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IMPLEMENTATION OF DIFFERENT APPROACHES USING ENHANCED ALGORITHMS FOR FRUIT DISEASE IDENTIFICATION

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ABSTRACT-The utilization of computers to investigate images has numerous possible applications for mechanized agricultural tasks. However, the fluctuation of the agricultural objects makes it hard to adjust the current industrial algorithms to the agricultural space.Data Mining procedures in horticulture field diverse data mining procedures are in use, for example, K-Means, K-Nearest Neighbor (KNN), Artificial Neural Networks (ANN) and Support Vector Machines (SVM). In our examination and framework usage this research will utilize new systems to foresee conceivable disease on the fruit plant.Disease identification is a challenging task in existing feature extraction models.QOS Metrics for Single layered prediction is low , but during multi layer the risks involves in diagnosing the hidden layered data. This research overcomes that issues and provides a gradual improvement.

Keywords:- [Algorithms for fruit disease, fruit disease data mining, Feature extraction]

1. INTRODUCTION

In India, fruit plants involve a zone of around 23 million hectares. Boss among them is mango, covering almost 1.3 million hectares, trailed by banana (0.42 million hectors) and citrus (about 0.42 million hectors). Customarily, in the participation with horticultural specialists, in light of involvement and information, ranchers are settling on choice about a reasonable time for the assurance of fruit from explicit microbes or pests.Data mining is generally valuable in an exploratory examination situation in which there are no foreordained ideas about what will establish an "intriguing" result. It is an agreeable exertion of people and PCs. Data mining comprise of two essential objectives, expectation and depiction. Here this research is interest for expectation. Forecast includes utilizing factors or fields in the data set to anticipate unknown or future estimations of different factors of interest. Nowadays, fruit diseases and land degradation are the most significant issues in agriculture. In this way, the improvement of agricultural is monitored by data mining techniques achieved through improved information and communication processes. In this field, numerous strategies have been discovered to help farmers in recognizing diseased fruit.

2. LITERATURE SURVEY

1. Milos Ilic, PetarSpalevic, MladenVeinovic, Abdolkarim Abdala M.

Ennaas (2015), et.al proposed Data mining model for early fruit diseases Detection. Programmed techniques for an early detection of plant diseases could be crucial for exact fruit protection. Generally, the farming master's information is elucidating and explore based, along these lines it is hard to portray it numerically and hence construct choice system which can supplant it. Key boundaries of choice-based fruit protection system could contrast for classes of plants and diseases. In any case, such systems are exceptionally uncommon and complex, and much of the time planned only for one plant class. For viable diseases protection of fruit, meteorological data and data about the illness appearance are the most significant. In this paper creators propose one thought for data mining-based system for detection of conceivable fruit disease. For this reason, various sorts of data mining techniques were assessed on extraordinary data sets.

2. Shiv Ram Dubey, Anand Singh Jalal (2014), et.al proposed Data mining model for early fruit diseases Detection. Programmed strategies for an early detection of plant diseases could be essential for exact fruit protection. Customarily the horticulture master's information is expressive and explore based, along these lines it is hard to portray it numerically and accordingly assemble choice system which can supplant it. Key boundaries of choice-based fruit protection system could vary for classes of plants and diseases. Notwithstanding, such systems are uncommon and exceptionally unpredictable, and much of the time planned only for one plant class. For compelling diseases protection of fruit, meteorological data and data about the infection appearance are the most significant. In this paper creators propose one thought for data mining-based system for detection of conceivable fruit contamination. For this reason, various sorts of data mining techniques were assessed on novel data sets.

3. Hardik Modi, Meet Patel, Meshwa Patel, Himanshu Patel (2019), et.al proposed the Implementation of Algorithm to Detect the Diseases in Fruit Using Image Processing Technique. The point of this article is to detect and distinguish the disease precisely from the image. The things need in the process is image division, pre-processing, include extraction and distinguishing proof. The infection considered is viral contagious, bacterial or disease by creepy crawlies and by environment. Here authors will detect the disease on the fruits. For ID of specific disease authors will utilize highlights of fruit, for example, their axis including major axis, minor axis etcetera is removed from fruit image and by grouping techniques authors can recognize the infection.

4. Umair Ayub, Syed Atif Moqurrab (2018), et.al proposed Predicting Crop Diseases Using Data Mining Approaches: Classification. This paper centers around forecast of misfortune because of grass grub creepy crawly. Authors break down the harms by utilizing notable classifiers, for example, Decision Tree, Random Forest, Neural Networks, Naïve Bayes, Support Vector Machines and K-Nearest Neighbor and plan Ensemble Models of previously mentioned classifiers which gave better outcomes when contrasted with classifiers. Neural Networks and Random Forest delivered somewhat preferable outcomes over different classifiers. Outfit model improve the aftereffects of feeble classifiers and demonstrated as fruitful technique for our farming related issue. To improve the outcomes further, half breed of transformative algorithms and data mining techniques will be utilized which is our future examination bearing.

5. Sulakshana A. Gaikwad, Kalyani S.Deore, Monali K. Waykar, Priyanka R.Dudhane, Geeta Sorate (2017), et.al proposed Fruit Disease Detection and Classification. In this paper, an answer for the detection and classification of fruit diseases is proposed and tentatively approved. The image handling based proposed approach is made out of the accompanying strides; in the initial step K-Means bunching strategy is utilized for the image segmentation, in the subsequent advance a few highlights are separated from the sectioned image, lastly images are characterized into one of the classes by utilizing a Support Vector Machine. Our trial results express that the proposed arrangement can essentially support precise detection and programmed classification of fruit diseases.

6. B. Doh, D. Zhang, Y. Shen, F. Hussain, R. F. Doh and K. Ayepah(2019) et.al Proposed Automatic Citrus Fruit Disease Detection by Phenotyping Using Machine Learning. The job Agriculture plays across the world is phenomenal. Nothing in this world beats 'food'. The two people and creatures rely upon it consistently, thusly a high premium ought to be given to farming; be it the sort, type, various yields or creation of any sort of harvest produces. A significant danger and issue influencing the agribusiness area are diseases. Fruits (citrus) are indispensable fixings in farming and nearly everybody devours it consistently. Citrus fruit diseases are not kidding issues that are extraordinarily influencing the quality and amount of yields everywhere on the world. There are various types of Diseases influencing citrus fruits. A portion of these diseases are ulcer, oily spot, and dark spot. This paper recognizes, orders breaks down certain diseases that influence citrus fruits. Apparently SVM accomplishes a basic upgrade inside the characterization exactness over ANN. SVM exhibited to be an amazing asset for automatic arrangement of plant contaminations considered in the current work. There's a colossal degree for redesign inside the order precision.

7. S. K. Behera, L. Jena, A. K. Rath and P. K. Sethy(2018) et.al Proposed Disease Classification and Grading of Orange Using Machine Learning and Fuzzy Logic. INDIA is a rural country. Global examinations uncover the normal yield of orange in India is for the most part 30%-half of the most noteworthy normal yield on the planet. The indications of orange diseases infer the reality of the disease and propose picking the best way to deal with managing the disease. It is additionally needful to analyze the disease appropriately and so as to maintain a strategic distance from the extraordinary mischief of the orange the treatment of orange diseases by applying disproportionate pesticides increment the expense and ecological contamination. Thus, the utilization of pesticide should be limited. This can be realized by focusing on the diseased zone, with the fitting amount and convergence of pesticide by assessing disease seriousness. In this paper, they effectively group the distinctive kind of disease with 90% exactness and furthermore figure the disease seriousness of four sort of diseased orange effectively. This examination can be reached out to expand the exactness utilizing delicate figuring procedure and approve with a more noteworthy number of tests.

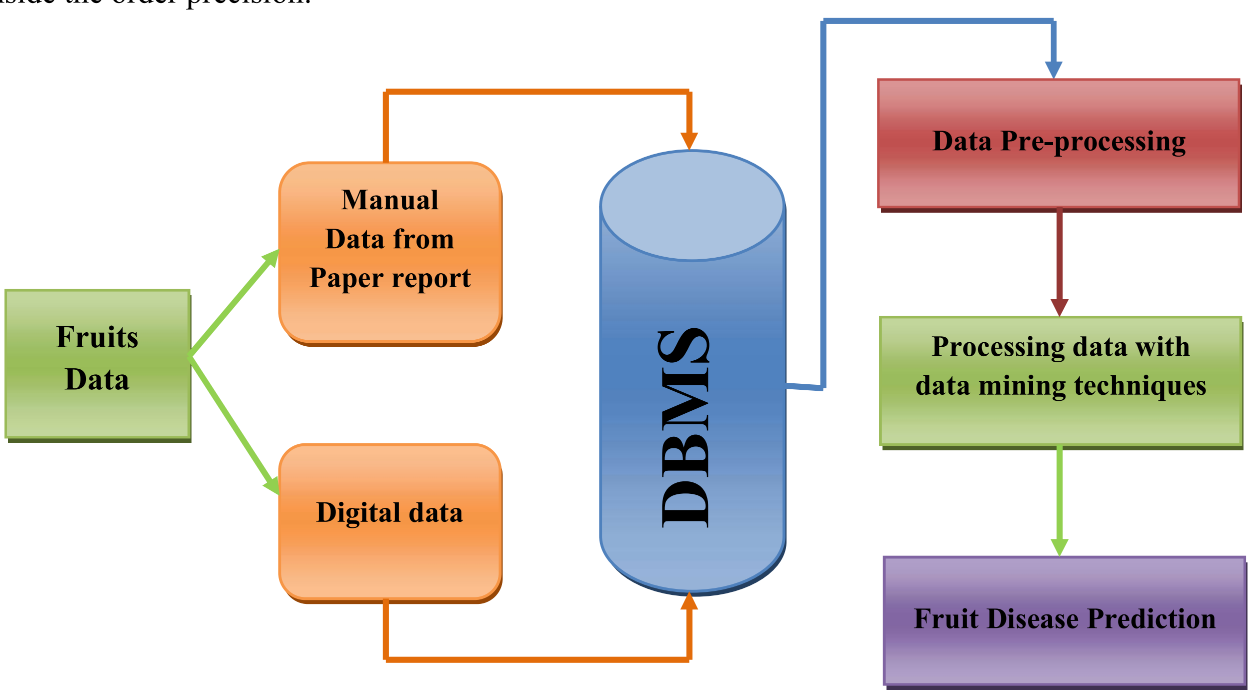

Figure 1.Block Diagram of Fruit Disease Detection using Data mining

8. Prediction and Classification of Textural properties on Fruits during ripening using Convolution Neural network

The assurance of the ripeness condition of fruits is a fundamental component in the agriculture research field. This is on the grounds that ripeness is identified with quality and it can influence the commercialization of the item. A Convolution Neural Network Algorithm is utilized for aging arrangement choice, which relies on shading and Tamura statistical texture features.

Fruit Ripening Classification using CNN

The network comprises of two convolutional layers, every one of them followed by pooling layers, and two completely associated layers appeared in figure 1. The information layer of the network contains 30,000 neurons as info data, addressing the standard RGB image of size 100×100 pixel. The originally shrouded layer is the convolutional layer 1 which has 64 channels with a kernel of size 3×3 pixels and Rectified Linear Units (ReLU) as an enactment work. The second convolutional layer is the convolutional layer 2 where 64 channels with the kernel size of 3×3 pixels and ReLU were utilized as on the first convolutional layer. The convolutional layer is utilized for the element extraction from input data. Likewise performs convolution activity to little limited zones by convolving a channel with the past layer. The kernel size decides the territory of the channels. A kernel initializer named Lecun uniform is utilized alongside each concealed layer for introducing the weights. ReLU is utilized as an actuation capacity to improve the exhibition toward the finish of all convolutional layers and completely associated layers. In pooling layers 1 and 2, where max pooling is utilized with a pool size of 2×2 alongside a step length of 2. The cushioning utilized here is a similar cushioning which implies that the yield and information highlight maps has similar spatial measurements. Pooling layers limit the spatial size of the yield and controls overfitting. The step characterizes how the convolution activity functions with a kernel when the bigger sizes of an image and complex kernels are utilized. A regularization layer dropout with a likelihood of 0.25 is utilized close to the pooling layer 2 where it arbitrarily turns off 25% of the neurons in the layer during preparing thus diminishing overfitting just as to improve the presentation of the network by making it more robust. This makes the network become able to do better generalization and less compelling to overfit the preparation data.

$$\boldsymbol{\sigma(z) = (1 + \exp(-z))\text{-}1} \quad \textbf{(4)}$$

After the dropout, a level layer is utilized which changes over the 2D channel lattice into 1D element vector prior to going into the completely associated layers. The following shrouded layer is the completely associated layer 1 comprises of 500 neurons with a dropout of 0.5 and ReLU. Again a dropout with a probability of 0.5 is utilized between the yield layer and the last concealed layer. At long last, the completely associated layer 2 or the yield layer contains 25 neurons where softmax classifier enactment is utilized to predice the yield of the model and addresses 25 unique classes of fruits.

$$\boldsymbol{\sigma(z)_j = \frac{e^{z_j}}{\sum_{k=1}^{k} e^{z_k}}} \textbf{ for j=1,….k} \qquad \textbf{(5)}$$

In deep neural network, optimizer assumes an indispensable part and assists with diminishing or increment the blunder capacity of the model. For preparing this network this research utilized Adam optimizer. Adam represents Adaptive Moment Estimation which processes versatile learning rates for hyper-parameter. The Adam advancement algorithm is direct to execute, requires little memory, fitting for issues with scanty angles and computationally compelling. Besides, it is extensively utilized in numerous deep learning applications like computer vision and characteristic language handling. For proposed CNN model, this research utilized Adam optimizer with a learning pace of 0.002, cluster size of 15 and 15 ages. For diminishing the model's preparation mistake a little learning rate is vital. For assessing the occasions, Adam conveys dramatically rotting midpoints and registered on the angle as:

$$\mathbf{n_t = \beta_{1*} n_{t-1} + (1 - \beta_1) * g_1} \quad \textbf{(6)}$$

$$\mathbf{s_1 = \beta_2 * s_{t-1} + (1 - \beta_2) * g_t^2} \quad \textbf{(7)}$$

Where n_t and s_t are the first and second moments, g_t is the gradient,β_1 and β_1 are the hyper-parameters.For performing the weight update:

$$\mathbf{w_t = w_{t-1} - \eta * \frac{n\hat{}}{\sqrt{s\hat{}+\epsilon}}} \quad \textbf{(8)}$$

To compute the model performance, error rate need to be calculated. This researchhave used categorical cross-entropy cost function as a loss function in equation (9) and cost function is defined in (10).

$$\mathbf{L_i = -\sum_j t_{i,j} \log(p_{i,j})} \quad \textbf{(9)}$$

$$\mathbf{C(w,b) = \frac{1}{2n} \sum_x [y(x) - a^2]^2} \quad \textbf{(10)}$$

Where w is the cumulation of weights in the network, b is all the inclinations, n is the all-out number of preparing inputs and an is the real output. C(w,b) is non-negative as all the terms in the whole is non-negative.

Algorithm for Textural properties on Fruits during ripening

Step 1: Input Images
Step 2: Extract fruit from Background and brown spots
Step 3: Initialize Cr, Cn, D, H, RF
Step 4: Extracting Texture Features (Coarseness (Cr), Contrast (Cn), Directivity (D), Hue color space (H).
Step 5: Fix the minimum and maximum values of the Texture Features according to the Fruit
Step 6: Calculate the fruit ripeness coefficient (RF)
Step 7: Check the Coarseness (Cr) with minimum and maximum values of the texture features
Step 8: Classify the fruit class (class 1 or class 2 or class 3 or class 3)
Step 9: Build and train the CNN
Step 10: Load the test data
Step 11: Classification of the test dataset based on the trained neural network
Step 12: Output classified Images

9. Enhanced Back Propagation Neural Network for Fruit Disease Prediction and Classification

In this phase proposed Enhanced Back Propagation Neural Network Algorithm to distinguish the sickness on the natural fruits dataset. A data mining tool named Weka 3.6.11 was used for the experiment. Additionally, multilayer perceptron neural network (MLPNN) with backpropagation (BP) was used as the training algorithm.One of the most common Neural Networks is Multiple Layer Perceptron Neural Network (MLPNN).The MLPNN consists of one input layer, one or more hidden layers and one output layer. In MLPNN, the input nodes pass values to the first hidden layer, and then nodes of first hidden layer pass values to the second and so on till producing outputs.

Algorithm MLPNN

Data: The existence of a W arrangement representing ANN.
Result: Neural network trained with the data from the training examples;
Neurons = W.size() //The size of the arrangement that represents the neural network is obtained;
for i = 0; i< neurons; i++ do
W[i] = random(−1,1) //Each neuron is covered and is started with a random number between −1 and 1;
end i< neurons; i++ do
bias = 0.5// Approximation to the obtained output;
inputs = readInputs() //Reading of the inputs used for the training;
Outputs = readOutputs() //Storing of the size of training examples;
Size = inputs.size() // storing of the size of the training examples;
for i= 0; i< size; i++ do
Sum = 0;
for j = 0; j < neurons; j++ do
Sum = Sum + W[j] * inputs[i] [j] // The ANN output is calculated for each one of the outputs;
end

output = hardlims (Sum + bias) //The output is approximated using hardlims;
if output ! = outputs[i] then
error = output[i] –output // The ANN output error is calculated with respect to the expected output, in case they are different;
for j = 0; j <neurons ; j++ do
W[j]= W[j] + inputs[i][j]*e //each neuron is corrected and its weights corrected with respect to the calculated error;
end
bias = 0.5+ error// Correction of approximation
end
end

The BP algorithm has filled in as a helpful philosophy to prepare multi-facet Perceptron for a wide scope of utilizations. The BP network computes the distinction among genuine and anticipated qualities, which is circled from yield hubs in reverse to hubs in past layer. The Back-propagation neural network can be separated into two stages, engendering and weight update.

Step 1: Initialize loads and balances

Set all loads and hub balance to little arbitrary qualities.

Step 2: Present input and desired outputs

Present a nonstop esteemed information vector $X_0, X_1, \ldots\ldots\ X_{N-1}$ and specify the desired output $d_0, d_1, \ldots.. d_{M-1}$. In the event that the net is utilized as a classifier them all ideal yields are normally set to zero except for that relating to the class the info is from. That ideal yield is 1. The information could be new on every preliminary or tests from a preparation set could be introduced consistently until balance out.

Step 3: Calculate Actual Output

Utilize the sigmoid non linearity from a higher place and equations to figure output y0, y1…..YM-1

Step 4: Adapt loads

Utilize a recursive calculation beginning at the yield hubs and working back to the primary secret **layer by W_{ij}(t+1) = W_{ij}(t) + n$\delta_j X_i$ (3)**

n this condition Wig(t) is the load from covered up hub I or from a contribution to hub j at time t, is either the yield of hub I or is an info, ℵ is an addition term, and δ_j, is a blunder term for hub j, on the off chance that hub j is a yield hub,

$$\boldsymbol{\delta_j = y_j\ (1- y_j(\ 1 - y_j)(d_j - y_j)} \qquad \textbf{(4)}$$

Where d_j is the desired output of node j and y_j is the actual output.

If node j is an internal hidden node, then

$$\boldsymbol{\delta_j = x_j\ (1 - x_j) \sum_k \delta_j^m W_{jk}} \qquad \textbf{(5)}$$

Where k is over all nodes in the layers above node j.

Inner hub edges are adjusted likewise by expecting they are association loads on joins from helper steady esteemed data sources. Union is once in a while quicker if a force term is added and weight change are smoothened by

$$\boldsymbol{w_{ij}(t+1) = w_{ij}(t) + n\ \delta_j x_i + \alpha(W_{ij}(t) - W_{ij}(t - 1)), \text{ where } 0<\alpha < 1} \qquad \textbf{(6)}$$

$$\boldsymbol{\delta_j = y_j(1 - y_j)\ (d_j - y_j)} \qquad \textbf{(7)}$$

Step 5: Repeat by going to step 2

To begin with, this learning calculation gives preparing information to the organization and thinks about the real and wanted yields. At that point, it ascertains the blunder in every neuron. In view of this, the calculation computes what yield ought to be for every neuron and how much sequential yield should be adapted to want yield lastly changes the loads. The general interaction is done to improve loads during handling.

4. EXPERIMENTAL RESULT

Prediction and Classification of Textural properties on Fruits during ripening using Convolution Neural network

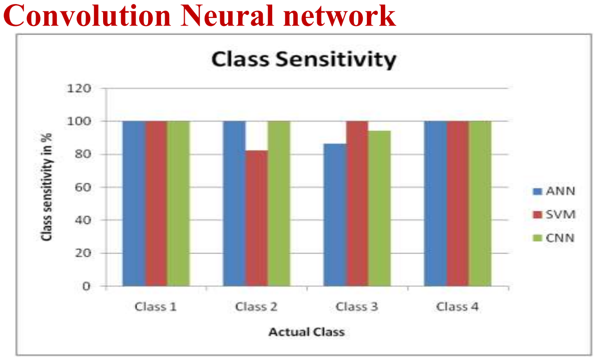

Figure 2. Comparison chartof class sensitivity of different algorithms

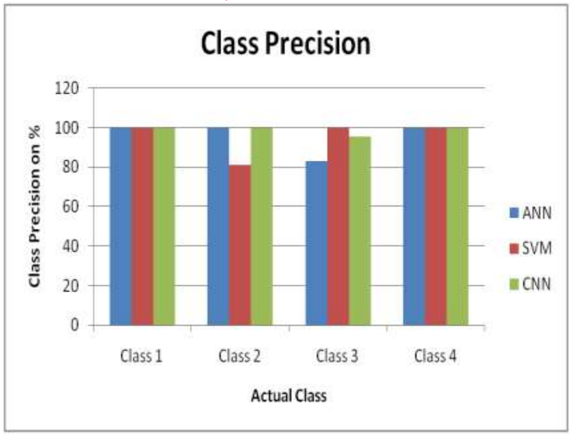

Figure 3.Comparison chart of class Precision of different algorithms

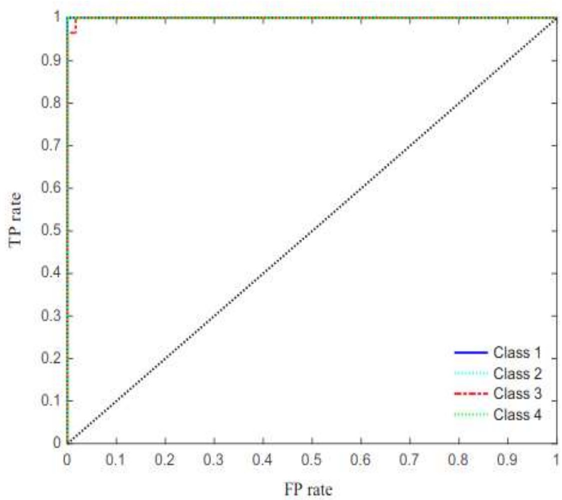

Figure4. Receiver operating characteristic (ROC) curves for proposed CNN

Figure 10 represents the class sensitivity values are compare with them. Here the proposed novel CNN is compared with existing ANN and SVM classifiers. Class 1, class 2 and class 4 sensitivity is 100% and class 3 has 94.5 Overall sensitivity values are higher than existing methods as shown in this diagram. Existing 1 is a lower than compare with existing 2 and proposed values.Figure 11 represents the runtime values are compare with them. All values are only positive. The proposed values are higher than in this diagram. Existing 1 is a lower than compare with existing 2 and proposed values.

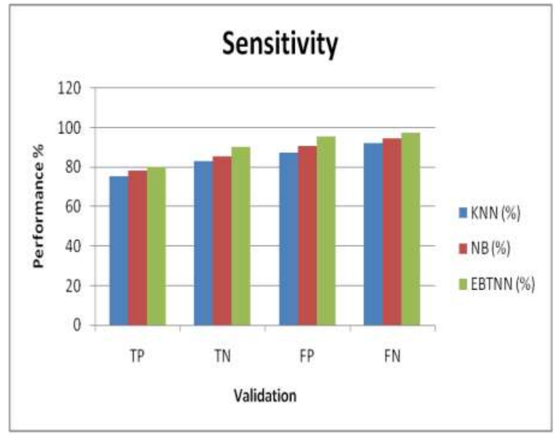

Figure 5.Comparison of Sensitivity Chart

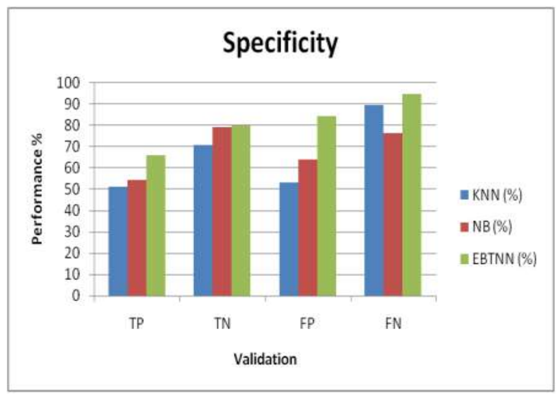

Figure 6.Comparision of Specificity chart

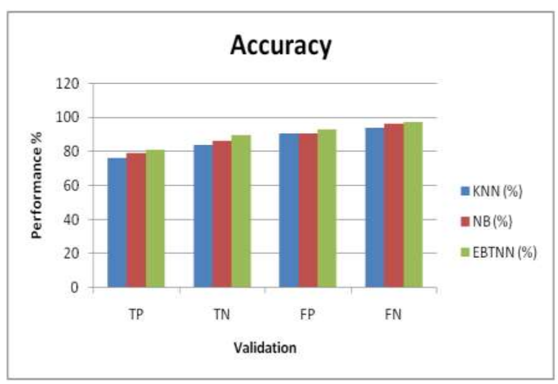

Figure 7.Comparison of Accuracy chart

The Figure 13 Shows the comparison chart of Sensitivity demonstrates the existing1, existing 2 and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values. X axis denote the Validation of the Algorithm and y axis denotes the performance values in Sensitivity. The proposedvalues are better than the existing algorithm. The existing algorithm values from 75.4 to 92.4, 78.4 to 94.5 and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values starts from 80.3 to 97.5. So the proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) provides the great results. The Figure 14 Shows the comparison chart of Specificity demonstrates the existing1, existing 2and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values. X axis denote the Validation of the Algorithm and y axis denotes the performance values in Specificity. The proposedvalues are better than the existing algorithm. The existing algorithm values from51.2 to 89.4, 54.4 to 76.5 and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values starts from 65.8 to 94.7. So the proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) provides the great results. The Figure 15 Shows the comparison chart of Accuracy demonstrates the existing1, existing 2 and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values. X axis denote the Validation of the Algorithm and y axis denotes the performance values in Accuracy. The proposedvalues are better than the existing algorithm. The existing algorithm values from 76.4 to 94.2, 79.4 to 96.4 and proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) values starts from 81.3 to 97.6. So the proposed Enhanced Back Propagation Neural Network Algorithm (EBPNN) provides the great results.

CONCLUSION

In this research first phase proposed a Novel Feature Selection based on Association Rule (NARFS) algorithm for fruit image preprocessing. The improvement of agricultural is monitored by data mining techniques achieved through improved information and communication processes. The second phase proposed K Means Clustering Algorithm for fruit image segmentation. Third phase proposed a Convolution neural network-based system for the classification of ripeness condition of fruits has been talked about. The general class acknowledgment exactness of 100% is acquired for the green and overripen classes, while it is 97.7% for the yellowish green and 97.5% for the mid-ripen classes. Last phase proposed Enhanced Back Propagation Neural Network to predict the sickness on the fruits dataset. Rather making separate models permits the model to get explicit and increment precision in one area, this will by and large permit better outcomes. Our exploratory outcomes express that the proposed arrangement can fundamentally uphold precise location and programmed distinguishing proof of natural product infections.

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