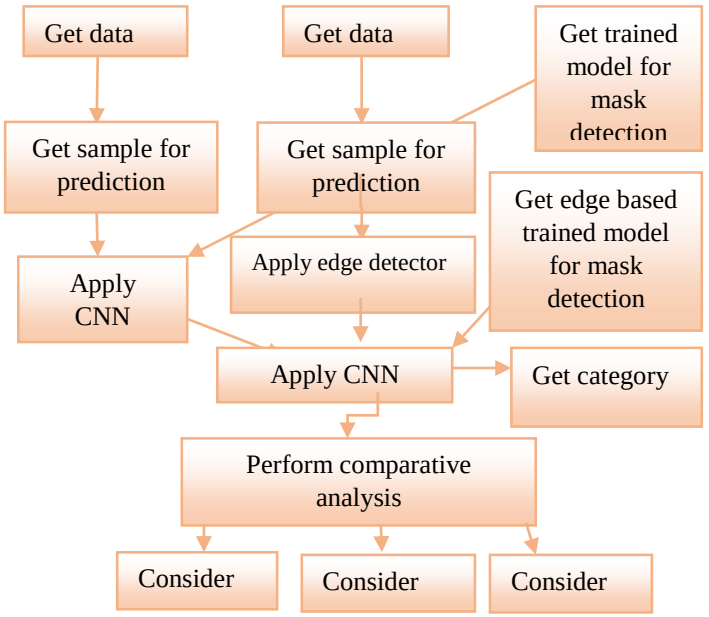

Figure 2: Process Flow of Work

PROCESS FLOW OF PROPOSED WORK

1. The proposed work consists of following steps
2. Data sets based on images acquired by cameras would be developed.
3. Use a standard CNN classifier to analyses the time and storage requirements.
4. Edge detection on the picture collection.
5. Consider the time and storage requirements by implementing the suggested CNN classifier.
6. Evaluate the efficiency of the current method of doing things versus the suggested method, taking into account the amount of space each need.

RESULT AND DISCUSSION

Simulation for Time comparison

Compared to traditional CNNs, edge-based implementations have been shown to be faster. Please refer to the following chart for a visual representation of the time savings achieved by using the suggested method against the conventional method.

Number of images	Traditional	Proposed
10	11.4572876	10.74948
20	20.50853997	16.85575
30	30.33565172	29.0909
40	44.4279834	39.61687
50	51.94184435	47.14731
60	60.87912169	59.69355
70	72.00435247	69.39121
80	84.74060993	81.57668
90	90.95395154	90.89955
100	102.9952156	99.88655
110	113.0461106	111.5295
120	120.390181	119.034

Table 2: Simulation for Time comparison

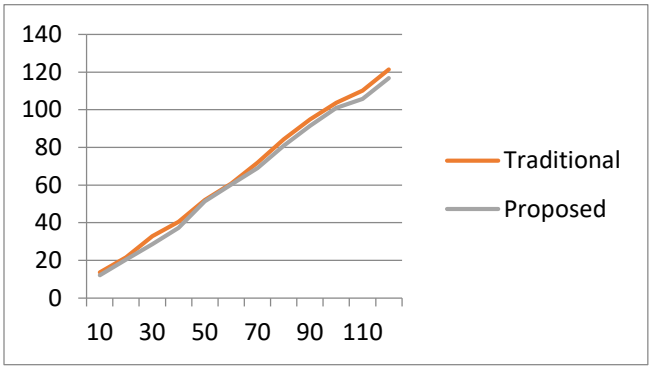

Figure 3: Simulation of time consumption in case of traditional and proposed

Simulation for space consumption

More than that, edge detection can completely do away with the need to archive individual datasets. The following graphic compares the amount of space needed for conventional and suggested methods.

Number of images	Traditional	Proposed
10	12.57556	7.66332
20	23.72709	20.18629
30	31.46273	30.31031
40	40.21042	39.4402
50	54.80655	52.72196
60	61.73554	57.33647
70	72.72713	68.06659
80	81.56018	79.18314
90	90.73974	86.93579
100	104.0705	102.1003
110	112.6541	110.2934
120	124.8266	124.3945

Table 3: Simulation for space consumption

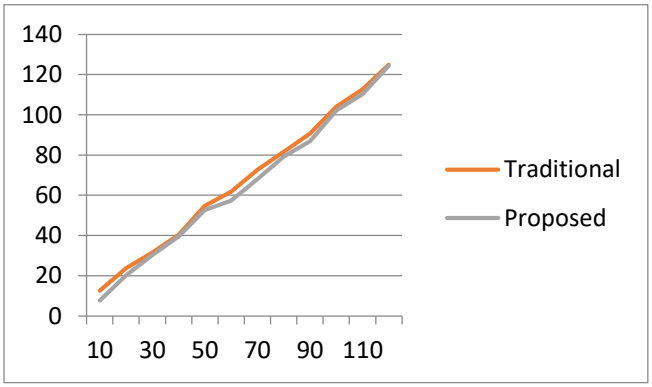

Figure 4 Simulation of space consumption in case of traditional and proposed

CONCLUSION

The study found that canny edging detection significantly improved efficiency compared to the standard CNN model. In addition, the size of the graphical sample has shrunk.

Incorporating this change has no effect on the underlying process used for categorization and prediction. The suggested study, if applied to the medical field, would increase convolution neural networking's decision-making prowess. The aforementioned simulations also show that the suggested approach is around 14 percentage points more accurate than the conventional method. This precision, however, may shift if picture size and dataset modifications are considered. Although prior studies have also shown that support vector machines (SVMs) work well with textual data, convolutional neural networks (CNNs) are superior when it comes to graphical assessments and data categorization. As a result, given CNN's advantages, greater research into the detection of face masks is warranted. SVM focuses on textual data, whereas CNN is more concerned with images. CNNs utilize layers, which are used essentially to detect the characteristics of a graphical data collection of face mask-related pictures. Therefore, in this study, we have examined the edge detection method as a means of enhancing the performance of the classic neural network paradigm. The process of identifying edges also involves the identification of variations in luminance. It has found use in data extraction and picture segmentation. It has found applications in computer and machine vision, as well as image processing. Additionally, owing to the difficulty of the job, there is a dearth of study in the area of graphical pattern identification models. This is why we're interested in graphical image processing using convolutional neural networks.

Future Scope

SVM, CNN, and RF are just a few of the promising pattern recognition algorithms that have been developed. Almost all of the previous paradigm's aims have been realized thanks to the ongoing efforts of the scientific community. This was a test of how well the data was structured. All of the algorithms' efficiency has been measured relative to how well they maintain data correctness. After reviewing the literature, we may conclude that support vector machines (SVM) perform better with textual data, whereas convolutional neural networks (CNN) do better with graphical evaluations and classifications. Comparing visual content is a time-consuming process. For this reason, there has been a wealth of study into methods for more accurately and quickly detecting people who are wearing disguises.

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