iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** II **Month of publication:** February 2023

DOI: https://doi.org/10.22214/ijraset.2023.49023

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

Literature Survey on Grain Type Prediction Using Machine Learning

Tanuja Reddy[1], Arihant Gupta[2], Shubham Raj[3], Anirvesh R[4], Mrs Shahedhadeennisa Shaik[5]
[1, 2, 3, 4]Computer Science Department, Dayananda Sagar College of Engineering, Bangalore, India
[5]Assistant Professor, Dept. of Computer Science, Dayananda Sagar College of Engineering Bangalore, India

***Abstract:** Classification of grains according to their type becomes very much necessary because there are multiple grains available in the market today. Classification of Grains according their types manually is not efficient. Classification becomes a really wearisome task when it comes to doing it hand-operated instead of automating the process. Manually classifying would be a grueling task.*

There is a need for mentally keen and quick system which can get better of this difficulty by automating these processes. It should be able to recognize and label the every single grain according to their respective type automatically. Therefore we conducted a literature survey on how various seeds were classified and various analysis which were used to obtain the various desired result. Here we observed that various researchers used k-means, CNN and various other algorithms.

Keywords: supervised learning, CNN, K-Means, Image Processing

I. INTRODUCTION

The field of grain type prediction using machine learning is a correspondingly new field that holds a lot of progress in the recent decades. The purpose of this overview is to examine the current state of grain classification techniques and to identify any remaining challenges that need to be addressed. Through this review, we aim to provide a comprehensive understanding of the state of the art in this field.

Grain type prediction is a critical task for the agricultural industry, as it allows farmers to make informed decisions about which crops to plant and how to best manage their crops. Not long ago, There has been a significant amount of research and development in the field of grain classification. In this literature survey, we will provide a summary about the present state of the art in the field and identify the open problems that still need to be solved.

Further, As the world population continues to grow, the need for efficient food production becomes increasingly important. In a path to meet this need, it is required to optimize grain production through accurate predictions of grain type.

In this Literature Survey, we will explore the liberty of machine learning algorithms for predicting the grain type. We will first discuss the numerous machine learning algorithms along with their applications. Next, we will describe the various features that are used for grain type prediction.

Finally, we will evaluate the outcomes of different machine learning algorithms for grain type prediction along with comparing their performances.

II. LITERATURE SURVEY

The authors of [1] discussed rice grain classification as a process of automatically distinguishing different types of rice grains with the help of image processing and machine learning approaches. This becomes an important task for the rice industry, as it accounts for more accurate sorting and grading of rice grains.

In this research paper, we will investigate various different methods for rice grain classification, and evaluate their performance on a dataset of rice images.

This research paper carries out various image processing algorithms on the captured images in that some of which are LiClipse which works with eclipse, Open Source Computer Vision Library (OpenCV) and Spider in Python language. The several machine learning algorithms used in the research paper were Decision Tree Classifier, Logistic Regression, Linear Discriminant Analysis, K-Neighbours Classifier, Random Forest Classifier. Main aim of this research paper is to help in the difficulty of vendors making fraudulent transportation in account of sales.

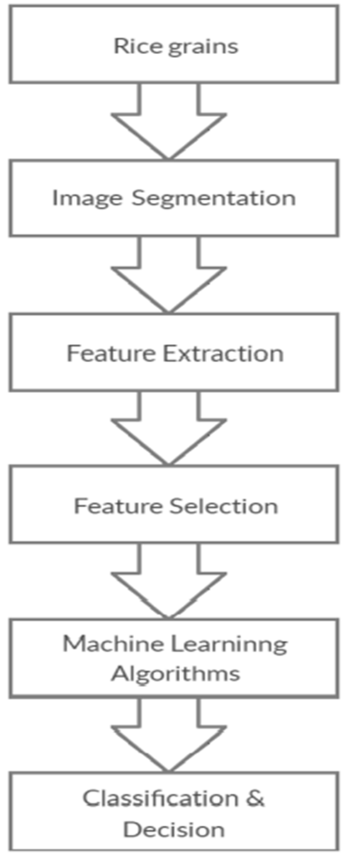


Fig 1.1 Flow chart

The authors of [2] discussed A deep learning framework approach that can detect different varieties of grain types has been developed. This approach uses a hybrid of two different deep learning models, which improves the accuracy of grain type detection. The first deep learning model is a CNN(convolutional neural network), which is used to detect the general shape of the grain. The second deep learning model is a RNN(recurrent neural network), which is used to detect specific features of the grain. The combination of these two models results in a more accurate detection of grain types. A well defined type of 13 types of grains have been classified in this Research paper Barley, Oats, Wheat and Rice to name a few. They put forward a framework that outperformed with classification accuracy of 96.12%. Algorithms which were used are Support Vector Machine(SVM), Random Forest(RF), K-Nearest Neighbor(KNN), Deep Learning, CNN (Convolution neural network) .

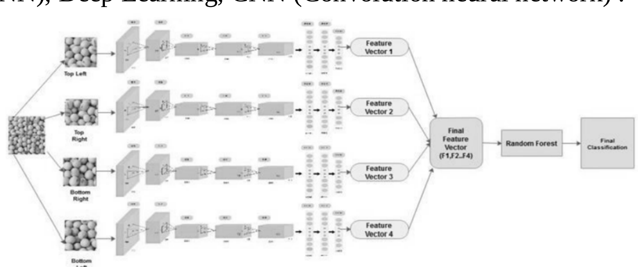


Fig 2.1 Proposed Architecture

The authors of [3] discussed, At the forefront of analysis of rice grain along with classification and quality grading is a new technology which can determine the quality of a grain of rice. This technology can help to ensure that only the best rice is exported to other countries. By using this technology, rice grain quality can be graded and sorted, which will help to improve the overall quality of rice.using SVM algorithm with a training data of around 350 images the accuracy was around 98.6%. Other algorithms used are fourier transform , DCNN , etc.

The authors of [4] discussed Sesame Seeds as a common ingredient in many foods. They are also a common target of pests and diseases. In this Research paper, They have used image classification to detect pests and diseases on sesame seeds. They have used a deep learning model that is Convolutional Neural Network (CNN) to classify pictures of sesame seeds. The CNN will be trained on a dataset of images that have been manually labeled with the presence or absence of pests and diseases. We will also evaluate the performance of the CNN on a dataset of images that have not been manually labeled. Here the research paper set side by side a developed CNN(Convolutional Neural Network) model along with five other ready-made models namely - VGG and Resnet variants. The dataset contained around 1,700 images of sesame leaves which were further grouped into three classes, two of which were of diseases which were currently affecting the Sesame in Sudan region, and the later was of the healthy leaves. These leaves were photographed from different fields in Gedarif State. The model which was developed achieved the finest result with a training accuracy of 90.77% and with a testing accuracy of 88.5%.

The authors of [5] discussed Grain classification with hierarchical clustering along with a self-adaptive neural network which is a process that can be used to identify different types of grains. The hierarchical clustering algorithm is used to group similar grains together, along with the help of self-adaptive neural network it is used to spot the required type of grain within each group. BPNN(Self-adaptive back propagation neural network) models which are based on hierarchical clustering were used to classify corn kernels. To come up with the sample sets, kernels were randomly selected and were distinguished into seven classes by the use of number of clusters, which consisted of three classes of flat kernels and round kernels respectively and abnormal classes. additionally, the Stepwise Discriminant Analysis which was carried out to select eleven morphological features of the kernel. Their research outcome resulted that kernels of each and every class had fair steadiness in morphology after clustering the kernels and hence the average accuracies for the whole network was over 90%.

The authors of [6] discussed The ability to automatically recognize and identify seeds based on size, form and texture features is a valuable tool for farmers. By using this technology, they can speed up the process of sorting and planting seeds, and also reduce the chances of mistakenly planting a weed seed. For their tests, four hundred samples containing each of four varieties of seed species, which were oat, corn, lentil and barley were considered. After this the images were acquired and further preprocessing was carried out, the widespread process included the usage of the features like space reduction with the help of Principal Component and clustering operation which was built on the k-means algorithm. Next, The phase of decision was based on a rule which was the nearest Euclidean distance rule connecting the feature vector of an unknown seed and the average feature vector of each cluster. The identification rate of seeds based on shape and texture were 85,75% and 78% respectively. The amalgamation of these features improved the recognition which reached 89.25% .

The authors of [7] discussed the regression coefficients and the prediction error are obtained by minimizing the least square error. According to the reports of China national seed cotton grade classification standard, with the usage of image processing algorithms, extraction of feature and analysis of the images of seed cotton containing impurities, yellowness, brightness and other characteristics were taken into account, this particular paper proposed a cotton seed grade classification model that was based on the least squares method and also had usage of algorithms along with support vector machines to reach autonomous classification of cotton seed grades. Vaguely the algorithms used can be summarized as least square method(LSM),support vector machine(SVM) to name a few. On the ground of least-square principle, and by using support vector machine, the all-inclusive classification accuracy was enhanced from 83% to 92%, we can conclude that this ameliorate the accuracy of classification.

The authors of [8] discussed a method for classifying different types of corn seeds using machine vision techniques. The approach makes use of both color and texture features to differentiate between different seed types. To extract the color features, the authors used a color space transformation to represent the seeds' pixel values in a three-dimensional color space. They then calculated statistical features such as mean, standard deviation, and skew for each color channel. For texture analysis, the authors applied gray-level co-occurrence matrix (GLCM) to the images of the seeds. GLCM is a method for characterizing the texture of an image by calculating the probability of different combinations of pixel intensities occurring in a given image. From the GLCM, the authors calculated features such as contrast, correlation, and homogeneity. These proposed models and systems were calculated for 10,000 sample images and more . The achieved accuracies were 95.6% for normal seed type and 80.6% for a group of defect in the seed types.

The authors of [9] discussed that Rice is a large-scale crop in the present world, and it is important to categorize the different types of rice for breeding and other purposes. In this study, we used RGB and hyperspectral images to classify the varietal types of rice.They used RGB and hyperspectral images to classify the different types of rice. Their results showed that the different types of rice can be classified accurately using these images. This information would be useful for breeding new rice varieties and for other purposes. This paper presents a new RGB and HSI SYSTEM for different varieties of classification .

The authors of [10] discussed The classification of lactuca sativa seeds into different varieties is a complex task that has been attempted in the past through the use of various image-processing techniques. In this study, we use a machine-learning algorithm to classify lactuca sativa seeds into different varieties based on their spectral features. Our approach is based on the analysis of single-Kernel RGB images, and we use a SVM to learn the discriminating spectral features.

The authors of [11] discussed Segmenting Seeds by Touching Shape. Do you know how to tell a pumpkin seed from a sunflower seed just by looking at them? It may seem tricky at first, but if you know what to look for, it's actually quite simple. All seeds have a certain shape to them, and by touching them, you can determine their type. Pumpkin seeds are generally oblong or triangular in shape, with a few sharp points on one end. Sunflower seeds, on the other hand, are typically round or oval, with several small indentations on the surface. But what if a seed has more than one concave point? How do you determine its type in that case? Well, the best way to do it is by using multiple concave point detection.

The authors of [12] discussed Rice quality is determined by many factors, including shape, size, color and texture. In this study, we used image processing techniques to analyze the grade of rice. We used image processing techniques to analyze the quality of rice. Our study found that the quality of rice is determined by many factors, including shape, size, color and texture. Here we used the following five steps for image processing , they were image preprocessing ,Shrinkage Morphological operation , Edge detection , Object measurements , and object classification .

The authors of [13] discussed Here in this research they used the SIFT algorithm to point out pot seeds species in a sample with cereal grains. The results were surprising, as we found that some weed seeds were very similar in size and shape to wheat grains. This could lead to problems with weed control, as it would be difficult to identify them without using a sophisticated identification method like SIFT. Here are some of the important stages of the first SIFT algorithm, namely scale-space extrema detection, Key point localization, Orientation assignment , Key point descriptor and matching.

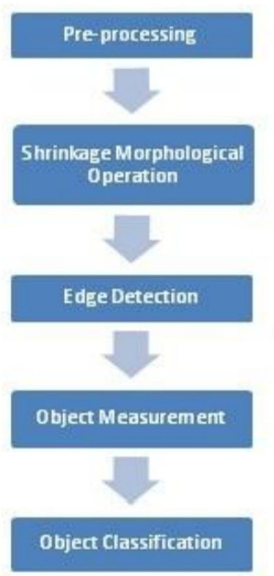


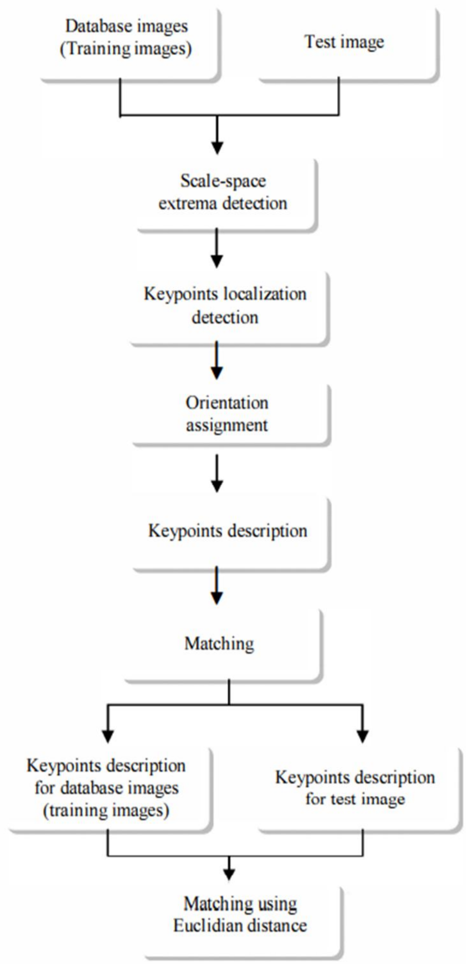
Fig.12.1 Flow Diagram for Image Processing Algorithm

The authors of [14] discussed A fuzzy k nearest neighbor algorithm is a great way to find the best in a set of data. This algorithm is used to find the k closest neighbors to a given point, and then it assigns a weight to each neighbor based on how close it is to the given point. This algorithm is perfect for finding the best match for a set of data, and it can be utilized for various purposes. The fuzzy K-NN rule is also shown to compare well against other standard more-refined pattern recognition procedures in these experiments.

The authors of [15] discussed A deep learning segmentation and identification approach of different Bangladeshi plant seeds is proposed in this paper. The proposed approach is implemented using a convolutional neural network (CNN). The performance of the proposed approach is evaluated on a plant seed dataset. The results show that the proposed approach achieves a high accuracy in segmenting and identifying different Bangladeshi plant seeds. The main purpose of this research is to pin out the method that can classify paddy seed images and extract seed features.

The authors of [16] discussed A new method of identifying paddy seed varieties has been developed by scientists at the Indian Agricultural Research Institute. The new algorithm is said to be more precise and faster than the old method. Scientists at the Indian Agricultural Research Institute have developed a new method of identifying paddy seed varieties. The proposed algorithm is said to have good accuracy and faster than the classical method. This new method is a great advancement in the field of paddy seed identification and will help to improve the accuracy of seed selection. The proposed method used image segmentation and a key point identification method that can classify paddy seed images and extract seed features.

The authors of [17] discussed Rice crop quality, production, and cost are all impacted by contaminated rice seeds. Purity testing of rice seeds is a crucial stage in the quality evaluation process. Hyperspectral imaging (HSI) has shown promising results in the classification of rice seeds. Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) must be used for dimensionality reduction and feature extraction because the comparatively high number of spectral features in HSI data continues to provide classification issues.



In order to classify rice seeds using hyperspectral imaging, this work compares LDA and PCA as dimensionality reduction algorithms. Random Forest (RF) classifier was used to classify the spectral characteristics from hyperspectral pictures that were obtained using the findings of LDA and PCA. the classification outcomes

The authors of [18] discussed The process of producing, managing, and ensuring the quality of rice crops requires the varietal classification of rice seeds. Classification is typically done manually, which produces slow and variable results. A cost-effective, automated, real-time, non-destructive answer to this issue is offered by machine vision technology. In the classification of rice seeds, techniques that combine RGB and hyperspectral imaging have shown excellent results. In this study, we highlight the value of morphological and border-related characteristics utilized in conjunction with spectral data and suggest a feature set that significantly enhances classification outcomes. The suggested method was successfully evaluated using a dataset of 8640 seed samples representing 90 different rice seed kinds that was made up of 180 hyperspectral and RGB picture pairs.

The authors of [19] discussed It is essential to assess the germination ability of the seeds before the operation because seed storage has been a global concern for their conservation. Techniques for nondestructive detection (NDD) are frequently employed while examining and testing components. The hyperspectral image technique is used in this study to discriminate between living and dead watermelon seeds. The first fifty watermelon seeds that had been gathered were kept at 45 °C for 72 hours, while the remaining fifty seeds were preserved in dry bottles at 20 °C. 100 samples' worth of hyperspectral pictures were gathered. Mean spectral values from the region of interest were derived in the 400–1000 nm range (ROI). The spectral data were then preprocessed using the Savitzky-Golay (SG) and standard normalized variable (SNV) techniques, and principal component analysis (PCA) was used to choose intervals to analyze.

The authors of [20] discussed The seed sample obtained from the seed producer after harvesting is tested in the Seed Testing Laboratory (STL) for other distinct varieties (ODV). Before marketing the product, this is done to receive the foundation/certified tag from the seed certification department. Currently, this is done manually by using a naked eye to examine the morphological traits of the seeds. The STL must spend a lot of time on this procedure, and identifying ODV is subject to human mistake. The identification of ODV in the seed testing laboratory must thus be automated using machine vision technology. In this research, various methods for sunflower seed varietal identification are investigated. Ten different types of sunflower seeds are included in the dataset used for the experiments.

The authors of [21] discussed Long-term storage is possible for plant seeds. The preservation of seeds for a long time is crucial for the continuation of life. The amount of seed maturation, initial processing, seed germination value, and moisture content all have a significant role in determining how long seeds should be stored. Environmental factors like the storage location's temperature, humidity, and light levels, as well as parasite infestations, insects, and fungi, are some other first order elements that affect how long seeds can be stored. Seeds that have germinated and are bug-infested are not fit for cultivation or human consumption. A seed image classification technique must be used to automatically differentiate between these scenarios and healthy seeds. This article outlines different image processing procedures that can be used for seeds.

The authors of [22] Due to its usage as a raw material in the food and animal feed industries, corn has a significant role to play in the growth of the agricultural sector. The demand for corn has expanded as the food processing sector has grown. One significant challenge is choosing the best corn seeds to ensure that the quality of the maize produced is maximized. One method for overcoming these challenges is machine learning. The objective is to automatically classify the corn seed quality. The convolutional neural network is one technique that can be employed since it has extremely strong classification accuracy results, but its drawback is that training takes a lot of time.

The authors of [23] discussed The identification of seed type is the first step toward seed certification, a system to guarantee excellent quality of the seed and propagation materials of highly suited crop varieties. To determine the type of seed, a plant researcher must examine the morphology and visual characteristics of the seed, a laborious process. Convolutional neural networks (CNNs), which provide categorization using images, have been developed as a result of deep learning advancements. Even though they are effective at classifying, a major bottleneck is the necessity for a large amount of labeled data to train the CNN before it can be used for classification. The work utilizes the ideas of Contrastive Learning and Domain Randomization in order to address the aforementioned issues.

The authors of [24] discussed the Trickiness engaged with the extraction of concealed vegetation-shrouded surfaces (VS) is a typical issue in metropolitan vegetation planning. Filling in as an answer for it, a clever strategy named Nonlinear Fitting-based Cultivated Locale Developing (NFSRG) is investigated. With NFSRG, a progression of ordered results is coordinated by a cultivated locale developing cycle. To adjust to the variable detachability among Versus and foundation, the development is restricted in a few weighted supports characterized by a few nonlinear fitting connections. While looking through new Versus individuals (part implies both pixel and fix) inside such a cradle, a slowly decreased weight makes the cushion width persistently restricted as the distinctness declines. To stay away from unforeseen passageways of water and smooth concealed foundation individuals, a during-developing limitation, named extension rate, is proposed. Precision evaluations uncover that beyond what 96% of VS individuals can be precisely separated by the proposed strategy.

The authors of [25] discussed that Order of paddy seed assortments is a basic errand that decides the cost and nature of rice on the lookout. Profound learning strategies that have been effectively applied in various regions are not even in picture arrangement. In this paper, we proposed a grouping of paddy seed assortments by utilizing move learning of profound learning with three pre-prepared loads: VGG16, InceptionV3, and MobileNetV2. North of 1200 pictures of paddy seed are gathered for custom datasets. The exploratory outcome shows the general precision of VGG16, InceptionV3, and MobileNetV2 are 80.00%, 83.33%, and 83.33% separately. Test Loss of each model is 52.15%, 28.41%, and 61.95% consecutively.

Consequently, InceptionV3 gives the best exactness than others as well as the least test misfortune. This proposed examination can be an extraordinary benefit for a rancher to recognize paddy assortments that are expected to lessen the corruption of paddy assortments too.

The authors of [26] discussed the usefulness of cotton and how beneficial it can be. Cotton seed is a significant and basic connection in the chain of rural exercises expanding rancher industry linkage. Cotton yield is related with top notch seed as the seed contains in itself the blueprint for the agrarian flourishing in nascent structure. Move of innovation to recognize the nature of seeds is acquiring significance. Subsequently this work utilizes AI to deal with grouping the nature of seeds in light of the different development phases of the cotton crop. AI methods - Guileless Bayes Classifier, Choice Tree Classifier and Multi-facet Perceptron were applied for preparing the model. Highlights are extricated from a bunch of 900 records of various classifications to work with preparing and execution. The exhibition of the model was assessed utilizing 10 - crease cross approval. The outcomes acquired show that Choice Tree Classifier and Multi-facet Perceptron gives a similar precision in grouping the seed cotton yield. The time taken to construct the model is higher in Multi-facet Perceptron when contrasted with the Choice Tree Classifier.

The authors of [27] discussed Plant breeding projects widely screening the advancement of seed kernels for seed affirmation, wherein lies the need to name the seed pieces by type and quality fittingly. Notwithstanding, the reproducing conditions are huge where the observing of seed parts can be trying because of the tiny size of seed kernels. The utilization of automated aeronautical vehicles helps with speed observing and marking since they can catch pictures at low elevations while having the option to get to even the remotest regions in the climate. A vital bottleneck in the naming of seeds utilizing UAV symbolism is drone elevation for example the characterization precision diminishes as the height builds because of lower picture detail. Convolutional brain networks are an incredible device for multi-class picture order when there is a preparation dataset that intently addresses the various situations that the organization could experience during assessment. In any case, with the seeds being in a raiser climate combined with the fluctuating picture goal and clearness, it is trying to create a preparation dataset that covers each assessment situation. The article tends to the test of preparing information creation utilizing Space Randomization wherein engineered picture datasets are produced from a small example of seeds caught by the base camera of an independently determined Parrot AR Robot 2.0. Moreover, the article proposes a seed grouping structure as a proof-of-idea utilizing the convolutional brain organizations of Microsoft's ResNet-lOO, Oxford's VGG-16, and VGG-19. To improve the grouping precision of the structure, a gathering model is created bringing about a general exactness of 94.6%. The errand of grouping is performed on five unique kinds of seeds, canola, harsh rice, sorghum, soy, and wheat.

The authors of [28] discussed the vivo maternal haploid strategy .It is presently generally utilized in cutting edge maize rearing projects. This method abbreviates the rearing time frame and expands the productivity of reproducing. One of the significant cycles in this rearing method is the determination of haploid seeds. The way that this determination is performed physically decreases the choice achievement and causes time and work misfortune. Hence, it is a need to foster programmed choice techniques that will save time and work and increment determination achievement. In this review, a strategy was proposed to order haploid and diploid maize seeds by utilizing picture handling procedures and backing vector machines. Every maize, right off the bat, seed is fragmented from its unique picture. Besides, five distinct elements were removed for every maize seed. At last, the highlighted vector is grouped by utilizing support vector machines. The proposed strategy execution was tried by 10-overlap cross-approval technique. Because of the test, the achievement pace of haploid maize seed characterization was determined as 94.25% and the achievement pace of diploid maize seed order was 77.91%.

The authors of [29] discussed A prevalent harvest yield is an indispensable piece of the farming business. The chief part for a decent yield is great quality seeds. By and large, seeds are planted without earlier quality checks and investigations as these cycles are dreary and work concentrated. This will in general decrease the harvest yield as well as yield quality. This paper proposes a clever technique to consequently sort seeds as fortunate or unfortunate in view of the visual qualities of the seed utilizing a Convolutional Brain Organization. The informational index used to prepare the model involved pictures of the top and base profiles of the seeds. The Convolutional Brain Organization gave a characterization exactness of 96.875%. This review utilizes an equipment arrangement which characterizes seeds utilizing the CNN model. The gadget performs essentially better as it checks the two profiles of a seed instead of one profile. An order precision of 93.00% was obtained utilizing our equipment arrangement.

The authors of [30] discussed Top notch seeds decidedly affect plant development and harvest yield. Varietal immaculateness is one of the basic quality boundaries to assess the nature of the seeds. By and by, the seeds are isolated physically by visual assessment, which is emotional and inclined to human mistakes. Besides, the seeds are squashed into powdered structure for substance investigation, showing the need to investigate non-damaging strategies. In this review, a close infrared hyperspectral imaging (NIR-HSI) framework in the spectra scope of 900-1700 nm was utilized to order the wheat seeds assortment in a non-disastrous way.

The seeds from 15 distinct Indian wheat assortments were remembered for the review. The mean reflectance range was removed from each seed and pre-treated utilizing different phantom pre-handling methods, viz. standard ordinary variate (SNV), multiplicative disperse amendment (MSC), Savitzky-Golay smoothing (SGS), Savitzky-Golay first subordinate (SG1), Savitzky-Golay second subsidiary (SG2) and detrending. Moreover, five unique classifiers, specifically fake brain organization (ANN), support vector machines (SVM), halfway least squares discriminant examination (PLS-DA), irregular woods (RF) and K-closest neighbors (KNN). The outcomes showed that the ANN model combined with the SG2 pre-handling method gave the best characterization exactness of 97.77%. The ebb and flow research work examined the NIR-HSI framework joined with an ANN model to precisely, quickly and non-horrendously characterize wheat seeds assortment.

III. CONCLUSION

The literature survey on grain type prediction using machine learning has provided a comprehensive overview of the current state of the art in this field. The various approaches that have been explored in this area and the various challenges that still need to be addressed were discussed in detail. The potential of machine learning for grain type prediction was also highlighted and the future research directions in this area were proposed.we would like to conclude by saying we might conduct a deep data analysis on the data set and would make it easier for the scientists to understand the data set with the help of physical component analysis, we can further simplify the data by performing K-Means clustering and finally we can obtained the accuracy, precision, F1-Score with respect to the dataset

REFERENCES

[1] B. Arora, N. Bhagat, L. R. Saritha and S. Arcot, "Rice Grain Classification using Image Processing & Machine Learning Techniques," 2020 International Conference on Inventive Computation Technologies (ICICT), 2020, pp. 205-208, doi: 10.1109/ICICT48043.2020.9112418.

[2] R. Nijhawan, M. Ashish, A. Ahuja and N. Yadav, "A Hybrid Deep Learning Framework Approach for the Detection of Different Varieties of Grain Types," 2021 10th International Conference on System Modeling & Advancement in Research Trends (SMART), 2021, pp. 307-311, doi: 10.1109/SMART52563.2021.9676325.

[3] S. B. Ahmed, S. F. Ali and A. Z. Khan, "On the Frontiers of Rice Grain Analysis, Classification and Quality Grading: A Review," in IEEE Access, vol. 9, pp. 160779-160796, 2021, doi: 10.1109/ACCESS.2021.3130472.

[4] I.H. Bashier, M. Mosa and S. F. Babikir, "Sesame Seed Disease Detection Using Image Classification," 2020 International Conference on Computer, Control, Electrical, and Electronics Engineering (ICC EEE), 2021, pp. 1-5, doi: 10.1109/ICCCEEE49695.2021.9429640.

[5] Chen Xiao, Chen Tao, Xun Yi, W. Li and Tan Yuzhi, "Grain classification using hierarchical clustering and self-adaptive neural network," 2008 7th World Congress on Intelligent Control and Automation, 2008, pp. 4415-4418, doi: 10.1109/WCICA.2008.4593633.

[6] O. Adjemout, K. Hammouche and M. Diaf, "Automatic seeds recognition by size, form and texture features," 2007 9th International Symposium on Signal Processing and Its Applications, 2007, pp. 1-4, doi: 10.1109/ISSPA.2007.4555428.

[7] Si Chen, Ling Li-na, Yuan Rong-chang and Sun Long-qing, "Classification model of seed cotton grade based on least square support vector machine regression method," 2012 IEEE 6th International Conference on Information and Automation for Sustainability, 2012, pp. 198-202, doi: 10.1109/ICIAFS.2012.6419904.

[8] K. Kiratiratanapruk and W. Sinthupinyo, "Color and texture for corn seed classification by machine vision," 2011 International Symposium on Intelligent Signal Processing and Communications Systems (ISPACS), 2011, pp. 1-5, doi: 10.1109/ISPACS.2011.6146100.

[9] S. D. Fabiyi et al., "Varietal Classification of Rice Seeds Using RGB and Hyperspectral Images," in IEEE Access, vol. 8, pp. 22493-22505, 2020, doi: 10.1109/ACCESS.2020.2969847.

[10] R. Concepcion II, S. Lauguico, KHamphengphet, J. Alejandrino, E. Dadios and A. Bandala, "Variety Classification of Lactuca Sativa Seeds Using Single-Kernel RGB Images and Spectro-Textural-Morphological Feature-Based Machine Learning," 2020 IEEE 12th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM), 2020, pp. 1-6, doi: 10.1109/HNICEM51456.2020.9400015.

[11] L. Gao, C. Zhao and M. Liu, "Segmentation of touching seeds based on shape feature and multiple concave point detection," 2017 IEEE International Conference on Imaging Systems and Techniques (IST), 2017, pp. 1-5, doi: 10.1109/IST.2017.8261448.

[12] B. Mahale and S. Korde, "Rice quality analysis using image processing techniques," International Conference for Convergence for Technology-2014, 2014, pp. 1-5, doi: 10.1109/I2CT.2014.7092300.

[13] M. Wafy, H. Ibrahim and E. Kamel, "Identification of weed seeds species in mixed sample with wheat grains using SIFT algorithm," 2013 9th International Computer Engineering Conference (ICENCO), 2013, pp. 11-14, doi: 10.1109/ICENCO.2013.6736468.

[14] J. M. Keller, M. R. Gray and J. A. Givens, "A fuzzy K-nearest neighbor algorithm," in IEEE Transactions on Systems, Man, and Cybernetics, vol. SMC-15, no. 4, pp. 580-585, July-Aug. 1985, doi: 10.1109/TSMC.1985.6313426.

[15] M. Keya, B. Majumdar and M. S. Islam, "A Robust Deep Learning Segmentation and Identification Approach of Different Bangladeshi Plant Seeds Using CNN," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), 2020, pp. 1-6, doi: 10.1109/ICCCNT49239.2020.9225677.

[16] Huang KY, Chien MC. A Novel Method of Identifying Paddy Seed Varieties. Sensors (Basel). 2017 Apr 9;17(4):809. doi: 10.3390/s17040809. PMID: 28397773; PMCID: PMC5422170

[17] S. D. Fabiyi et al., "Comparative Study of PCA and LDA for Rice Seeds Quality Inspection," 2019 IEEE AFRICON, 2019, pp. 1-4, doi: 10.1109/AFRICON46755.2019.9134059.

[18] V. Filipović, M. Panić, S. Brdar and B. Brkljač, "Significance of Morphological Features in Rice Variety Classification Using Hyperspectral Imaging," 2021 12th International Symposium on Image and Signal Processing and Analysis (ISPA), 2021, pp. 171-176, doi: 10.1109/ISPA52656.2021.9552086.

[19] A. Nirere, J. Sun, X. Zhou, K. Yao, N. Tang and A. Hussain, "Identification of living and non-living watermelon seeds based on Hyperspectral Imaging Technology," 2021 33rd Chinese Control and Decision Conference (CCDC), 2021, pp. 5948-5953, doi: 10.1109/CCDC52312.2021.9602433.

[20] G. JayaBrindha and E. S. G. Subbu, "Ant Colony Technique for Optimizing the Order of Cascaded SVM Classifier for Sunflower Seed Classification," in IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 2, no. 1, pp. 78-88, Feb. 2018, doi: 10.1109/TETCI.2017.2772918.

[21] S. Aygün and E. O. Güneş, "Computer vision techniques for automatic determination of yield effective bad condition storage effects on various agricultural seed types," 2016 Fifth International Conference on Agro-Geoinformatics (Agro-Geoinformatics), 2016, pp. 1-6, doi: 10.1109/Agro-Geoinformatics.2016.7577707.

[22] B. D. Satoto and R. T. Wahyuningrum, "Corn Seed Classification Using Deep Learning as an Effort to Increase Corn Productivity," 2021 5th International Conference on Informatics and Computational Sciences (ICICoS), 2021, pp. 249-254, doi: 10.1109/ICICoS53627.2021.9651846.

[23] V. Margapuri and M. Neilsen, "Classification of Seeds using Domain Randomization on Self-Supervised Learning Frameworks," 2021 IEEE Symposium Series on Computational Intelligence (SSCI), 2021, pp. 01-08, doi: 10.1109/SSCI50451.2021.9659998.

[24] J. Zhou, Y. Huang and B. Yu, "Mapping Vegetation-Covered Urban Surfaces Using Seeded Region Growing in Visible-NIR Air Photos," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 8, no. 5, pp. 2212-2221, May 2015, doi: 10.1109/JSTARS.2014.2362308.

[25] D. Jaithavil, S. Triamlumlerd and M. Pracha, "Paddy seed variety classification using transfer learning based on deep learning," 2022 International Electrical Engineering Congress (iEECON), 2022, pp. 1-4, doi: 10.1109/iEECON53204.2022.9741677.

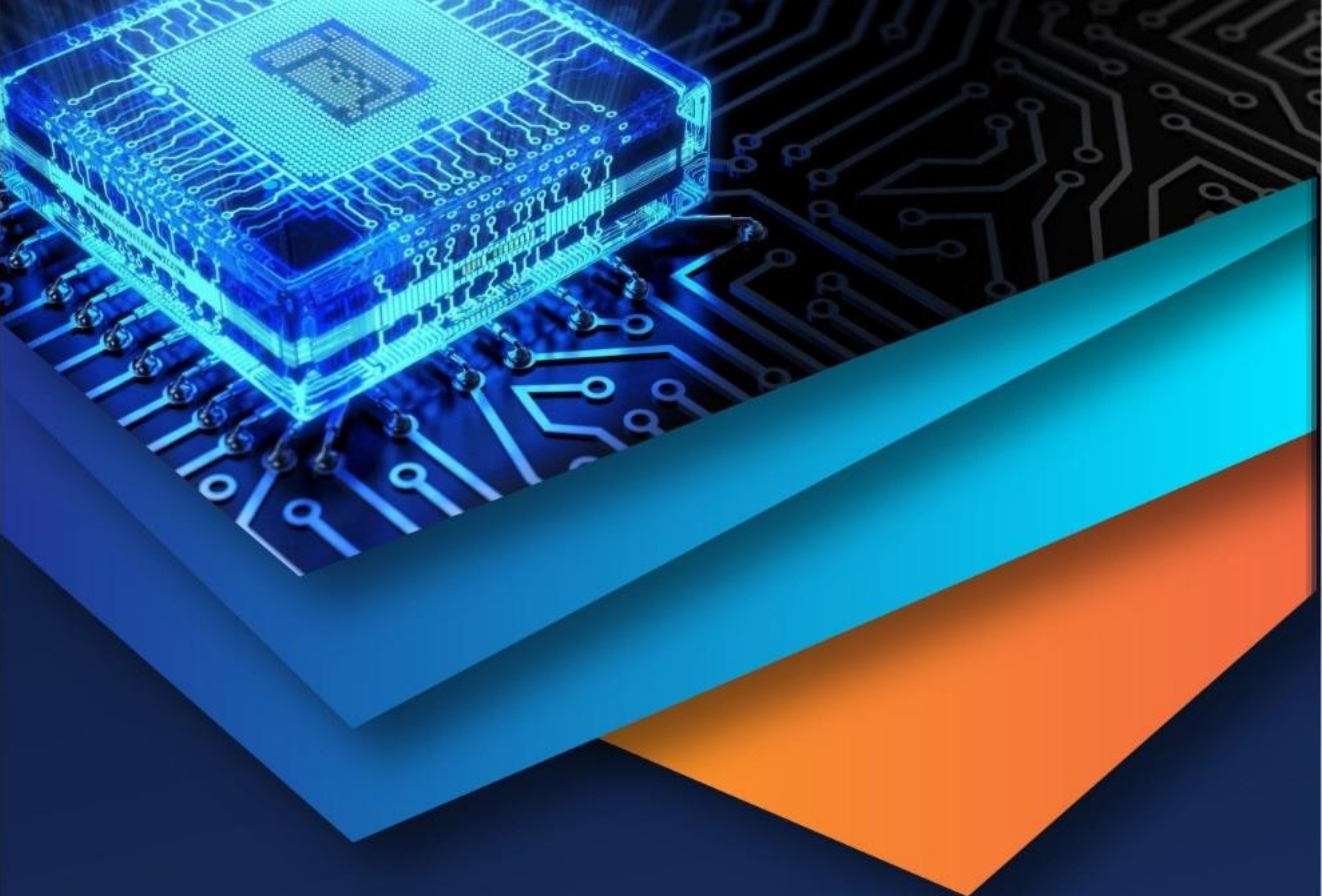
[26] K. S. Jamuna, S. Karpagavalli, M. S. Vijaya, P. Revathi, S. Gokilavani and E. Madhiya, "Classification of Seed Cotton Yield Based on the Growth Stages of Cotton Crop Using Machine Learning Techniques," 2010 International Conference on Advances in Computer Engineering, 2010, pp. 312-315, doi: 10.1109/ACE.2010.71.

[27] V. Margapuri, N. Penumajji and M. Neilsen, "Seed Classification using Synthetic Image Datasets Generated from Low-Altitude UAV Imagery," 2021 20th IEEE International Conference on Machine Learning and Applications (ICMLA), 2021, pp. 116-121, doi: 10.1109/ICMLA52953.2021.00026.

[28] Y. Altuntaş, A. F. Kocamaz, R. Cengiz and M. Esmeray, "Classification of haploid and diploid maize seeds by using image processing techniques and support vector machines," 2018 26th Signal Processing and Communications Applications Conference (SIU), 2018, pp. 1-4, doi: 10.1109/SIU.2018.8404800.

[29] S. K. Hiremath, S. Suresh, S. Kale, R. Ranjana, K. V. Suma and N. Nethra, "Seed Segregation using Deep Learning," 2019 Grace Hopper Celebration India (GHCI), 2019, pp. 1-4, doi: 10.1109/GHCI47972.2019.9071810.

[30] A. Sharma, T. Singh and N. Garg, "Combining near-infrared hyperspectral imaging and ANN for varietal classification of wheat seeds," 2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT), 2022, pp. 1103-1108, doi: 10.1109/ICICICT54557.2022.9917725.



10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)