D.Padmapriya *et al*, International Journal of Computer Science and Mobile Applications,
Vol.5 Issue. 9, September- 2017, pg. 10-14 **ISSN: 2321-8363**
Impact Factor: 4.123

A STUDY OF FEATURES AND DATAMINING TECHNIQUES USED FOR PLANT LEAF DISEASE PREDICTION IN AGRICULTURAL INFORMATICS

D.Padmapriya[1], Dr. V.Arulmozhi[2]

[1]Assistant Professor, Department of Computer Applications, Info Institute of Engineering, Kovilpalayam, Coimbatore, jeattn2000@gmail.com
[2]Associate Professor, Department of Research Head & Supervisor, Department of Research-Ph.D, Tirupur Kumarn College for Women, Tirupur, drarultkc@gmail.com

Abstract

Agricultural Productivity is mainly depends on Economy because of this reason the Leaf Disease Prediction is the one of the most significant role in agriculture, as having disease in plants are natural. If the prevention is not taken for this area means it will cause more affects in plants and due to which respective product excellent, quantity or productiveness is affected. This survey especially focuses on to examine the various data mining techniques in agriculture for monitoring plant leaf diseases by using various features. The several data mining strategies to predicting the leaf disease with the aid of the usage of the numerous features is discussed based on their advantages, disadvantage and overall performance metrics in terms of accuracy, specificity, sensitivity, and so on.

Keywords: leaf disease, features, mining, accuracy.

1. Introduction

Data mining in agriculture (Ghaiwat and Arora, 2014) applications includes the conceptualization, layout, improvement, estimation and application of contemporary approaches for utilizing the computer technology in rural domain inclusive of with the fundamental objective on agriculture productivity. Several modelling procedures and simulation strategies were applied for dynamic structures in agriculture. The foremost undertaking in agriculture is that no specific measures had been taken out with the large sets of agricultural facts. Modern research executes data mining in agriculture.

Data mining is the approach of discovering formerly unknown and doubtlessly patterns in huge datasets. The mined data is commonly represented as a model of semantic structure of database, wherein the model may be used on new statistics for prediction or class of agricultural information (Singh and Misra, 2017). Modern agriculture is attention to enhancing the production of yield with minimum resources, power, and time to achieve the boom in financial system. The most issues in agriculture and current strategies (Asha et al, 2015) are related to the overall crop manufacturing. The primary intention of this paper is to examine the data mining strategies in agriculture for monitoring plant leaf disease through the usage of various features.

In this paper, different data mining techniques to predicting the leaf disease by using the several features are discussed based on their advantages, disadvantage and performance metrics.

The rest of the paper is organized as follows: Section 2 describes the different methods, approach and data mining techniques used for detecting leaf diseases. Section 3 presents the comparison of the techniques in literature. Section 4 conclusion and future scope.

2. Literature Survey

Dutta et al (2014) presented novel approach to enhance the performance of salad leaf disease detection by using hybrid of machine learning and Hyper Spectral sensing. The classification disease affected salad leaves are performing by various classifiers such as Principle Component Analysis, Multi Statistics Feature Ranking and Linear discriminant Analysis (LDA). The absorption features such as water and plant pigments (including Chlorophyll, Zanthophyll and Carotenoids) and the minor absorption features are some of the chemical components like Cellulose, Lignin, Proteins, Starches and Sugars utilized to predicting the leaf disease. The aim of this analysis is a reveal the concept of the effectiveness of hyper spectral sensing of salad leaf physiology with rapid disease detection. The result shows that machine learning approach with high resolution hyper spectro radio meter deliver rapid detection of salad leaf disease.

Al-Hiary et al (2011) presents the software solution to reduce plant leaf disease. The proposed software solution has four phases. First predicts green color pixels and marked based on specific threshold value these are computed using Ostu's methods. Furthermore the pixel with zero red, green, blue values and pixels on the boundaries of the infected object are removed completely. In this analysis the K-means and ANN's classifier tools are utilized to texture feature set and can predicts only five leaf disease like Early scorch, Cottony mold, Ashen mold, Late scorch and tiny whiteness.

Yu et al (2013) presented to evaluation of fluorescence and reflectance indices on predicts barley disease on plant leaf when no fungicide is applied and estimating the leaf chlorophyll concentration (LCC). The Leaf fluorescence and canopy reflectance are weekly measured through portable fluorescence sensor and spectro radio meter, respectively. The partial least squares (PLS) and Support vector machine (SVM) regression models improve the fluorescence signals for estimated the LCC. Results showed that vegetation indices recorded at canopy level performed well for the early detection of Slightly-diseased plants.

Arivazhagan et al (2013) presented new software solution to identify plant leaf disease. The proposed software solution has four phases; first created the structure for color transformation of input RGB image, second masked the green pixels and eliminated by specific threshold value. Third the plant leaf texture statistics are computed for the necessary segments; fourth the features are extracted by the Support Vector Machine (SVM) classifier. This analysis evaluated with ten species of plants leaf namely banana, beans, jackfruit, lemon, mango, potato, tomato and sapota. The plant disease can be identifies at the initial stage itself and the pest control tools are used to reduce the risk. The symptoms of the plant leaf may vary at the beginning time tiny, dark brown to black spots, at the later time it has the phenomena of withered leaf, black or part leaf deletion.

Gupta et al (2017) Presented automated smart irrigation system with plant leaf disease detection using the Internet of Things technology. In the first phase the irrigation system works as the input provides by wireless temperature and moisture sensor which is tie up with the internet of things technology. In second phase, visual identification of disease in where the images are captures through camera and suggests the treatment for the identified disease in the leaf such as bacterial and fungal diseases. The results shows that the automated smart irrigation system with plant leaf disease detection is perform well than the traditional methods.

Mahlein et al (2013) presented the specific spectral disease indices (SDIs) to pick out the disease in crops. The sugar beet plant life consists of 3 leaf diseases inclusive of Cercospora leaf spot, sugar beet rust and powdery mould was indentified on this analysis. As a way to enhance the overall performance of hyper spectral indices for the detection of sugar beet disorder the best weighted combination of a single wavelength after which searched the normalized wavelength variations to all viable combos. The optimized disease indices are tested for ability to hit upon and classify the healthy and diseased sugar beet leaves with excessive accuracy.

Deshpande et al (2014) Presented to automatically detect the disease on the pomegranate plant leaves. The image processing methodology utilized to deal with main issues of plant pathology. The present's techniques were more efficient to identify the bacterial blight disease on pomegranate plant. Then the image segmentation techniques like the k means clustering algorithms were utilized to get target disease spots regions on the leaves and fruits. Also it's observed bigger bacterial blight spots and higher grade is obtained.

Prasad et al (2016) presented the mobile device based IP algorithm named Human mobile interface (HMI) for automatically identify leaf disease. The proposed HMI combined the Gabor wavelet transform (GWT) and gray level co-occurrence matrix (GLCM) to extract the texture features of matured plant leaf disease. In this proposed work the simple client server architecture is framed to serve multiple clients iteratively. This research

mainly focus the following diseases like leaf spots and disease patch caused by alternaria alternate and sclerotium rolfsii respectively.

Rumpf et al (2010) Presented identify and differentiations of sugar beet diseases by using support vector machines and spectral vegetarian indices. The goal of this research is an distinguish the disease from non diseased sugar beet leaves, Cercospora leaf spot, leaf rust and powdery mold and predicts the disease earlier than specific symptoms. The support vector machine classifier applied the radial basic function to distinguish between the foliar ailment Cercospora leaf spot, sugar beet rust, powdery mildew and healthful flowers.

Zhou et al (2014) presented orientation code matching (OCM) based novel approach to improve the observation of leaf disease in sugar beet plant. The robust template matching method of OCM utilized in this analysis to observations of disease progress. Furthermore the single feature 2- dimensional xy-color histogram proposed and the input fetch into the support vector machine (SVM) classifier for pixel wise disease classification. The proposed novel approach has two phases such as first consider the robustness of the proposed adaptive OCM algorithm for time series plant images and second examine the overall performance of proposed method on non-stop and specific disorder observations than the traditional classification.

3. Discussion

The above survey provides the detailed description of various approach, techniques and data mining methods to predict leaf disease by using various features. The following table shows the comparison of various approach, techniques and data mining methods to predict leaf disease by using several features with their merits, demerits and metrics.

Table 1 Comparison Table

Ref No.	Methods Used	Approach Used	Merits	Demerits	No of Images	Performance Metrics
[4]	Novel application of salad leaf disease detection	PCA, Multi Statistics Feature Ranking and LDA classifiers	Improving the detection Rate	Less Observation	105 Samples	Accuracy=84% Specificity=75% Sensitivity=87% F1-Score=79%
[5]	Software solution to automatic detection and classification	K-means and ANN's classifier tools	Increase Recognition Rate	Accuracy can be degrade by the presence of noisy or irrelevant features	Not Applicable	Computation time=380.64 Recognition Rate=99.66% Accuracy=94.67%
[6]	Analyse the performance of fluorescence and reflectance	PLS and SVM methods	Perform well in high dimensional feature space	Training time Expensive	Six number of leaf sample	Prediction accuracy=84%
[7]	Software solution for automatic detection and classification of plant leaf disease	SVM classifier pest control tools	Automatically detect disease from the symptoms	Learning takes long time	500 plant Leafs	Accuracy=87.66%
[8]	Automated smart irrigation system with plant leaf disease detection	Internet of Things technology	Visual identification of plant leaf disease	High computation cost	Not Applicable	Not Applicable

[9]	Enhance the specific spectral disease indices (SDIs) for the detection of disease in crops	RELIEF-F Algorithm	Improve disease detection	High sensitivity at the high cost specificity	Not Applicable	Accuracy=92%
[10]	Automatically detect the disease on the pomegranate plant leaves	K-means clustering ,Image processing methodology and Image segmentation	Improve the efficiency and productivity	Issue on convergence at local minimum	Not Applicable	Not Applicable
[11]	Multi-resolution mobile vision system for plant leaf disease diagnosis	GWT– GLCM and Human-mobile interface	High detection rate	Storage intensive	200 samples	Accuracy=93%
[12]	Early detection and differentiation of sugar beet diseases	Support Vector Machines	High performance in detecting	Used only small training samples	Not Applicable	Recall=92.35% Classification Accuracy=97%
[13]	novel approach based on orientation code matching (OCM)	Support Vector Machines	Improve the continues observation of disease	Sensitive to outliers	Not Applicable	Precision=0.94 Recall=0.87 F-Measure=0.91

4. Conclusion

In this paper, a detailed survey and further analysis on prediction of plant leaf disease by using several features. It is obvious that all researchers have tried in different methods to predict plant leaf disease by using several features. Even then, further improvement of predict plant leaf disease can make the prediction of various soil features to improve the detection. Hence, the further research focus will be based on predict plant leaf disease by using soil images and soil parameters.

References

[1] Ghaiwat, S. N., & Arora, P, 2014, Detection and classification of plant leaf diseases using image processing techniques: A review, International Journal of Recent Advances in Engineering and Technology (IJRAET), ISSN (Online), 2347-2812.
[2] Singh, V., & Misra, A. K. 2017, Detection of plant leaf diseases using image segmentation and soft computing techniques, Information Processing in Agriculture, 4(1), 41-49.
[3] Asha,M..,Korwar,C..,,Divys,T..,Virupakshappa, 2015, Techniques For Plant Leaf Disease Detection And Classification: A Survey, International Journal of Advance Foundation and Research in Computer, 2(5), 2348-4843.
[4] Dutta, R., Smith, D., Shu, Y., Liu, Q., Doust, P., & Heidrich, S, 2014, Salad leaf disease detection using machine learning based hyper spectral sensing, In SENSORS, 2014 IEEE (pp. 511-514), IEEE.
[5] Al-Hiary, H., Bani-Ahmad, S., Reyalat, M., Braik, M., & ALRahamneh, Z, 2011, Fast and accurate detection and classification of plant diseases, Machine learning, 14(5).
[6] Yu, K., Leufen, G., Hunsche, M., Noga, G., Chen, X., & Bareth, G, 2013, Investigation of leaf diseases and estimation of chlorophyll concentration in seven barley varieties using fluorescence and hyperspectral indices, Remote Sensing, 6(1), 64-86.
[7] Arivazhagan, S., Shebiah, R. N., Ananthi, S., & Varthini, S. V, 2013), Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features, Agricultural Engineering International: CIGR Journal, 15(1), 211-217.
[8] Gupta, L., Intwala, K., Khetwani, K., Hanamshet, T., & Somkunwar, R, 2017, SMART IRRIGATION SYSTEM AND PLANT DISEASE DETECTION.
[9] Mahlein, A. K., Rumpf, T., Welke, P., Dehne, H. W., Plümer, L., Steiner, U., & Oerke, E. C, 2013, Development of spectral indices for detecting and identifying plant diseases, Remote Sensing of Environment, 128, 21-30.

[10] Deshpande, T., Sengupta, S., & Raghuvanshi, K. S. 2014, Grading & identification of disease in pomegranate leaf and fruit, International Journal of Computer Science and Information Technologies, 5(3), 4638-4645.
[11] Prasad, S., Peddoju, S. K., & Ghosh, D. 2016, Multi-resolution mobile vision system for plant leaf disease diagnosis, Signal, Image and Video Processing, 10(2), 379-388.
[12] Rumpf, T., Mahlein, A. K., Steiner, U., Oerke, E. C., Dehne, H. W., & Plümer, L. 2010, Early detection and classification of plant diseases with Support Vector Machines based on hyperspectral reflectance, Computers and Electronics in Agriculture, 74(1), 91-99.
[13] Zhou, R., Kaneko, S. I., Tanaka, F., Kayamori, M., & Shimizu, M. 2014, Disease detection of Cercospora Leaf Spot in sugar beet by robust template matching, Computers and electronics in agriculture, 108, 58-70.

Authors Biography

D.Padmapriya – She received M.C.A degree from Bharathidasan University, Trichy, M.Phil degree from Bharathiar University, Coimbatore. Currently she is an Assistant Professor in the department of computer applications at Info Institute of Engineering. She has got 14 years of Teaching experience and 3 years Experience as Project co-ordinator. Her research area includes areas like Data Mining, Agricultural Informatics and Software Engineering. She has presented various papers in National and Inter National Conferences and published 7 Research papers in International and National conference. She has attended more seminars and training courses related to her research area.

Dr. V. Arulmozhi – Dr.V.Arulmozhi is presently working as a Associate professor, Research Head & Supervisor Department of Research – Ph.D Computer Science, Tiruppur Kumaran College for Women, Tiruppur. She did MCA in Indra Gandhi National Open University, New Delhi, Mphil in Bharathiar University Coimbatore, MA (Sociology) and M.Ed (Education) in Annamalai University, and Ph.D in Mother Teresa Women's University, Kodaikanal. Her research contribution focus in Chemoinformatics, Image processing, Softcomputing, evolutionary algorithms, machine learning techniques, neural networks. She has published more journal papers in reputed journals and conference proceedings and honored two best papers awards in multi-International conference and International conference. She has attended Orientation course in Bharathiar University and Refresher course in Jawaharlal Nehru Technological University, Hyderabad. She has attended more seminars and training courses related to her research area and guiding M.phil and Ph.D Research scholars.

