JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PERFORMANCE ENHANCEMENT AND ERROR RATE REDUCTION IN COVID-19 PREDICTION USING MACHINE LEARNING

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Abstract: Researchers at COVID-19 are focusing on machine learning as a means of improving methods for identifying face masks. In the field of machine learning, there are presently a number of dedicated machines. Despite this, there is a pressing need to enhance machine learning's accuracy and efficiency. In order to limit the transmission of Coronavirus, this study presents a deep learning-based technique for identifying disguised identities in public settings. An ensemble of single and two-stage detectors is used in the proposed method to efficiently handle various occlusions in congested environments. Using the ensemble method, the detection procedure should be much faster without losing accuracy. The study uses earlier research on the Internet of Things, pattern rearrangement, and face mask identification to identify concerns that need to be addressed in the future. Compression, edge detection, and CNN are combined in a unique way in this study, which has the potential to both enhance performance and accuracy. Error rates and performance are also being considered in the research.

Keywords: CNN, Machine Learning, Face mask Detection, Covid-19, IoT, Error rate, Performance.

[1] Introduction

Researchers at COVID-19 are working on enhancing machine learning approaches for face mask detection. There are a multitude of ways to machine learning. Though, machine learning techniques may be made more precise and efficient. This article presents a deep learning-based approach for detecting veiled faces in public contexts with the purpose of decreasing the transmission of Coronavirus among communities. To effectively manage diverse occlusions in a highly populated location, the suggested model employs a multi-stage detector and a sequence of single-stage detectors. Using an ensemble technique should also considerably speed up the time it takes to make a detection. Refinement of machine learning approaches for face mask identification is the focus of researchers at COVID-19. Machine learning may be approached in a number of ways. However, it is possible to improve the accuracy and efficiency of machine learning processes. Recognizing veiled faces in public places and preventing the transmission of Coronavirus is the purpose of this study, which presents a deep learning-based method for doing so. The suggested model employs a multi-stage detector and a succession of single-stage detectors to effectively handle diverse occlusions in a highly populated area. Artificial intelligence (AI) has the potential to have a substantial impact on a wide range of businesses due to its ability to increase productivity. The use of machine learning will increase as processing power increases. Computers may one day surpass humans in intelligence. When it comes to cancer detection, computer algorithms outperform radiologists. However, radiology is a relatively recent scientific field. Artificial intelligence and automation, if widely used, might put millions of people's jobs at risk. Software that can learn on its own, without human interaction, is referred to as "learning software" in this context. The term "machine learning" is often used to describe a broad variety of software in the context of big data analytics and data mining. Most predictive programmers depend on machine learning algorithms to produce accurate predictions. Deep learning is one of several machine learning techniques.

[6,8] 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 analyses 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. Image processing is often used to change the size or resolution of a graphic's component pieces, compare two or more pictures, or perform a variety of other related activities. Image processing. Images of people with masks may be analyzed using convolutional neural networks, a kind of machine learning (CNNs). There are advantages and disadvantages to using CNN-based categorization. Face mask detection was not improved during the current COVID-19 pandemic. No matter how much work goes into picture processing, it has been shown that the time required for anticipation is just too high. Visual stuff is also a lot heavier than text. The purpose of the proposed research is to minimize the amount of time and space required to create accurate forecasts. Research has focused on identifying and addressing the current constraints in image processing. The study advises utilizing an edge-based convolution neural network to identify face masks. Removing unused components from the graphical representation has allowed for greater efficiency when using Convolutional Neural Networks. In addition, this allowed for a less amount of storage space for the visual information. More data sets imply it gets more harder to make meaningful comparisons. The suggested technique will be implemented in large part with the help of MATLAB. The new strategy and algorithm are put to the test by running simulations against each other. Traditional methods for identifying face masks have been shown to be ineffective. The goal of COVID-19 research is to increase the capacity of convolutional neural networks to make accurate conclusions. The new procedure is designed to be more precise than the prior one. Face mask recognition performance may be improved by integrating the CNN approach with edge detection methods. In conjunction with video surveillance systems, these devices may sound alarms if a mask is missing. If a mask pattern is not found, an alarm is sent to signal the presence of an exposed person.

[2] Literature review

Research on how to identify the user of a mask has been extensive. Semantic Segmentation [1] and previous research in the area of Facial Mask Detection were examined to have a better understanding of the subject. [3] Smart Video Surveillance has been established utilizing IoT, and a neural classifier was modified using the data it acquired to better discern the shape of micro screws. Smart surveillance solutions for the Internet of Things (IoT) that focus on the Raspberry Pi and priorities data privacy and security for IP cameras have become more popular [5, 6]. Research on smart surveillance's technology, use cases, and outcomes is already available [8]. For public space monitoring, researchers have called for the adoption of high-tech solutions. Vision-based intelligent home automation and security systems have been examined by a number of researchers. We conducted a literature review on digital image processing [14] and flexible, high-performance CNNs for graphical classification [15] as part of our project. CNN-based handwriting recognition has been explored [16] and is currently being researched[17]. A subclass of CNNs known as deep convolutional neural networks (CNNs) was employed in the ImageNet classification experiments [18]. Face feature optimization using Bezier curves was studied in this research. An FDTD approach employing a recurrent convolutional neural network was developed by L Guo et al. in 2019. Because of the model, the decision-making process at CNN has been much enhanced. In 2018, CNN and RNN were used to improve character-level Bug Localization [24]. To better recognize emotions in videos, researchers at B Abdul Qayyum et al. [25] suggested a convolutional neural network technique in 2019. Most of the time, individuals will only communicate with one another via speaking. Using convolutional neural networks, G. Lou et al. [26] created a system for detecting persons in images in 2020. (CNNs). Facial recognition was a key issue of discussion. According to the researchers, the best method for identifying characteristics was a convolutional neural network (CNN). Using deep convolutional neural networks, Almakky and colleagues [27] investigated text localization in 2019. The data for the research was gleaned from medical journal publications. This research, on the other hand, focuses only on the potential uses of textual information. An algorithm created by Samudra et al. [28] in 2019 improved the efficiency of a CNN, and P. S. U. Lihue and colleagues proposed an EDA-based method for recognizing edges in images in 2010 [29]. We adopted a unique strategy to feature selection while performing this investigation. S. contrasted red blood cells with edge-detection operators in his presentation. (2013) With this in mind, the field of visual image processing has substantially benefitted from considerable study, according to Suwannee and colleagues. Multi-level morphological fuzzy edge detection was proposed by E. for color graphics. Their research was reported in 2017 by Perumal et al. [31]. A 1-or-0 strategy to drawing conclusions is used in fuzzy logic. Real-time flood monitoring was used in 2019 study conducted by Q. Basically, Zhang et al.

Table 1 Comparison of existing research works

	Camera Surveillance	Face mask Detection	Security	IoT	Error rate	Performance factor	Reliability factor	Scalability
[4]	N	N	N	Y	N	N	N	N
[5]	Y	N	N	Y	N	N	N	N
[6]	N	N	Y	Y	N	N	N	N
[8]	Y	N	N	N	N	N	N	N
[9]	Y	N	N	N	N	N	N	N
[10]	Y	N	N	N	N	N	N	N
[12]	Y	N	Y	Y	N	N	N	N

[3] Problem Statement

A variety of algorithms have been shown to be useful in pattern recognition, including SVM, CNN, and Random Forest. Here, many of the objectives of previous investigations were met. It was a test of the data organization's accuracy. Consistent results have been used to assess the algorithms' effectiveness and efficiency. According to our research, SVM is the greatest tool for analyzing and categorizing textual data, whereas CNN is best suited for visual information. Further research into pattern identification algorithms is needed despite CNN's obvious benefits. Despite these limitations, CNN's present paradigm still has a lot of space for growth. It takes a long time to analyses visual content in detail. As a consequence, it is critical to increase the typical CNN model's performance. More research on a pattern-detection approach is needed to maximize the benefits of CNN. Prior CNN-based tests merely scratched the surface in terms of accuracy and performance, as has been pointed out. Moreover there is need to improve performance and reduce error rate during face mask detection operation. Thus, proposed research is supposed to provide solution to increase reliability and scalability.

[4] Need of Research

In order to study pattern recognition and the Internet of Things, academics have turned to convolutional neural networks. As a result of this research, we were able to look into the issues that had come to light. A performance and accuracy gap must be bridged by researchers in this subject. An effective learning model may then be used to identify edges in compressed data. Our next step is to evaluate the correctness and efficiency of the model that has been proposed. Image processing may enhance images taken by satellites, space probes, aircraft, and even in the course of everyday life. Throughout the last four or five decades, image processing methods have advanced significantly. Images may be altered by removing valuable information. An object's nature must be defined in terms of color, patterning, limitations, stiffness, and form, among other things. Furthermore, a new system must be implemented that will improve speed while minimizing errors.

[5] Proposed Work

Current approaches to the detection and management of face masks are the subject of the proposed research. Every effective research effort includes an examination of the shortcomings of traditional pattern detection approaches. Using a CNN and data from the network's edges, we demonstrate how masks may be detected. The goal of this proposed endeavour is to implement the provided approach using MATLAB. The usual method has been compared to the recommended strategy and algorithm. The proposed work is expected to be more productive than standard methods.

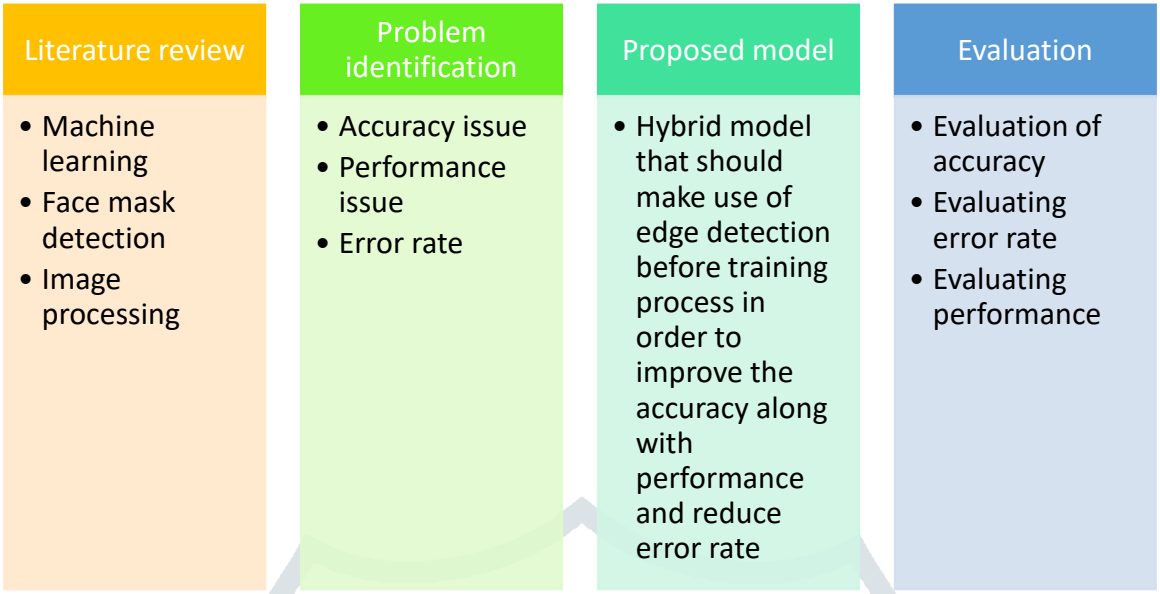

Fig 2 Proposed research methodology

Proposed work is considering research in area of machine learning for face mask detection. Image processing has been used in order to get edge detected images. The edge detection process has improved the performance of system by reducing training and testing time. Moreover the accuracy provided by proposed model is higher.

[6] Result and discussion

Simulation for Time comparison

Edge-based CNNs have been found to be more efficient than regular CNNs. The following graph shows how much time may be saved by adopting the proposed technique instead of the traditional one.

Table 2 Simulation for Time comparison

Number of images	Traditional	Proposed
10	11.31904	9.5525783
30	30.66644	3.1150576
50	50.551815	23.08662
70	70.350487	55.490428
90	90.487655	58.915687
110	110.60828	26.078573
130	130.64178	110.10603
150	150.4879	80.969507
170	170.41294	88.029051
190	190.91988	25.227782
210	210.43011	66.834354
230	230.87114	171.22104
250	251.30681	168.05724

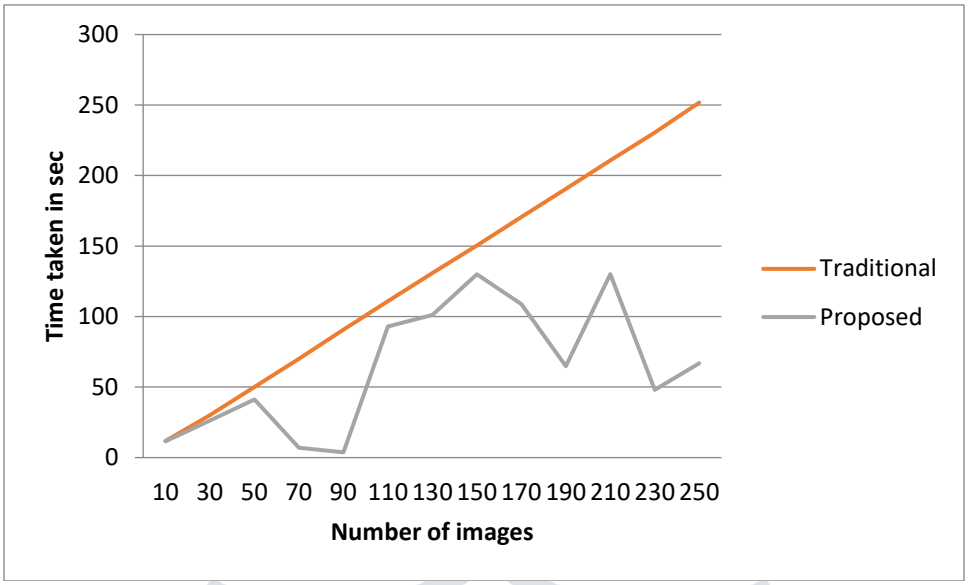

Fig 3 Simulation of time consumption in case of traditional and proposed

Simulation for Error rate

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

Table 3 Simulation for Error rate

Number of images	Traditional	Proposed
10	0.1952194	0.1082694
30	0.1704828	0.1377279
50	0.1741573	0.135615
70	0.1250695	0.0753023
90	0.1598356	0.1452966
110	0.1584341	0.1080008
130	0.1853579	0.1361432
150	0.1619178	0.0676957
170	0.1746741	0.0971377
190	0.1261649	0.1159236
210	0.1425472	0.1264843
230	0.167911	0.1079934
250	0.1332073	0.1043932

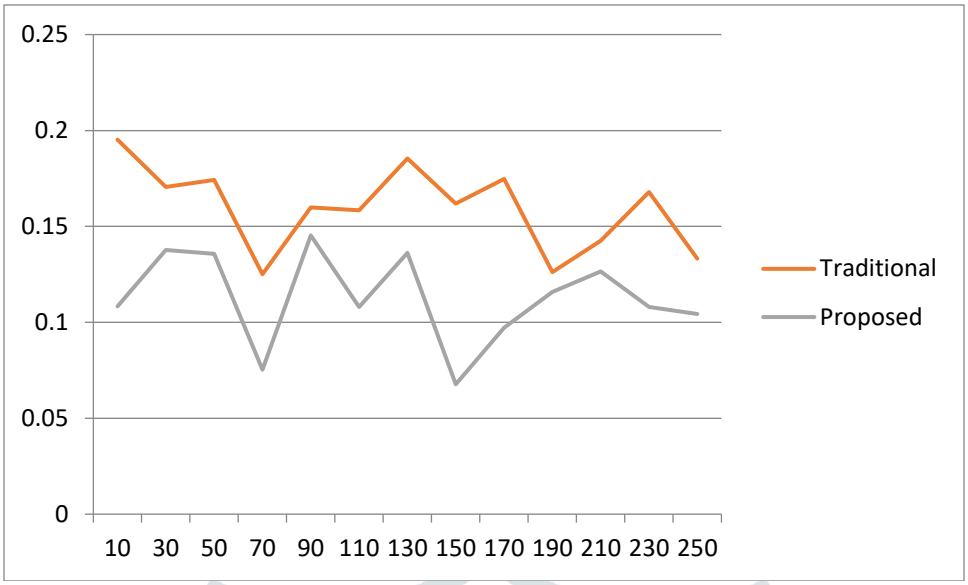

Fig 4 Simulation of error rate in case of traditional and proposed

[7] Conclusion

Canny edge detection was shown to be substantially more efficient than the usual CNN model in this investigation. Graphical sample size has also decreased. The underlying classification and prediction method is unaffected by this modification. To improve convolution neural networking's ability to make decisions, the proposed research should be applied to the medical field. It has been shown that the proposed strategy is 14 percentage points more accurate than the standard way in the simulations above. However, if the image size and dataset alterations are taken into account, this accuracy may change. Convolutional neural networks (CNN) outperform support vector machines (SVMs) when it comes to graphical evaluations and data classification, according to previous research. In light of CNN's benefits, further study on face mask detection is necessary. In contrast to CNN, SVM is primarily focused with textual data. Face mask-related images may be recognized using CNNs because of their usage of layers, which CNNs use. Our findings show that the edge detection approach may be used as a supplement to the traditional neural network paradigm. To recognize edges, it is necessary to distinguish differences in brightness. Data extraction and image segmentation have both benefited from its usage. Computer and machine vision, image processing, and other uses have been identified for this technology. Graphical pattern identification models are also understudied because of the difficulties involved in the task. This is why we're interested in convolutional neural networks for graphical image processing. Error rates are reduced.

[8] Future Scope

Many potential pattern recognition algorithms have been devised, including SVM, CNN, and the RF algorithm. All of the preceding paradigm's goals have been achieved by the scientific community's continued efforts. To see how effectively the data was organized, we ran a series of tests. According on how effectively they preserve data accuracy, all of the algorithms have been evaluated. Convolutional neural networks (CNN) perform better with graphical assessment and classifications than support vector machines (SVM), according to a survey of the literature. It takes a long time to compare visual stuff. As a result, a great deal of research has been done on how to more quickly and effectively identify persons who are wearing disguises.

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