FACE MASK DETECTION USING REGION BASED NOVEL CONVOLUTIONAL NEURAL NETWORK ALGORITHM IN COMPARISON WITH LONG SHORT TERM MEMORY NETWORK TO IMPROVE CAMBRIDGE FACE MEMORY TEST SCORE

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Abstract

Aim: This work is a comparative study of region based novel convolutional neural networks (R-CNN) and long short term memory networks (LSTM) to improve the Cambridge face memory test accuracy.
Materials and Methods: Region based novel convolutional neural network algorithm (N=20) and long short term memory network (N=20) methods are simulated by varying the NCNN parameter and long short term parameter to optimize the pH sample size is calculated using G power 80% for two groups and there are 40 sample used in this work.
Result: Based on obtained results NCNN has significantly better accuracy (91.62%) compared to long short term accuracy (89.19%). There exists statistical insignificance between region based novel convolutional neural network and long short term memory network based on independent sample T-test with the value of p=0.453 (p>0.05).
Conclusion: Region based novel convolutional neural network algorithm produces better results in detecting face masks to improve accuracy percentage of Cambridge Face Memory Test than long short term memory algorithm.

Keywords: Machine Learning, Face Mask Detection, Region Based Novel Convolutional Neural Network Algorithm, Long Short Term Memory Algorithm, Deep Learning.

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1. Introduction

In this article, we explore an application of computer vision that is largely relevant to the global health crisis that is the coronavirus ((Ali et al. 2021)). As many countries continue their desperate fight to control the infection rate and spread of the virus, we have seen the integration of many unfamiliar,and somewhat inconvenient, protection measures being introduced into society over the past 6 months (Meng et al. 2021)). One of these particular measures; at least in the UK, is the mandatory requirement of wearing a protective face mask in shops, cafes, restaurants, and other compact or enclosed social environments(Sable, Goel, and Chatterjee 2019). This project looks at automating the task of checking whether someone is wearing a protective mask through the development, training, and deployment of a computer vision ML model. A comparative detecting the face mask can reduce spread of covid-19 (Głowacka and Rumiński 2021). In this article (Ieamsaard, Charoensook, and Yammen 2021; Negi and Kumar 2021);(Ieamsaard, Charoensook, and Yammen 2021) analysis of region based novel convolutional neural network and deep boltzmann machine algorithm in high performance efficiency has been made using an experimental approach. This article presents the comparative analysis between the accuracy control of region based novel convolutional neural networks using convolutional controllers like face mask detectors. A novel method for region based novel convolutional neural networks using deep boltzmann machine algorithm and face mask detector has been presented in this article for efficiency improvement (Anderson et al. 2021) In a previous study the efficiency improvement of the region based novel convolutional neural network algorithm with face mask detection was not properly considered to increase accuracy of face mask detection. In a previous study the efficiency improvement of the region based novel convolutional neural network algorithm with face mask detection was not properly considered to increase accuracy. To overcome this issue a Long short term memory algorithm is implemented to improve accuracy of Cambridge Face Memory Test.

In the last 5 years, more than 120 papers have been published on IEEE Xplore and google scholar on face mask detection which can be detected in public places. By detecting the face mask in the public places can reduce spread of covid-19 (Kodali and Dhanekula 2021). In this paper (Ieamsaard, Charoensook, and Yammen 2021) the analysis of region based novel convolutional neural networks and Long short term memory algorithm in high-performance efficiency has been made using an experimental approach. This paper (Meng et al. 2021) presents the comparative analysis between the accuracy control of region based novel convolutional neural networks using conventional controllers like face mask detectors. A novel method for region based novel convolutional neural networks using Long short term memory algorithm and face mask detector has been presented in this paper for efficiency improvement (Ali et al. 2021).

Our institution is keen on working on latest research trends and has extensive knowledge and research experience which resulted in quality publications (Rinesh et al. 2022; Sundararaman et al. 2022; Mohanavel et al. 2022; Ram et al. 2022; Dinesh Kumar et al. 2022; Vijayalakshmi et al. 2022; Sudhan et al. 2022; Kumar et al. 2022; Sathish et al. 2022; Mahesh et al. 2022; Yaashikaa et al. 2022). In a previous study efficiency improvement of region based novel convolutional neural networks and deep neural network algorithms with face mask prediction was not properly considered to improve accuracy. To overcome this issue a region based novel convolutional neural network algorithm is implemented to improve accuracy of face mask prediction.(Rinesh et al. 2022; Sundararaman et al. 2022; Mohanavel et al. 2022; Ram et al. 2022; Dinesh Kumar et al. 2022; Vijayalakshmi et al. 2022; Sudhan et al. 2022; Kumar et al. 2022; Sathish et al. 2022; Mahesh et al. 2022; Yaashikaa et al. 2022)

2. Materials and Methods

The research work is carried out in the Data Analytics laboratory lab at Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Chennai. The sample size has been calculated using the GPower software by comparing both of the controllers in Supervised learning. Two numbers of groups are selected for comparing the process and their result. In each group, 10 sets of samples and 20 samples in total are selected for this work. The pre-test power value is calculated using GPower 3.1 software (g power setting parameters: statistical test difference between two independent means, α=0.05, power=0.80, Two algorithms (LSTM and random forest algorithm) are implemented using Technical Analysis software. In this work, no human and animal samples were used so no ethical approval is required (Ghosh et al., n.d.).

Region Based Novel Convolutional Neural Algorithm

A convolutional neural network (Convolutional Neural Network/CNN) is a deep learning algorithm which can take in an input image, assign

importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The preprocessing required in a convolutional neural network is much lower as compared to other classification algorithms in machine learning. While in primitive methods filters are hand-engineered, with enough training, convolutional neural networks have the ability to learn these filters/characteristics. The architecture of a convolutional neural network is analogous to that of the connectivity pattern of neurons in the human brain and was inspired by the organization of the visual cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the receptive field. A collection of such fields overlap to cover the entire visual area. A convolutional neural network is able to successfully capture the spatial and temporal dependencies in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of parameters involved and reusability of weights. In other words, the network can be trained to understand the sophistication of the image better. The role of the convolutional neural network is to reduce the images into a form which is easier to process, without losing features which are critical for getting a good prediction. This is important when we are to design an architecture which is not only good at learning features but also is scalable to massive datasets. The Kernel shifts 9 times because of stride Length = 1 (Non-Strided), every time performing a matrix multiplication operation between K and the portion P of the image over which the kernel is hovering. The filter moves to the right with a certain Stride Value till it parses the complete width. Moving on, it hops down to the beginning (left) of the image with the same stride Value and repeats the process until the entire image is traversed.

Pseudocode for Region Based Novel Convolutional Neural Network Algorithm

Input : d1: dataset: dataset true labels, W1: Word2Vec Matrix

Output: score of CNN trained model on test dataset

1. Let f be the featured matrix.
2. For i in dataset do
3. Let f1 feature matrix of sample i
4. For j in i do
5. Vj is vectorized
6. Append vj and f1 split the feature set and labels
7. Append f1 for f
8. M is Parallel
9. score is evaluate
10. return score

Long Short Term Memory Algorithm

Long short-term memory units or blocks are part of a recurrent neural network structure. Recurrent neural networks are made to utilize certain types of artificial memory processes that can help these artificial intelligence programs to more effectively imitate human thought. The recurrent neural network uses long short-term memory blocks to provide context for the way the program receives inputs and creates outputs. The long short-term memory block is a complex unit with various components such as weighted inputs, activation functions, inputs from previous blocks and eventual outputs.

Statistical Analysis

SPSS software is used for statistical analysis of region based novel convolutional neural networks and Long short term memory algorithm based methods. The independent variable is region based novel convolutional neural network accuracy and the dependent variable is efficiency. The independent T test analyses are carried out to calculate the accuracy of the region based novel convolutional neural network for both methods.

3. Results

Table 1 represents the mean accuracy of the novel convolution neural network algorithm which is better compared with Deep neural network algorithm with a standard deviation of 0.98241 and 0.46143 respectively. From the results, the NCNN algorithm (91.62%) gives better accuracy than the deep neural network algorithm (89.91%).

Table 2 represents the T-test comparison of both novel convolutional neural network algorithm and deep neural network algorithm. The mean, standard deviation and standard error mean were calculated by taking an independent variable T test among the study groups.

Figure 1 gives the comparison chart of novel convolutional neural networks of deep neural network algorithms in terms of mean and accuracy. The mean accuracy of the novel convolutional neural network algorithm is better than deep neural networks.

4. Discussions

Region based novel convolutional neural network and Long short term memory algorithms are implemented and compared for Face mask detection to improve the accuracy of Cambridge Face Memory Test. From the obtained results it is concluded that the region based novel convolutional neural network algorithm provides better accuracy results compared to Long short

term memory algorithm with the value of p=0.453 which is insignificant due to the chosen dataset and limitations.

In the recent survey, the proposed Deep learning algorithm helps to solve the matter of face mask detection by introducing region based novel convolutional neural network models and their ability to retain future dependencies (Kinslin and Velmurugan 2018). This directly implies the evolution of all related technology which could signify a meaningful improvement of all forecasting problems (Wei and Nguyen 2020; Soni et al. 2018). These new technologies may also imply a far better quality of life for the unknown as for the economic implications of this project, the benefits of using such technology are numerous (Wei and Nguyen 2020). Within the case of a highly accurate model, using this tool would signify a substantially interesting help guiding investments within the mask detection (Sable, Goel, and Chatterjee 2019). From the above discussion, only a few articles ensure that they provide better performance than the proposed region based novel convolutional neural network algorithm and long short term memory algorithm was analyzed for improved Cambridge Face Memory Test for the face mask detection. It is clearly observed that the region based novel convolutional neural network algorithm has better accuracy compared to the long short term memory algorithm (Damrongsakmethee and Neagoe 2020; Lin, Guo, and Hu 2013; Parsons 2019). The sigmoid function maps the predictions to the probabilities of stock price values based on date, adjacent close attributes of the dataset which helped in improving the accuracy. The results show the evidence there is a statistically significant difference between the LSTM algorithm and Support vector machine algorithm (Damrongsakmethee and Neagoe 2020; Lin, Guo, and Hu 2013).

From the above discussion, only a few articles ensure that they provide better performance than the proposed region based novel convolutional neural network and long short term memory algorithm for improving the accuracy of face mask detection. Also the present mask detection requires no additional prediction and therefore received intense attention in recent years. So, the proposed region based novel convolutional neural network and long shor term memory algorithm can be used to improve the accuracy of face mask detection by regulating the face mask. Face mask detection has limited mask detection ability on future significant detection which makes better mask detection in future.

5. Conclusion

The work involves a convolutional neural network algorithm to find the face mask detection to be improved with a better accuracy of 91.81% when compared to deep neural network accuracy is 89.19%.

Declarations

Conflict of Interests

No conflict of Interest in this manuscript.

Authors Contributions

Author AP was involved in data collection, data analysis and manuscript writing. Author KL was involved in the conceptualization, data validation and critical review of manuscript.

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6. References

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Tables and Figures

Table 1. Mean accuracy of Region Based Novel Convolutional Neural Network (91.62%) and Long Short Term Memory (89.19%).

	Algorithm	**N**	**Mean**	**Std.deviation**	**Std.Error mean**
Accuracy	Region Based Novel Convolutional Neural Network	20	91.6270	.12374	.03913
	Long Short Term Memory	20	89.1940	.13550	.04285
Loss	Region Based Novel Convolutional Neural Network	20	8.3730	.12374	.03913
	Long Short Term Memory	20	8.8060	.13550	.04285

Table 2. Independent sample T-test is performed for the two groups which shows insignificance and standard error determination is p=0.453 (p>0.05).

		F	**Sig**	**t**	**df**	**Sig.(2-**	**Mean**	**Std Error**	**Lower**	**Upper**

						tailed)	Difference	Difference		
Accuracy	Equal variances assumed	.102	.453	7.462	18	.000	.43300	.05803	.31109	.55491
	Equal variances not assumed			7.462	17.854	.000	.43300	.05803	.31102	.55498
	Equal variances assumed	.102	.453	-7.462	18	.000	-.43300	.05803	-.55491	-.31109
	Equal variances not assumed			-7.462	17.854	.000	-.43300	.05803	-.55498	-.31102

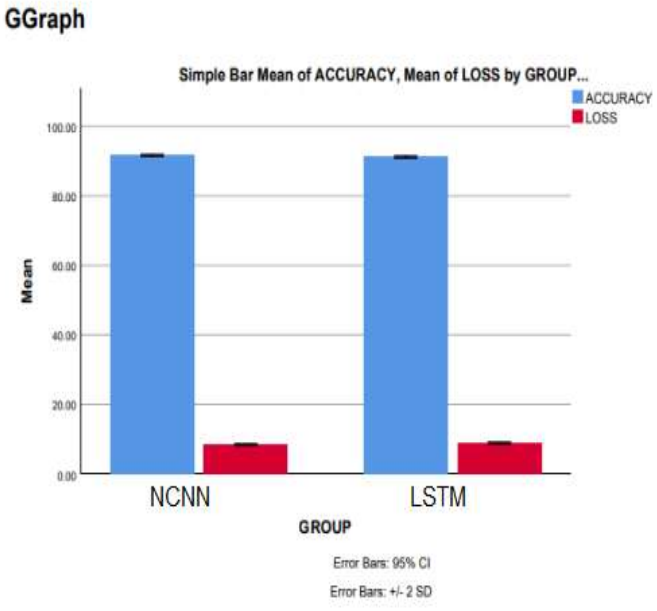

Fig. 1. Comparison of region based novel convolutional neural network algorithm and long short term memory network algorithm in terms of mean and accuracy. The mean accuracy of the region based novel convolutional neural network algorithm is better than long short term memory network algorithm. X-axis: NCNN Vs LSTM Y-axis: Mean accuracy. Error bar +/-2 SD.