Analysis of Various Data Mining Techniques in Prediction of Various Apples Fruit Diseases

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ABSTRACT

Agriculture play a vital role in economics of India. The larger portion of fruits and vegetables exported from India, so cultivation of large amount of vegetables and fruits are necessary. But the crop percentage of fruits and vegetables affected by lot of diseases. So the prediction and analyze of disease in fruits must be in advance. This will be implemented by computer techniques. Data mining play major role in prediction of fruit disease. This paper focuses the various diseases of apple fruits. This research analysis the various data mining techniques used to predict the apple fruit disease. The following techniques are analyzed in this work such as: K-mean clustering, Multi-class SVM, Artificial Neural Network, Point cloud segmentation and nearest neighbor algorithm.

Keywords:— Multi-class SVM, Artificial Neural Network, Point cloud segmentation and nearest neighbor

I. INTRODUCTION

Food is the basic necessity for any living being to be alive in the earth. It is nourished by Agriculture tremendous food supply. But in real scenario it has to battle with lot of issues. One among them is crops affected by diseases. It effects the production in large scale. Plant diseases can cause significant reduction in crops and lead to poor quality of agricultural products. Research in agriculture is aimed towards increase of productivity and food quality at reduced expenditure and with increased profit. Although there is an industrial recognized corresponding standard to grade the fruit spot disease eye observation method is mainly adopted in the production practice. With the advent of new technologies and superior techniques, adopting these means would indeed help this sector to outperform in the coming days. Precision agriculture aims to optimize field-level management and also provides farmers with a wealth of information to build up a record of their farm; improve decision-greater traceability; enhance marketing of farm products; enhance the inherent quality of farm products. In the presence of the disease in the fruit, the quality and yield of the fruits can be degraded too much. However, infection prediction system is still challenging because of the normal contradiction in skin color of diverse categories of fruits, prominent irregularity of infection types, and amount of stem/ calyx.

Apple Fruit Diseases in Grading

Grading of the samples is a daunting task, one of the major reasons being the difference of personal knowledge and practical experience, the same samples are classified into different grades by different experts. Therefore, the result is usually subjective and it is impossible to measure the disease severity precisely as the outcomes may vary and could be misleading. The apple fruit diseases are apple scab, brown rot, core rot, apple blotch, Sooty blotch and block rot canker. The following are the few images that effects apple fruit:

Figure: 1 Three common apple fruit diseases: (a) apple scab (b) apple rot(c) apple blotch (d)normal apple

This issue has to be addressed at high rate. Nowadays, technical advancements are taking lead in fixing the problem. This paper narrow downs to reflect the diseases which affect the apple fruit plant. This study focus the different data mining techniques to predict the diseases with acquire accurate results. The data mining can be used in agricultural applications for following purposes:

1. To detect diseased leaf, stem, fruit

2. To quantify affected area by disease.

3. To find shape of affected area.

4. To determine colour of affected area

5. To determine size &shape of fruits etc.

II. LITERATURE REVIEW

Study on various Data mining techniques for apple diseases prediction:

This research focus survey from 2017 to 2012 based on data mining techniques to prediction and classification.

Chithra, P. L., & Henila, M. (2017)[1] identified the defected apple with high accuracy. The defected region of apple's images is predicted using K-means segmentation algorithm. Color images are taken for the analysis. To partition the apple's image k clusters are used. The images are preprocessed and enhanced by median filter. This study proved its accuracy with 96%.

Suraj Khade, et al.(2016)[2] presents a novel approach to predict the quality of the fruit by using k mean clustering algorithm. This method process the image, analyze the features of fruits based on color and texture of fruit, finally this system separate the normal and defected apple successfully. 90% of predication accuracy is achieved by this proposed system.

Varughese, S., Shinde, N., Yadav, S., & Sisodia, J. (2016)[3] described the following diseases of apple fruit: scab, rot infections, fungal disease. In this research k-mean segmentation is used to segement the affected area. Artificial neural network is used for learning process it gives great accuracy.

Dewliya, S., & Singh, M. P. (2015) [4] experiment the Multi-class Support Vector Machine to detect and classification for apple fruit diseases. This research applied median filter and color conversion, shape approximation technique is used for feature extraction and finally Multi class SVM is used for classification. Experimental result gained the 97%.

Cupec, R., Filko et al. (2014, September) [5] Proposed point cloud segmentation method to recognize the fruit. This approach transforms a depth image into triangular mesh and divides this into convex segments. Clustering the segments depends on their color and shape features. Segmentation reduced by color cue. The accuracy of this system is 88%.

Arlimatti, S. R. (2012)[6] introduced the new classification system by using nearest neighbor classifier. In this method image is divided into windows and statistical features of each window is extracted then classified as defected fruit and non defected fruit it also predict the apple contains stem and calyx. The accuracy of this new system is 85%

Dubey, S. R., & Jalal, A. S. (2012) [7] suggested the way to the detection and classify the three disease on apple. This research focused the following diseases: scab, blotch and rot. Kmean clustering is used to image segmentation next the features are extracted from the segmented image. Finally **Vector** Quantization Neural Network method is used for classification and it achieved more than 95% classification accuracy**.**

III. RESULT AND DISCUSSION

This research studied the various data mining method used in various research in the prediction of apple fruit diseases. The table 1 shows the accuracy of existing methods. The multi class SVM produced the highest accuracy than other methods in data mining. The next level of accuracy is achieved by K mean segmentation. The figure 1 shows the comparison chart of accuracy of data mining methods. however the existing algorithms have very low execution time and low quality of grading.
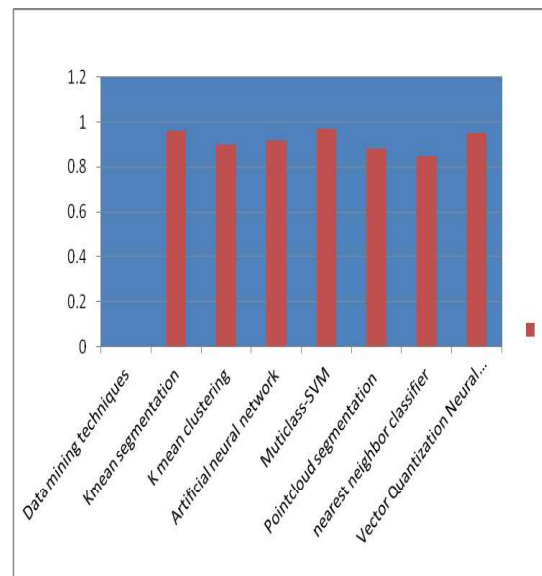

Figure 2: The Comparison Chart of Existing Algorithm

Table 1: Various Data Mining Techniques And Accuracy

Author& proposed year	Data mining techniques	accuracy
Chithra, & Henila, M. (2017)[1]	Kmean segmentation	96%
Suraj Khade, et al. (2016)[2]	K mean clustering	90%
Varughese, et al.(2016)[3]	Artificial neural network	92%
Dewliya, & Singh, (2015) [4]	Muticlass-SVM	97%
Cupec, R., Filko et.al. (2014)[5]	Pointcloud segmentation	88%
Arlimatti, S. R. (2012)[6]	nearest neighbor classifier	85%
Dubey, S. R., & Jalal, A. S. (2012) [7]	**Vector** Quantization Neural Network	95%

IV. CONCLUSION

This research paper analysis the various apple fruit diseases detection using data mining techniques. Various methodologies and accuracy of each of the research have been discussed in this paper. Each research have used different image segmentation algorithm, feature extraction method and classification techniques to predict the fruit disease. Among the various data mining techniques multiclass SVM and k -mean give higher accuracy.

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