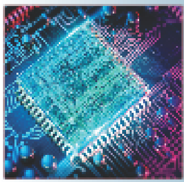

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Machine Vision Approach for Identification of Four Variant Pakistani Rice Using Multi-Features Dataset

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ABSTRACT:

Crops are the most essential and beneficial food source in Pakistan. The demand for food has increased in Pakistan due to population growth. Pakistan produced 7,410 million tons of rice according to the financial year survey 2020 (FYS-2020). Pakistani rice has been cultivated in 3,304 hectares of agricultural land and exported worldwide. Rice is also increased by 0.6% of Pakistan's Gross Domestic Product (GDP) (FYS-2020). The old and manual process of rice classification is more expensive and time-consuming. In this study, we describe a machine vision approach for rice identification. We use four different rice varieties for the experimental process such as Pakei_Kaynat, Kaynat_Kauchei, Kauchei_Super_Banaspati and Tootaa_Kauchei (P1, P2, P3, and P4). The 100 images dataset have been used for practical work and the total calculated 400 (4 x 100) rice image. The different process has been deployed on available datasets, such as introduction, preprocessing methodology, and result discussion. A quality enhancement technique has been implementedto clarifythe difference between rice color and shape sampling, and it is also converted color imagestoa gray scale level. Every image has employed six different non-overlapping regions of interest (ROI's) and calculated 2400 (6 x 400) ROI's. Binary (B), Histogram (H), and Texture (T) features have been implemented and extracted 43 features on each ROI's and total calculated 103,200 (2400 x 43) machine learning (ML) features. Best First Search (BFS) Algorithm was used for feature optimization. Different ML classifiers are implemented for the experimental process: Function Multi-Layer-Perception, Function SMO, Random Tree, J48 Tree, Meta Classifier via Regression and Meta Bagging. The Function Multi-Layer-Perception overall accuracy (OA) has describeda better accuracy result is 99.8333%.

KEYWORDS: Rice Grains, Image Preprocessing, Feature Extraction, Machine Learning Classifier

1. INTRODUCTION

Pakistan is geographically represented in Sothern Asia and near the border of the Arabian Sea. Pakistani border was linked with China, Afghanistan, Iran and India on the following side North, West and East[1], [2]. Paddy crops are the most essential and beneficial food source in Pakistan. The demand of food has increased in Pakistan due to population growth. Pakistan produced 7,410 million tons of rice according to the financial year survey 2020 (FYS-2020). Pakistani rice has been cultivated in 3,304 hectares of agricultural land and exported worldwide. Rice is also increased by 0.6% of Pakistan's Gross Domestic Product (GDP) (FYS-2020). The old and manual process of rice classification is more expensive and time-consuming [3].Mize, wheat and sugarcane werePakistan's most important and beneficial food sources, and rice is one of them. Rice is the second largest crop among these in Pakistan. Sindh and Punjab are the two leading rice-growing provinces that produce 92% of rice around the total area. Punjab covers nearly one million (Hectares) per year. The soil condition was perfected for rice production in the Punjab districts:Sialkot, Bahawalpur, Jhaang, Gujranwala, Okaraa, Sheikhupuraa, and Multan.These districts produced more than 70% of rice in Pakistan[4].

Furthermore, in Pakistan, there isno exact and proper cropping system and rice agricultural land was insufficient for cultivating. Usually, growers adopt traditional and old rice cultivation or identification procedure. In this study, we introduced a machinelearning technique for rice growers. It is an automated, cost and time-saving technique. There isthe following objective of these studies; (1) To evaluate the automatic identification of rice varieties and direct rice seed classification; (2) To improve the efficiency of rice classification and technical system.In Pakistan, two methods are used for generating rice:the procedural method and the Dry method. The direct process of seeding rice system has been introduced in the last some years. The research has been estimating the dry method's technical efficiency and also sources of inefficiency. There are 300 data collected from farmer rice samples during the Khareef crop season (2013-14). Pakistani different rice is exported to 144 countries from 2003 to 2016.The Stochastic frontier analysis (SFA) technique has been employed to identify the results accuracy of available samples. Samples output shows that the direct seed process is more beneficial for farmers dry sample rice and increases farmer's efficiency. The Farmers get more profitable economically by using direct-seeded or dry rice [4].

This research is based on the calculation of finding the largest exporter countries. A panel-gravity approach was used in this article by adopting the PPML methodology to display the potential country for following Pakistani varieties of rice. The results of this article Show that in the international market, compared to other major exporters countries, Pakistan had a highly competitive and comparative advantage in the exportation and production of rice. The results for rice transport potential suggest that Pakistan has plenty of different rice and transports the best rice good variety within 109ountries[5]. This research shows that Pakistan increasingly focuses on rice transport inside and outside different countries. The rice export is beneficial to Pakistan and bright for Pakistan feature. Rice is beneficial for increasingits earnings and decreasing its trade inflation. Pakistani farmers and transporters have faced different hurdles due to high tax value, increased crop cultivation cost, decreased crop infrastructure, and lack of electricity.

The data was collected from time series from 1970 to 2015. The organization of National Food Security and Research about Economic Survey of Pakistan and various authors give the data. The ordinary square and augmented Dickey fuller technique have been used for the rice crop. The Johansen testing technique is used[6]. So, this research gives the result based on the long-term relationship between rice cultivation, its procedure areas, and water availability with Pakistan's GDP. But we analyzed that the availability of water has a negative relationship. We conclude from this research the Pakistan government must organise an effective method and new funding technique to improve and increase the water system[7].

This research shows that we have rice quantity and quality losses in Pakistan. The Problems of rice insecurity are faced due to socioeconomics, poor management, institutions, and policymakers. The awareness of new technology and Practice will make farmers increase rice production. There has no awareness of using the latest technologies and efficient techniques in farming mechanisms for the production at the grass-root level [8].

2. LITERATURE REVIEW

The economic source of earning foreign exchange for the vital crop of Pakistan is rice. This research has two types; (a) Analysis of the ways of production and its areas and also analysis of the quantity export and transport value of other Pakistani rice. (b) Shows the relationship between transport quantity, production and Pakistan's rice crop production areas. This research analyzes the data collected from the time series the year 1972 - 2011 about rice production areas. This research obtained the rice export quantity and calculated the value and growth Rates. This research shows that the overall growth rates and productions for rice crops are incremental and give the per year increment rate is 5.43%, 6.81% and 1.30%. The researcher employs the co-efficient of variation method, and the output shows the rice cultivation areas have been displayed as gives the total co-efficient of variation dataset has been exploring the accuracy 15.62%, 30.06 % and 14.48%. Due to available data of the increment value of rice transport quantity and rice transport data value, the overall accuracy time period has been displayed which showed 30.06% and 15.80%. The rice transport values and data have been observed; the accuracy result is 89.32% and 58.76% yearly[1].

In [9] , Pakistan for the quality of rice grains has been improved; local genetic of rice samples (475) are gathered from the 3 rice production areas and for the seed characters were evaluated in the other parts of the country. The grain size and shape, we have found that the vast varieties. During the rice measurement of rice length, Pakistan rice production has been dominated by high grain category while we have found that the short grains were absent. However, based on rice grain height/width ratio is 1.3% short rice grain types have been produced in NWFP/N.

Due to the TRIPS process, the famous type of rice "Punjab Basmati Rice," is a central problem for (GIS) regime identification. This study leads the Punjab rice in its historical areas. It explores a good contribution of Indian rice, which is a leading exporter in the local and international rice market (Basmati). This beneficial rice inflation production area may organize due to the water supply in the Punjab area due to the melting of Himalayan glaciers in 2050 [10].

This research shows that the past accuracy results of different years of experiments on thorough seeding process methodology have been adopted. The authors do a little more struggle for improving crop production, and the results between 4.5 t/ha have shown that by employing this methodology. The latest technology has the main potential of adopting the alternative of crop cultivating if the seeds are correctly managed. More experiment process describes many varieties by adopting latest technology [11], [12].

In this study, we explore on the available dataset OsACBP6 in different rice. The OsACBP6 has shown cultivation increase due to decrease in root growth process and leaf. In short, OsACBP6 describe the available for more accuracy in management of ACYL-CoAS. OsACBP6 has also improved the provoked display detail. It also informed about the relationship of following acyl-CoAs method with saving reports[13].

Plants describedas a most beneficial nutrition and food system in the population[14]. An improved process of different seed (Plants) metabolomics, the information about the genetic-seed and bio-molecular process of rice grains metabolomics were different in the processing model [15].The rice intensification (SRI) system has used minimum water in crops and evaluated rice yield using synergy with different agronomic arrangements. This research has been evaluated to describe the infection of crop increase, crop yield, and cultivation water, using two-thirds of the recommended SRI process and adopting two different rice varieties such as Tidung30 (TD-30) and Tainan11 (TN-11). The irrigation process has been (a) cultivation irrigation with a three-day time duration (TD-303 and TN-113); (b) cultivation process with a seven-day time interval (TD-307 and TN-117), and (c) correctly flooding process (TD30F and TN-11-F). Results showed intermittent production of three- and seven-day cultivated water secure,5% and 74% related to properly water flooding [16].

Researchers[17] Increasing demand for good rice in different varieties, which are also more important to increase under sub-optimal production environments, increases quality in rice studies[18]. Different procedures were adopted to explore the difference between rice cultivating varieties such as IR64 and Apo. A multi-disciplinary technique using SNP-based genotyping between phenol typing based on rice yield analysis, the rice grain metabolomics technique, and the panel sensory analysis method is used on plants grown under drought-induced and standard environments. Results accuracy beneficial differences among the rice dataset of the two different types of and we compared these differences to those perceived by the sensory panel[19].

The Apo is a more effective tolerant rice variety. There was minimum accuracy in the tough environment concerning crop yield and sensory dataset; IR64, the biggest butmost sensitive process, showedmore significant differentiation in these datasets in response to the two growth-up conditions.High-yield rice varieties were developed during the 1960s-1970s inthe International Rice Research Institute (IRRI) and were important for humans, unfortunately incre the crop yield and minimising the cost of rice production. These different varieties of rice where minimum food improvement have been deployed from variants of the manual or old rice varieties were changed. In 1985, the international institute (IRRI) improved the indicaa rice variety, which was IR64 deployed in the Philippines. These advantages increase accuracy in its exchange spread and production of over ten million hectors in two different cultivation periods[20].

Rice improvement study describes production worldwide. The rice chalkiness process is one of the main indices that valuate kernel rice[21]. The traditional and old rice chalkiness cultivation process only uses different rice as the dataset. It mainly depends on open eyes observation or area open based with two different dimensional (2D) image techniques. The results don't describe the three different dimensional (3D) of chalkiness in the kernel rice. This process has been evaluate in vivo thus describe to explore different rice seed varieties for high incremental process of rice chalkiness. This research evaluates a new incremental tool for chalkiness rice experiment, especially for high output chalkiness phenol-typing described by using different rice seeds [22].

Rice food crops were the most beneficial production in China[23]. China is themost prominent developer of food agricultural land zone using water[24]. Research has been deployed based on two continuous years in two different locations such as the province of Jiangsu, to examine the description of 4 different cultivation techniques with 4 different replications process (shallow water irrigation (FSI), wet-shallow irrigation (WSI), controlled irrigation (CI), and rain-catching and controlled irrigation (RCCI)) on drainage, raining water of utilized, pollutant increasing of P and N, water irrigations quality, a yield of the rice grain, and efficiency of water use. The results accuracy has shown that FSI exploresand describes the most significant cultivation values. Our research findings show hat RCCI and FSI were the beneficial cultivation process in the Nanjing field area [25].Water processing is sometimes described in agricultural areas namely, Indo Gangatic Plain (IGP) in southeastern Asia[26]. This study evaluates the mainly conventional and organic rice cultivating of rice (basmati) crops on the purity of water during the rainy period July to October (2011-2016)in Haryana, Kaithal in Indian areas.The research area describes seven different tissues and seven different con-ventional areas of rice fields where organic cultivating was developed for over two decades. Quality of water arrangements has been used for drinking water quality (nitrate, NO3) [27].

3. METHODOLOGY AND MATERIALS

3.1. Experimental work and image Datasets

The Department of Computer Science employs this experimental study; the Muhammad Nawaz Sharif University of Agriculture Multan and The Islamia University of Bahawalpur Pakistan were based on real images dataset. This experimental process was employed on two locations (Multan and Bahawalpur, Pakistan) located at 30°14'75" (North) latitude and 71°44'36" (East) longitude is shown. [28][29].

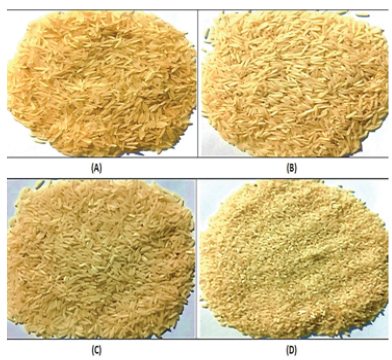

Figure 1: Rice Images Dataset of 4 Varieties; (A) P3, (B) P1, (C) P4, (D) P2

This study has implemented a variant methodology for real image processing. CVIP and WEKA (Version 3.8.4) software is implementing for machine learning classification on Intel (R) core i5, 4 GB-RAM, 3.0 GigaHertz (GHz) processor with 64-bit window 8 operating system [30]. Four rice varieties are evaluated for the experimental process, namely Kaynat_Kauchei, Tootaa_Kauchei, Pakei_Kaynat, and Kauchei_Super_Banaspati (P1, P2, P3, and P4), that is described in Figure 1. The rice dataset image was captured with 16 megapixels (MP) digital camera between 02:00 (P.M) to 04:00 (P.M) according to the Pakistani area time zone. The rice image resolution differed in pixel size with Joint Photographic Expert Group (JPEG) frames.Proposed

Proposed Working Algorithm

Start from main ( )
{
Input ⟶ Rice varieties image dataset
For
{
Step 1 to 6
Step 1 ⟶ Four different images (P1, P2, P3 and P4) dataset.
Step 2 ⟶ Preprocess on available dataset.
Step 3 ⟶ Select ROIs for feature selection.
Step 4 ⟶ Evaluate 43 (B + H + T) different features.
Step 5 ⟶ Feature minimization or optimization
End For
}
Step 6 ⟶ Different Machine learning classifiers were applied.
Output ⟶ Rice classification results.
End of main
}

The identification framework of rice classification was shown in Figure 2. In first steps collected four different (P1, P2, P3 and P4) varieties of rice. In step two was explore detail description of image preprocessing techniques and methodology and describe the images resolution changed into 512 x 512 resolution or pixels size.

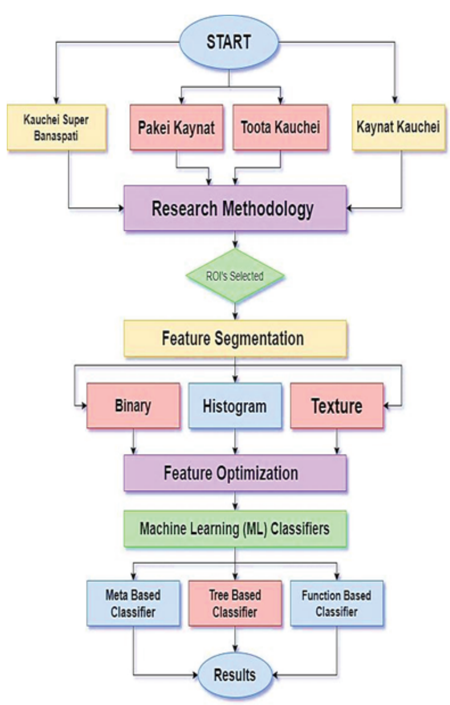

Figure 2: Future selection Based Framework for Rice Classification

The whole rice images dataset was described in a separate image file for further processing. In step three, we select 6 non-overlapping ROI's on each image for feature selection. In step four and five, this entire image segmentation process describe in below. In step four, variant ML features Binary (B), Histogram (H) and Texture (T) were deployed for feature segmentation procedure and extract 43 features. In step five, Best First Search (BFS) algorithm was employing for feature optimization. It has been describe the better results from optimized feature available dataset. In step six, evaluate different ML classifiers namely; Meta, Tree and Function Based Classifiers. The main idea of this experiment study is to describe the rice classification by using different ML techniques[31].

3.2. Image Preprocessing andSegmentation

The image preprocessing and segmentation technique has been deployed to clarify the image dataset on all available JPEG images and eliminate unnecessary and noisy data information. The quality enhancement filter is employed for rice grain accuracy based on rice shapes, size and color. Initially, all images dataset are converted into the grey-scale level; a median filter (CVIP) is also implemented for the purity of rice image classification[30].

Figure 3: 6 Non-Overlapping ROI Areas

Six (6) non-overlapping ROI have been captured on each rice image shown in Figure 3. Each image's resolution has been converted into (512 x 512) pixels. The total extracted ROI's are 2400 (400x 6) from 400 (100 x 4) rice images dataset on four different rice varieties[30].

3.3. Feature Extraction and Optimization

Feature extraction depends on the researcher methodology and optimization method, and BFS algorithm was deployed on different feature extraction techniques for the accuracy of the result[32]. In this study, we implement different statistical features segmentation such as Binary (B), Histogram (H), and Texture (T) are evaluated below:

3.3.1. Standard Deviation (S.D)

This S.D describes the total contrast values of the image object in processing. SD has defined in equation 1.

$$\sigma_p = \sqrt{\sum_{p=0}^{N-1} (p - \bar{p})^2 N(p)} \qquad (1)$$

This method also evaluated the shape or design and identified object placement in image segmentation using the Axis of last-second moments, the center object area, the number of Euler, and the object projection.

3.3.2. Binary (Bin):

The binary also evaluates the image shape or design and the object placement in image processing by using the axis of last-second moments, center object of the image, Area, Euler values of the area, and image projection object.

3.3.3. Histogram

The histogram adjacent momentum angles describe the x-axis area by using the area of proportional and class mark of frequency. Histogram probability Y(n) has been used for collecting data or information with available pixels and grey-scale in image processing. That is shown in equation 2.

$$Y(n) = \frac{M(n)}{Q} \qquad (2)$$

Here, M (n) calculate the pixels of the image in the grayscale level, and Q is calculated the image pixel by employing different formulas such as; SD, Mean, Energy, Entropy, and skewness. Mean describes the bright and dark image area with Low and High average mean values. The mean is defined in equation 3.

$$\bar{P} = \sum_{m=0}^{N-1} mN(m) = \sum_c \sum_d \frac{L(c,d)}{N} \qquad (3)$$

Here L measures all grey level values from 0 to 255, and c and d represent Rows and Colum pixels.

3.3.4. Skewness

Skewness is calculated in the static procedure based on different central values (Median, Mean, and Mode). Positive and negative values have been implemented in the skewness distribution process, also called tail-to-right and tail-to-left. Skewness has shown in Equation 4.

$$\text{Skewness} = \frac{1}{\sigma_n^3} \sum_{n=0}^{L-1} (n - \bar{n})^3 L(n) \qquad (4)$$

3.3.5. Entropy

Entropy is evaluating the values of the total calculated bits by deployed image code. Entropy is described in equation 5.

$$\text{Entropy} = -\sum_{n=0}^{L-1} L(n) \log_2[L(n)] \qquad (5)$$

3.3.6. Energy

The grey level area is defined with energy, shown in equation 6.

$$\text{Energy} = \sum_{n=0}^{L-1} [L(n)]^2 \qquad (6)$$

3.4. Texture Feature Segmentation

Rows and columns select an object in texture processing using XY-Coordinates of image. Five statistical algorithms are used for experimental processes such as inverse difference, energy, inertia, correlation, and entropy.

3.4.1. Inverse Difference (I.D) Texture

I.D calculates the image object area; it is also called homogeneity, shown in equation 7.

$$\text{InverseDifference} = \sum_c \sum_d \frac{M_{cd}}{|c - d|} \qquad (7)$$

3.4.2. Energy

The identification of homogeneity or smoothness between gray image levels is defined in equation 8.

$$\text{Energy} = \sum_c \sum_d (M_{cd})^2 \qquad (8)$$

Here M_cd are evaluating the distribution data values of pixels in matrix form.

3.4.3. Inertia

The image object contrast is measured by inertia, defined in equation 9.

$$\text{Inertia} = \sum_{c}\sum_{d}(c-d)^2 M_{cd} \qquad (9)$$

3.4.4. Correlation

This method calculates the pixel value of object from pixels distance, which is defined in equation 10.

$$\text{Correlation} = \frac{1}{\sigma_p \sigma_q}\sum_{m}\sum_{n}(m-\mu_p)(n-\mu_q)L_{mn} \qquad (10)$$

Here µ_P and µ_q are definedas the mean value from c and d, respectively.

$$\mu_f = \Sigma_p\, p\, \Sigma_n L_{np} \qquad (10.1)$$

$$\mu_e = \Sigma_n\, n\, \Sigma_p L_{np} \qquad (10.2)$$

$$\sigma_f^2 = \sum_{P}(p-\mu_f)^2 \sum_{n} L_{np} \qquad (10.3)$$

$$\sigma_e^2 = \sum_{n}(n-\mu_e)^2 \sum_{p} L_{np} \qquad (10.4)$$

The Second-order statically histogram technique is described for probability measurement based on the Gray-Level-Co-occurrence-Matrix (GLCM)[33].

3.4.5. Entropy

Entropy evaluates the content values ofthe object of the image. Entropy has shown in equation 11.

$$\text{Entropy} = -\sum_{m}\sum_{n} L_{mn}\log_2 L_{mn} \qquad (11)$$

According to the following discussion, the 43 features (B, H, and T) have been evaluated on every ROI's and the total calculated are 103200 (43 X 2400) features on image datasets.

4. RESULT CLASSIFICATION AND DISCUSSION

The best first search (BFS) algorithm was employed for feature optimization in WEKA, and the following features were extracted for better result accuracy name: Binary features (10), Histogram features (31), and Texture features (58). Machine learning (ML) classifiers are employed for experimental processes on rice digital image datasets such as P1 to P4 shown in Table 1.

Table 1: Field Image Dataset of Rice

Rice Categories	Classes	Images Data
Kaynat_Kauchei,	P1	100
Tootaa_Kauchei,	P2	100
Pakei_Kaynat,	P3	100
Kauchei_Super_ Banaspati	P4	100

The different feature classifications for rice varieties have been employing variant ML techniques.

4.1. Tree Classifiers

Tree classifiers have been used for this practical study, namely Tree J48 and Random Tree. The overall accuracy of Tree J48 evaluates a better accuracy result of 97.2038% compared to Random Tree 95.875%, shown in Table 2.

Table 2: Tree Based Classification Output Datasets

Tree Classify	Kappa-Statistic	MAE	T_P_ Rate	RMSE	ROC	F_P_ Rate	T_N_I	Time in Second	Output
J48	0.9628	0.0172	0.972	0.1167	0.983	0.009	2400	0.14	97.2083%
Random Tree	0.945	0.0206	0.959	0.1436	0.973	0.014	2400	0.03	95.875%

Confusion Matrix Table

Tree J48 describes the confusion matrix's highest output values diagonally in Table 3.

Table 3: Confusion Matrix Table for Tree J48

Classes	P1	P2	P3	P4
P1	581	6	5	8
P2	6	593	1	0
P3	11	3	574	12
P4	6	0	9	585

4.2. Meta Classifiers

Meta ML classifiers have been implemented for more accuracy of results. The Meta classification via Regression has been display better accuracy of result is 98.5833% as compared to Meta Bagging 97.375%, which result shown in Table 4. It is also examined that the Meta classifier has shown better results and accuracy than tree-based classifiers.

Table 4: Output of Meta Classifier Dataset

Meta Classify	Kappa-Statistic	MAE	T_P_ Rate	RMSE	ROC	F_P_ Rate	T_N_I	Time in Second	Output
Classification Via Regression	0.9811	0.0339	0.986	0.0971	0.999	0.005	2400	0.52	98.5833%
Bagging	0.965	0.0278	0.974	0.0991	0.998	0.009	2400	0.47	97.375%

Confusion Matrix Table

The confusion matrix of the Meta classification via Regression classifier has described the highest values, shown in Table 5 diagonally.

Table 5: Confusion Matrix Table for Meta classification via Regression Classification

Classes	P1	P2	P3	P4
P1	588	3	5	4
P2	7	590	3	0
P3	3	1	593	3
P4	4	0	1	595

4.3. Function Classifier

All the above classifiers Tree and Meta, do not display satisfactory accuracy in the available results. That is why; Function classifiers have been deployed for an experimental study, namely Multi-Layer-Perception and SMO. So, Multi-Layer-Perception gives better accuracy is 99.8333% as compared to SMO is 96.8333% and as compared to all the above classifiers shown in Table 6.

Table 6:Function Based Classification Output Dataset

Function Classify	Kappa-Statistic	MAE	T_P_ Rate	RMSE	ROC	F_P_ Rate	T_N_I	Time in Second	Output
Multi Layer Perception	0.9978	0.0029	0.998	0.0289	1.000	0.001	2400	29.11	99.8333%
SMO	0.9578	0.2526	0.968	0.3155	0.989	0.011	2400	0.39	96.8333%

Confusion Matrix Table

Table 7 represents the confusion matrix of the Multi-Layer-Perception classifier, which showed the highest output values in a diagonal arrangement.

Table 7: Confusion Matrix Table for Multi-Layer-Perception

Classes	P1	P2	P3	P4
P1	598	2	0	0
P2	0	600	0	0
P3	0	0	600	0
P4	0	0	2	598

4.4. Comparison Graph of all Machine Learning Classifiers

As per the above information, the overall accuracy result of different Machine Learning (ML) classifiers sequences is available: Function Multi-Layer-Perception, SMO, Random Tree, J48 Tree, and Meta Classifier via Regression and Meta Bagging.Multi-Layer Perception achieved better accuracy results, 99.8333%, compared to all other classifiers shown in Figure 4 from maximum to minimum accuracy result arrangement.

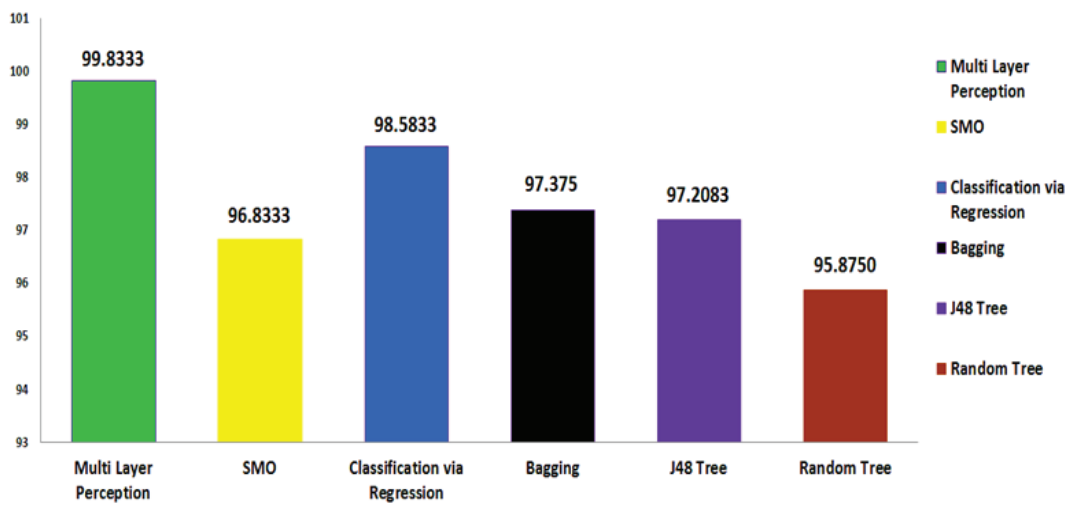

Figure 4: Comparison Graph of all ML Classifiers OA Result

5. CONCLUSION

This study and the experimental process have been identifying the rice varieties based on four varieties named P1, P2, P3 and P4. Different challenges are faced during rice production and specification in the agricultural field and economic sectors. The Rice quality assessment technique offers the facility to increase the purity of rice grains used for practical study or experimental processes. After adopting the image preprocessing technique, evaluate three different features: Binary, Histogram, and Texture. ML classifiers have been implemented on available features optimized datasets such as Function Multi-Layer-Perception, Function SMO, Random Tree, J48 Tree, Meta Classifier via Regression and Meta Bagging The comparison of overall accuracy results between 6 different ML classifiers. Finally, Multi-Layer-Perception ML classifiers give better OA results is 99.8333%.

5.1. Author Contributions

Dr Salman Qadri and Tanveer Aslam (Department of Computer Science; MNS University of Agriculture Multan, Pakistan), Hafiz Muhammad Ijaz (Department of Computer Science; ISP-Multan, Pakistan) supervised all the fieldwork of data collection, wrote the manuscript, and description of the available dataset.

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5.3. ConflictsofInterest

Theauthorsdeclarenoconflictofinterest.

5.4. Funding

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