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Convolutional Neural Network with Keras with Improved Accuracy and Comparison to Logistic Regression for Traffic Sign Recognition

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ABSTRACT:

AIM: To predict the accuracy of traffic sign recognition using a Novel Convolutional Neural Network over a Logistic Regression. **Materials and Methods**: At different events, CNN with test size (N=10) and Logistic Regression with test size (N=10) the sigmoid limit is a probability assumption used in basic CNN that aids in chipping away at the figure of accuracy. Logistic regression and CNN attained relevance there was a real significance among logistic regression SPSS statistical analysis yielded an accuracy value of p=0.001(2 tailed) (P<0.05).**Result:** The findings showed that CNN achieved fundamental outcomes with 91% precision and outperformed logistic regression with 80% exactness. **Conclusion**: CNN is the simplest and most effective algorithm for assembling quick AI models.

Keywords:Traffic Signs, Retroreflection, Logistic Regression, Feature Extraction, Road Safety, Traffic rules,NovelConvolutional Neural Network.

INTRODUCTION

Drivers may have various criteria for route selection based on existing traffic rules information about road safety (Anelli et al. 2021). It is critical to understand drivers' route choice habits in order to reassign traffic and reduce traffic congestion on a certain road network of a road safety (Delaney et al. 2021). Many studies have been conducted on drivers' route selection systems in the context of information and dynamic route assistance techniques retroreflection (Liscum 2000). The study on the dynamic route guiding system approach considered a number driver response (O'halloran 2000). Road Safety The endogenous relationship of the usage of radio traffic rules information and changeable message sign was modeled using bivariate models Retroreflection (Heuser 2000).Feature extraction In other research, the response of drivers to VMS information was investigated using a self-completion expressed preference questionnaire. The applications of Novel Convolutional Neural Network are used in Image analysis in medicine,Social media face recognition etc.

More than 150 articles were published in the past 5 years through IEEE xplore nearly published in 80 papers and

75 papers in google scholar. This author mainly discusses. An evaluation of existing research and future needs for model development of road users(Tuxworth and Titus 2000), Including choice modeling, decision-making mechanisms (Jackson 2019), and pertinent theories, was conducted. However, there has been relatively little study on the features of (Vanderbilt 2009) Chinese drivers' route choice using experimental methods (Bruntlett and Bruntlett 2021) such as SP surveys and software testing (Srinivasa 2018).(Parakh et al. 2020; Pham et al. 2021; Perumal, Antony, and Muthuramalingam 2021; Sathiyamoorthi et al. 2021; Devarajan et al. 2021; Dhanraj and Rajeshkumar 2021; Uganya, Radhika, and Vijayaraj 2021; Tesfaye Jule et al. 2021; Nandhini, Ezhilarasan, and Rajeshkumar 2020; Kamath et al. 2020)

The faster detection and recognition of traffic signs based on convolutional neural networks A large amount of literature has been released targeted at the topics . Mapping and assessing the state of traffic rules infrastructure deep learning large scale traffic sign detection and recognition for support vector machines. The traffic sign segmentation and extraction work have been done a shadow and highlight in varian of color segmentation algorithms were used to extract traffic signs from those captured pictures.

MATERIALS AND METHODS

This research work was done in the DBMS laboratory,department of computer science and engineering,Saveetha school of engineering.In this study two sample groups were taken**.** Two differences are used for the research. Group 1 is convolutional neural network and group two is Logistic regression Sample size is calculated using Gpower, consider the pretest power to be 80%.The project is mainly dependent on two algorithms , which has the sample sizes of convolutional neural network (376) and Logistic regression (437) which is total of 752.The has been carried out with 2000 records which is taken from the kaggle dataset .The accuracy is predicated using two different groups.Here the data is from kaggle website (https://kaggle.com).

CONVOLUTIONAL NEURAL NETWORK

Algorithm used in this study was the convolutional neural network. Which plays a major role in detecting the traffic signs. The algorithm is calculated based on the formula given in equation (1).

$$J(W,b;x,y) = \frac{1}{2}||hw,b(x) - y||^{2} \quad (1)$$

Pseudocode for convolutional neural network

Algorithm parallel CNN
Input: d: dataset, 1:dataset true labels,W: Word2Vec matrix
Output: score of parallel-cnn trained model on test dataset
Let f be the featureset 3d matrix
for i in dataset do
let f be the featureset matrix of simple i
for j in i
v←vectorize
append v to f
append f to f
m←parallel-cnn
score←evaluate
Return score

LOGISTIC REGRESSION

The existing algorithm compared with Logistic regression algorithm , which is formed by growing trees determined on a logistic regression.The training set is independent from distribution of logistic regression x and y the formula is given in equation (2).

$$P(y = 1) + P(y = 2) + P(y = J) = 1 \quad (2)$$

Pseudocode for logistic regression

Input: Training data

For i ← 1 to K

For each training data instance d:

Set the target value for the regression to

$$Zi \leftarrow \frac{Yj - P(1|dj)}{[P(1|dj).(1-P(1|dj))]}$$

initialize the weight of instance d to P (1 / d). (1-P) (1/d)

finalize a f(j) to the data with class value (zi) & weight (wj)

Classification label decision

Assign (class label:1) if P (1/d) >0.5, otherwise(class label:2)

The model is tested on the setup with hardware requirements i7 processor,16GB RAM and 256 SSD by using Hp laptop.The software configuration is windows 10.The tool which is used to execute the process is jupyter notebook version 6.Algorithm is implemented using the python3 code and accuracy of both groups is determined based on the dataset.

STATISTICAL ANALYSIS

The statistical analysis is done using IBM's SPSS statistical tool with version 26. The independent variables are accuracy and dependent variables are Data,Time,Junction, Vehicles Id. In SPSS (Statistical Package for the Social Sciences) a dataset is prepared using 10 samples from each of the algorithmsand the total sample size is 20. Group id is given 1 for Convolutional Neural Network and 2 for Logistic Regression . The independent T-Test using SPSS is done for a proposed research study.

RESULT

In this study , machine learning algorithms are used for prediction of traffic sign detection for following traffic rules and regulations.two algorithms are selected and tested for which algorithm produces the highest rate of accuracy.

From Table 1, explains the group statistics of the algorithm by comparing the algorithm and accuracy using sample values of =10 convolutional neural network and also 10 sample values for Logistic regression, mean=91.5000 for Novel convolutional neural network , mean=80.5000 for logistic regression .std.deviation =3.02765 for CNN and 3.02765 for LR.

From Table 2, explains about the independent variables , which defines the Equal variances assumed and equality of Means with sig. (2-tailed)=.001 for both assumed and non assumed variances and Mean Differences =11.00000 for both assumed and non assumed variances and 95% of confidential value respectively.

From Figure 1 the graph explains the comparison of accuracy with algorithms convolutional neural network and logistic regression. where the accuracy of the convolutional neural network is 91% and logistic regression is 80% .

DISCUSSION

The data evolution was performed using IBM SPSS software version21.To analyze data for performing independent sample T-test and group statistics be carried out . Which represents the comparison of two algorithms with their accuracy percentage 91% for Novel Convolutional Neural Network and 80% for logistic regression.From the above results it is concluded that convolution neural networks . So the system can detect traffic signs easily . The future scope of this study explains how it will be useful in future for the clients with improved accuracy . Feature selection techniques are used in this algorithm . To simplify the model.

There are many studies similar to this study of proposed research where the findings are:
elemental composition of fine and coarse particles across the greater losangeles area(Oroumiyeh et al. 2021). Association between particulate matter air pollution and traffic and industrial zones (Khanum, Chowdhury, and Sant 2021). Signs in adverse conditions feature extraction (Liu and Maruya 2009). Road Safety Recognition of traffic in color images retroreflection(Mo and Aoki, n.d.).Recognition method and evaluation of traffic signs recognition based on capsule network(Qu and Shao 2020). Traffic signs recognition Retroreflection road safety(Yildiz and Dizdaroglu 2020) and classification based on deep feature learning feature extraction (Lai et al. 2018).

It is concluded that conventional neutral networks have higher significant value than logistic regression algorithms. The future scope of this study traffic sign recognition ensures that current speed limit and other road signs are displayed to the driver on an ongoing basis. Feature selection techniques are used in this algorithm. To simplify the model.

CONCLUSION

The accuracy of the Novelconvolutional neural network is 91% compared to logistic regression 80% . It proves that a NovelConvolutional Neural Network is an efficient algorithm compared to logistic regression .

DECLARATION

Conflict of Interests

No conflict of interests in this manuscript.

Authors Contributions

Author TRP was involved in data collection, data analysis, and manuscript writing. Author JPC was involved in conceptualization, data validation, and critical review of the manuscripts.

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TABLES AND FIGURES

Table 1. The CNN(91.5000) method and grouped statistics were compared using group statistics for recorded data from simulation for 10 iterations (80.5000). In comparison, the LR algorithm has a high level of accuracy.

	Algorithm	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Accuracy	CNN	10	91.5000	3.02765	.95743
	LR	10	80.5000	3.02765	.95743

Table 2. For logged data from simulation, an independent sample test was performed for 10 iterations to set the confidence interval to 95% and the threshold of significance to $p<0.05$. The results yielded a $p = 0.001$ significant probability.

		Levene's Test for Equality of Variance		**T-test for Equality of Means**						
		f	**Sig**	**t**	**df**	**Sig.(2-tailed)**	**Mean Difference**	**Std.Error Difference**	**95% Confidence of the Differences**	
									Lower	**Upper**
Accuracy	Equal variances assumed	.000	0.532	8.124	18	0.001	11.00000	1.35401	8.15534	13.84466
	Equal variances not assumed			8.124	18.000	0.001	11.00000	1.35401	8.15534	13.84466

Graph

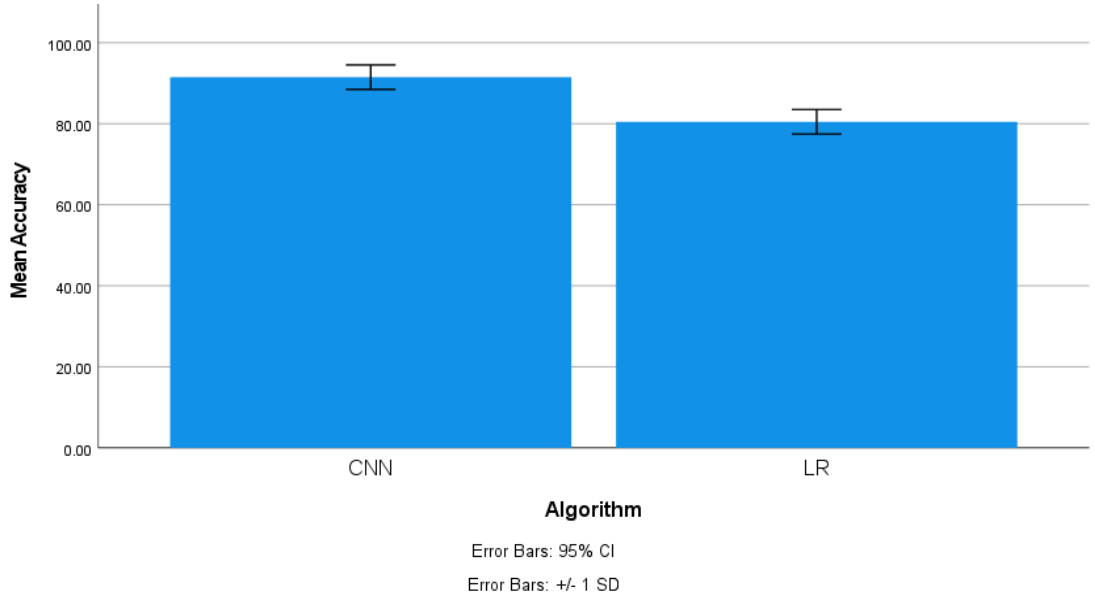

Fig. 1. Performance comparison between CNN(91.50%) and LR(80.50%). The mean precision of CNNis better than LR and the standard deviation of CNNis better than LR . X axis CNN Vs LR algorithm Y axis mean precision. Error Bar +/-1 SD.