PREDICTION OF QUALITY OF RICE IN RICE MILL USING SVM COMPARED WITH ECNN WITH IMPROVED ACCURACY

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Abstract

Aim: The main objective of this research article is to improve the accuracy rate in Novel prediction of quality of rice in Rice Mill by using Support Vector Machine (SVM) compared to Enhanced Convolutional Neural Networks (ECNN) Classifier.

Materials & Methods: The data set in this paper utilizes the publicly available Kaggle data set for Novel prediction of quality of rice in rice mills. The sample size of Novel prediction of quality of rice in rice mill with improved accuracy rate was sample 80 (Group 1=40 and Group 2=40), and calculation is performed utilizing G-power 0.8 with alpha and beta qualities are 0.05, 0.2 with a confidence interval at 95%. Novel Prediction of quality of rice in rice mill with improved accuracy rate is performed by Support Vector Machine (SVM) whereas the number of samples (N=10) and Enhanced Convolutional Neural Networks (ECNN) where some samples (N=10).

Results: The Support Vector Machine (SVM) classifier has 91.0 higher accuracy rates when compared to the accuracy rate of Enhanced Convolutional Neural Networks (ECNN) is 90.44. The study has a significance value of ($p<0.05$), i.e., $p=0.044$.

Conclusion: Support Vector Machine (SVM) provides better outcomes in accuracy rate when compared to Enhanced Convolutional Neural Networks (ECNN) for Novel prediction of quality of rice in rice mills.

Keywords: Quality of Rice, l Support Vector Machine (SVM), Enhanced Convolutional Neural Networks (ECNN), Machine Learning, Rice Mill, Novel Prediction.

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1. Introduction

The interest like food items we tend to eat expands day by day. India is the second-biggest maker of rice grains in Beijing, China(Fafchamps, Hill, and Minten 2008). The development of rice is expanding the interest subsequently for its quality. This interest like food grains is increasing because some dealers cheat the businesspeople by trading low-quality food grains that contain the particles like stones, sand, leaf, endlessly broken seeds, and so on; this sort of mediocrity of rice is sold while not being seen even. Moreover, there's no unique subject to look out for such low-quality grains(Puri, Dhillon, and Sodhi 2014). Monitoring the quality and accessibility of grains is time-taking and a troublesome errand. Consequently, this paper proposes a design that will make grain ordering, foreseeing quality, and observing easy. It will assist clients with deciding the sort and nature of the grain and advise clients when the degree of the grain becomes underneath some edge esteem. In an overview it utilizes image processing, and ideas of Support vector machine (SVM) classifiers(Kumar and Javeed 2019). The SVM characterization precision with boundaries enhancement was superior to that of ECNN for the order of rice quality grades(S. Chen et al. 2019).

During the last few decades, several approaches have been described for the Novel prediction of quality of rice. IEEE Xplore published 89 research papers, and Google Scholar found 145 articles. This paper introduced a quality assessment strategy for processed rice(Ajay et al. 2013). PCA-based rice grain arrangement and quality investigation algorithm(Asif et al. 2018). PCA was utilized as a classifier to distinguish rice assortments which brought about 92.3%. In 2014,(Auttawaitkul et al. 2014) explored a rice quality assessment framework in light of mathematical and color highlights. The difference was upgraded for the rice image, and the edge location was then applied. One more strategy for quality appraisal of Indian Basmati rice grains was introduced in(Mahajan and Kaur 2014) in which creators used morphological shutting and opening activities(Vincent 1994) to a grayscale image, trailed by a top-hat transformation(Bai 2013). In(Silva and Sonnadara 2013) explored the classification of rice grains by neural network technique. In this methodology, the info rice picture was pre-handled with a few activities: Gaussian channel, morphological opening, contrast extending, widening, and disintegration. In 2017, Patel et al. suggested two methodologies because of CNN(Wu et al. 2018) for rice grain arrangement(Patel, Jayswal, and Thakkar 2017). The authors of(Qiu et al. 2018) suggested a rice assortment arrangement framework in light of the mix of hyperspectral imaging with CNN.(X. Chen et al. 2012) suggested a machine vision framework for rice quality identification. The Least Squares Support Vector Machines (LS-SVM) were applied to arrange head rice and broken rice. The hereditary calculation was utilized to upgrade the boundaries upsides of LS-SVM.(Kaur and Singh 2013) suggested a machine algorithm to grade (Premium, Grade A, Grade B and Grade C) utilizing Multi-Class SVM. The SVM classified accurately more than 86%.The SVM grouped precisely over 86%.Our team has extensive knowledge and research experience that has translated into high quality publications(K. Mohan et al. 2022; Vivek et al. 2022; Sathish et al. 2022; Kotteeswaran et al. 2022; Yaashikaa, Keerthana Devi, and Senthil Kumar 2022; Yaashikaa, Senthil Kumar, and Karishma 2022; Saravanan et al. 2022; Jayabal et al. 2022; Krishnan et al. 2022; Jayakodi et al. 2022; H. Mohan et al. 2022)

The main drawback with the traditional method is that it has more time consuming, tedious and poor detection rate. To overcome this limitation, this study presents a SVM algorithm that is utilized to distinguish the nature of rice and in correlation with Enhanced Convolutional Neural Networks (ECNN) algorithm. An experimental result shows that the suggested SVM method produces better outcomes compared to the existing ECNN method.

2. Materials And Methods

This work was carried out at Machine Learning Laboratory in Saveetha School of Engineering, SIMATS, Tamil Nadu, and India. In this study, the rice data set was collected from various rice mills. 13 different types of rice samples are taken. The Sample size was analyzed utilizing earlier works(Niu et al. 2010). Group 1 was an Enhanced Convolutional Neural Networks (ECNN) algorithm and Group 2 was a support vector machine (SVM) algorithm. In this work two groups are taken and 10 samples for each group, total samples considered are 20. The calculation is performed utilizing G-power 0.8 with alpha and beta qualities 0.05, 0.2 with a confidence interval at 95%.

Enhanced Convolutional Neural Networks (ECNN) algorithm

The sample preparation group 1 is the Enhanced Convolutional Neural Networks (ECNN) algorithm, one of the most important algorithms in the field of deep learning technology. The steps involved in the implementation of the ECNN algorithm are described as follows.

Enhanced Convolutional Neural Networks (ECNN) is a typical, deep learning approach, which unites feature description and grouping to accomplish better execution in different arrangement tasks. ECNN is a weight-sharing network based on image convolution(Krizhevsky, Sutskever, and Hinton 2017). The quantity of ECNN models and their capacities for handling complex images has expanded quickly since the primary ECNN model (LeNet) was presented.(Lecun et al. 1998). To conquer the slope dissemination issue. He et al.(He et al. 2016) suggested a residual block in the neural network, the ResNet.

Step 1: Separate the images based on the labels.
Step 2: For training the data 75% of the data is used for building the model.
Step 3: Remaning 25% of the data is used for testing the model.
Step 4: Remove all the outliers from the dataset, So the model does not overfit.
Step 5: Deep Enhanced Convolutional Neural Networks (ECNN) relates to the data given.
Step 6: Predicts the nutrition analysis and calorie count significantly.

Support vector machine (SVM) algorithm

The sample preparation group 2 is the novel support vector machine (SVM) algorithm, and is the most powerful and popular tool for classification and prediction of rice quality. The experimental results show that the suggested D-Tree method has achieved better accuracy results.
Support Vector Machines (SVM)(Vapnik 2013) can be utilized as a highly vigorous and productive non-direct multivariate tool. The essential outline complex non-straight connection between certain factors could be attributed to a direct relationship in a higher layered space. Along these lines, the aspects of interest are projected into a high-layered space where direct advancement strategies are applied. To observe a compelling classifier for rice portions characterization, the decision of SVM bit work is a crucial stage. The benefit of SVM is that it uses support vectors to distinguish ideal hyperplanes in a component space. The benefit of SVM is that it uses support vectors to distinguish ideal hyperplanes in a component space to observe a compelling classifier for rice portions characterization, the decision of SVM bit work is a crucial stage.
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Step 3: Remaining 25% of the data is used for testing the model.
Step 4: Remove all the outliers from the dataset, so the model does not over fit.
Step 5: Deep support vector machine (SVM) relates to the data given.

Statistical Analysis

The output is obtained by using Python software(Milano 2013). To train these datasets, required a monitor with a resolution of 1024×768 pixels (10th gen, i7, 12GB RAM, 500 GB HDD) and Python software with essential library functions and tool functions. For statistical implementation, the software tool used here is IBM SPSS(Healey 2014). The independent sample t-test was performed to find the mean, standard deviation, and standard error mean statistical significance. Then a comparison of the two groups with the SPSS software will give the accurate values for the two different S, which will be utilized with the graph to calculate the significant value with maximum accuracy value (91.0%), mean value (91%), and standard deviation value (0.22839). Dependent variables are accuracy, and independent variables are image size.

3. Results

Figure 1 shows that the SVM Classifier is higher in terms of accuracy rate 91.0 when compared with ECNN Classifier 90.44. Variable results with its standard deviation ranging from 80 lower to 90 higher ECNN Classifier where SVM Classifier standard deviation ranging from 90 lower to 100 higher.
Table 1 shows the Evaluation Metrics of Comparison of ECNN and SVM Classifier. The accuracy rate of ECNN is 90.44 and SVM has 91.0.
Table 2 shows the statistical calculation such as Mean, standard deviation and standard error Mean for ECNN and SVM. The accuracy rate parameter used in the t-test. The mean accuracy rate of ECNN is 90.44 and SVM is 91.0. The Standard Deviation of ECNN is 1.92939 and SVM is 0.22839. The Standard Error Mean of ECNN is 0.91838 and SVM is 0.17284.
Table 3 displays the statistical calculations for independent samples tested between ECNN and SVM. The significance level for accuracy rate is 0.044.

4. Discussion

The above results show the comparison of accuracy rate for Support Vector Machine (SVM) Classifier and Enhanced Convolutional Neural Networks (ECNN) Classifier. Enhanced Convolutional Neural Networks (ECNN) Classifier is higher in terms of accuracy rate 90.44 when compared with Support Vector Machine (SVM) Classifier 91.
Recently, many studies have been published in the literature for the Novel prediction of rice quality. In 2014, Pazoki et al suggested a methodology that separated twenty colors, eleven morphological and four shape features. Then the parameters were provided to the neural network fuzzy systems(Pezeshki and Mazinani 2019) and MLP, accomplishing precision of 96.34% and 96.62% separately(Pazoki et al. 2014). This paper introduced a productive method for the

arrangement of rice grains utilizing BPNN and wavelet deterioration(Singh and Chaudhury 2016). When the preparation stage was finished, BPNN was assessed with test information, and as indicated by the review, it characterized rice assortments with an exactness pace of over 98%. In(Nagoda and Ranathunga 2018), this issue was tended to by using shape recognition and Watershed algorithm(Liu et al. 2019). They fostered a rice division and order framework in light of shading and surface elements utilizing SVM, accomplishing a precision of 90%. In(Lin et al. 2017), a rice distinguishing proof model was presented using CNN, which brought about 98.12% precision. In 2019, Ibrahim et al. suggested a methodology utilizing morphological and HSV highlights. These were then taken care of to a multi-class SVM for rice grain grouping(Ibrahim et al. 2019).

Although the results of the study are better in both exploratory and geometric analysis, there are particular disadvantaged in the work. The ECNN has more error in mean value compared with the SVM classifier. Nonetheless, the result can be upgraded by applying advancement algorithm methodologies, to achieve better accuracy and less mean error. In future, before Classification of rice, the feature selection algorithms are utilized to enhance the classification accuracy in predicting the rice grains and o develop the order exactness rate. Thus, we can diminish the calculation time and further develop the order exactness of novel classifiers through the measures.

5. Conclusion

The proposed model exhibits the Enhanced Convolutional Neural Networks (ECNN) and Support Vector Machine (SVM), in which the Support Vector Machine (SVM) has the highest values. The accuracy Rate of Support Vector Machine (SVM) is 91.0 is more elevated than Enhanced Convolutional Neural Networks (ECNN), which has an accuracy rate of 90.44 in the analysis of Novel prediction of quality of rice in rice mill with improved accuracy rate.(Hennessy et al. 2022)

Declarations

Conflicts of Interest

No conflict of interest in this manuscript

Authors Contribution

Author KPR was involved in data collection, data analysis & manuscript writing. Author VN was involved in conceptualization, data validation, and critical review of manuscripts.

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6. Reference

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Tables and Figures

Table 1. Comparison of ECNN and SVM Classifier for predicting the Novel prediction of quality of rice in rice mill with improved accuracy rate. The accuracy rate of ECNN is 90.44 and SVM has 91.0.

S.No.	Test Size	ACCURACY RATE	
		Enhanced Convolutional Neural Networks (ECNN) Classifier	Support Vector Machine (SVM) Classifier
1	Test1	90.344	90.344
2	Test2	90.483	91.083
3	Test3	90.075	91.075
4	Test4	90.192	90.192
5	Test5	90.484	91.014
6	Test6	90.072	91.012
7	Test7	90.483	91.083
8	Test8	90.394	91.094
9	Test9	90.493	91.093
10	Test10	90.393	90.393
Average Test Results		90.44	91.0

Table 2. The statistical calculation such as Mean, standard deviation and standard error Mean for ECNN and SVM. The accuracy rate parameter used in the t-test. The mean accuracy rate of ECNN is 90.44 and SVM is 91.0. The Standard Deviation of ECNN is 1.92939 and SVM is 0.22839.

Group		N	Mean	Standard Deviation	Standard Error Mean
ACCURACY	SUPPORT VECTOR MACHINE	10	91.0	0.22839	0.17284
	ENHANCED CONVOLUTIONAL NEURAL NETWORKS	10	90.44	1.92939	0.91838

Table 3. The statistical calculations for independent samples test between ECNN and SVM. The significance level for accuracy rate is 0.001.

Group		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval (Lower)**	**95% Confidence Interval (Upper)**
Accuracy	**Equal variances assumed**	9.27	0.044	18.18	18	.001	12.1839	0.78284	12.72839	15.78294
	Equal variances not assumed			12.18	14.67	.001	12.0673	0.11029	10.18393	13.01839

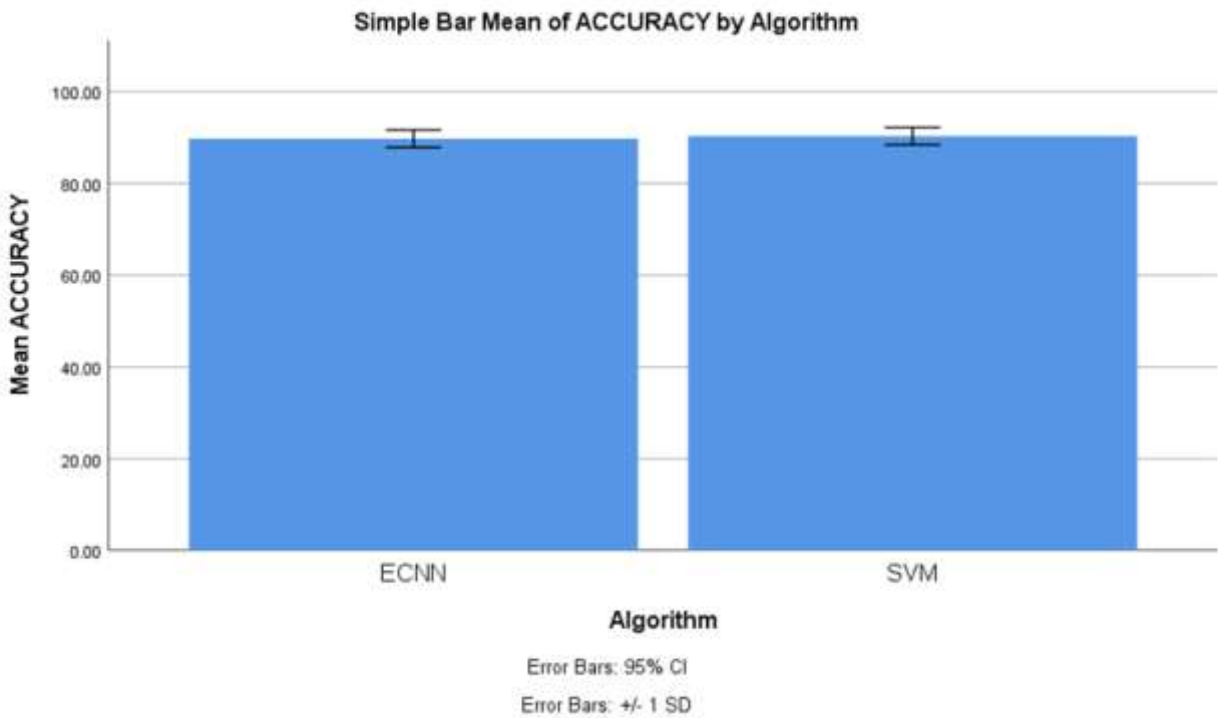

Fig. 1. Simple Bar graph for ECNN Classifier accuracy rate is compared with SVM Classifier. The ECNN Classifier is higher in terms of accuracy rate 90.44 compared with SVM Classifier 91.0. Variable results range from 80 lower to 90 higher ECNN Classifier where SVM Classifier standard deviation ranges from 90 lower to 100 higher. X-axis: SVM Classifier accuracy rate vs. ECNN Classifier Y-axis: Mean accuracy rate for identifying keywords ± 1 SD with 95 % CI.