Identification of Tea Root Rots Disease Through Image Recognization in Conventional Neural Network

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Abstract - **This paper proposes the identification and prevention of tea root rot diseases. Root rot is the leading diseases of the tea leaves occurs during its growth period when it is planted in overwatered or poorly drained soil. This usually occurs when soil is not properly aerated and soil remained wet for a long time. A survey is conducted to identify various tea leave diseases and found that wet and non aerated soil leads to poor absorption of oxygen in the soil, as oxygen starvation takes place it allows the root to die and decay. This paper proposes that still prevention can be done to save the plants and use it commercially without much loss.**

Index Terms - **CNN, Python, Medicinal, Diseases, Deep-Study, Led-Camera.**

INTRODUCTION

Plant root rots are the crucial conditions arises in the root of the plants resulting from wet soil or poorly drained soil. This wet soil prevents oxygen absorption in the roots affecting various vital functions of plant roots such as assimilation, absorption, photosynthesis, transpiration, fertilization, pollination, germination, etc. Eventually lack of oxygen allows the roots to die or get decayed. This all process can be prevented by using proper aerated and drained soils which saves the roots from getting spoiled.

LITERATURE REVIEW

1. Gensheng Hu, Xiaowei Yang, Yan Zhang, Mingzhu Wan, "Diagnosis of Tea Leaf Disease through Advanced CNN Advanced", stated that in order to diagnose and prevent leaf diseases effective tea, accurate and early detection of tea leaf diseases are beneficial in their prevention and control. This study proposes a method based on the advanced deep convolutional neural network (CNN) for the detection of tea leaf disease. Multi-featured output module was added to CNN's advanced CIFAR10 fast model to improve the ability to automatically extract image features of various tea leaf diseases. Deep differentiated convolution is used to reduce the number of model parameters and speed up model calculation. The test results show that the median accuracy of the proposed method is 92.5%, which is higher than that of machine learning and deep learning methods. The number of parameters and the repetition times of the advanced model is much lower than that of VGG16 and Alex Net in-depth learning network models.

2. Xiao Xiao Sun, Shaomin Mu, Youngyu Xu, Zhihao Cao, Ting ting Su, "Image recognition of Tea leaf diseases based on CNN", In order to effectively diagnose and prevent tea leaf disease, the convolution neural network (CNN) was used to monitor the visual acuity of tea leaves. First, image classification and data development were used for image processing, and then these images were uploaded to the network for training. Second, in order to achieve the highest accuracy of CNN recognition, literacy rates and repetitive numbers were constantly adjusted and school dropouts were added in an equally balanced manner. Finally, test results show that CNN recognition accuracy is 93.75%, while SVM and BP neural network accuracy is 89.36% and 87.69% respectively. Therefore, a CNN-based awareness algorithm is better at differentiating and can improve the effectiveness of detection of tea leaf disease effectively.

3. Bikash Chandra Karmokar, Mohammad Samawat Ullah, Md Kibria Siddiquee, Kazi Md Rokibul Alam, "Tea leaf diseases recongnition using neural network ensemble", This paper proposes to identify tea leaf disease (TLDR),a step to recognize tea leaf diseases. At TLDR, in first the image of the tea leaf is cut off, resized converted to limit value in image processing.Then the feature detection method is used. Neural Network Ensemble (NNE) used for pattern recognition. I the extracted features are transmitted to ANN and type of disease and ANN trained. If a new image uploaded to the system the most appropriate matching is available and the disease returns. After passing the test process 91% accuracy detected. Proposed solution will support Bangladesh tea industry to grow in global market and increase its tea production by to reduce the effect of tea leaf infections.

4. Jing Chen, Qi Liu, lingwang Gao, "Visual Tea leaf disease recognition using a CNN model", The rapid, recent development of imaging technology has led to the widespread use of convolutional neural networks (CNNs) for automatic image classification and the detection of plant diseases. Objectives: The purpose of the current study was to establish comprehensive CNNs for the identification of tea plant species in leaf pictures. Materials: The CNNs model called LeafNet was developed with filters that extract different multi-dimensional features that automatically extract the characteristics of tea plant diseases in images. The DSIFT (compact dynamic scale feature) features are also extracted and used to build a virtual word bag (BOVW) model and then used to diagnose disease with vector support (SVM) and multi-layer perceptron (MLP) separators. The effectiveness of the three phases in disease detection was then evaluated individually. Results: The LeafNet algorithm identified tea leaf disease with the highest accuracy, with an intermediate phase 90.16%, while that of the SVM algorithm was 60.62% and that of the MLP algorithm was 70.77%. Conclusions: LeafNet was significantly better at detecting tea leaf infections compared to MLP and SVM algorithms. As a result, LeafNet could be used in future applications to improve the efficiency and accuracy of diagnosing diseases in tea plants.

5. Somnath Mukhopadhyay, Munti Paul, Ramen Pal, Debashis De, "Tea leaf detection using multi-objective image segmentation", Tea leaf infections caused by constant exposure to germs are leading to the loss of large yields worldwide. Early detection of tea break disease reduces the loss of tea yield. In this study, the novel's method of diagnosing tea leaf disease is introduced automatically based on imaging technology. Non-dominated Sorting Genetic Algorithm (NSGA-II) based image clustering is proposed to detect infection in tea leaves. Thereafter, PCA and multi-class SVM are used to reduce the factor and identify the disease in the tea leaves, respectively. The result shows that the proposed algorithm can detect the ongoing disease in tea leaves with an accuracy of between 83%. Five diseases of tea leaves are considered here, such as Red Rust, Red Spider, Thrips, Helopeltis, and Sunlight Scorching.

METHODOLOGY

• Black root rot disease- Black root rot is common in N.E.India particularly in the hills. It also occurs in Indonesia, Japan, South India and Central Africa. The fungus (*Rosellinia arcuata* Petch*)* forms irregular black, cob-webby adherent cords of mycelium and small isolated black dots and dashes on root surface. Mycelium is woolly, purplish grey to black in colour. Prune the severely affected sections. Improve aeration by lopping side branches. Improve drainage and thining of the dense shade. Give alkaline wash after certain measures. Actions can be taken to minimize the infestation.

• Charcoal root rot disease- It attacks all kinds of tea bushes usually above three years. It spreads through root contact with the diseased woody material

present in the soil and through wind borne spores. Removal of affected part during rejuvenation. Flat shears can be used to avoid intensive harvesting. Nitrogen & potassium fertilizers are useful for treatment but in balanced manner. Plant stress must be avoided. 5% aqueous solution of Amphineuron opulentum/ Cassia alata by spraying in approx. 15 days interval.

• Violet root rot disease- Affected roots are inky black or light violet in colour and freshly dug up ones often smell sour or vinegary.The surface of the wood is covered with thick, irregular white to orange flattened strands of mycelia that ultimately changes to purplish black. Burning & deep burying of infected plants can be done. Reducing the soil acidity by using lime amendments. To reduce the risk of severity early harvesting can be done. No chemicals are used to prevent from this disease.

• Red root rot disease- Underneath the rhizomorphs the root surface appears whitish. On washing with water, the rhizomorphs take brighter colour with the appearance of whitish patches of conidial conglomerations. When cut with a sharp knife, brownish dots appear on the wood. Spraying with strong jet of water to remove aphids from leaves. Insecticidal soaps or oils such as neem or canola oil are treatment of choice. 5% EC @ 411.2 ml in 200 – 400 I of water/acre of Phosalone is the best chemical treatment.

• Brown root rot disease- Roots of affected bushes are encrusted with soil, sand and stone particles, firmly held by a brown mycelium. The mycelium also grows upto main stem along with thin white film. Irregular rings or reticulations are formed by hard brown lines in light yellow coloured lines. Uproot the infected bushes & burnt it. Maintain proper spacing. 50% WP @ 0.24 kg in 50 I of water/acre of Copper oxy chloride is treatment of choice.

• Tarry root rot disease- It is a soil-borne fungus of the species *Phymatotrichopsis omnivora* that attacks the roots of susceptible plants. Recommended methods of decreasing soil pH are through the use of ammonium sulfate or ammonium phosphate fertilizer at around 4.5 kg per 9.3 m^2. Applications of fertilizer in this manner will cause the soil pH to decrease making to less favorable to Texas root rot which has a preference for a higher more basic soil environment.

Table

S. No	Tea Root Rot Disease	Characteristic	Management
1	Black Root Rot Disease	• Leaves of any age can be affected. • Affected parts are not useful in any manner.	• Prune the severly affected sections • Improve aeration by lopping side branches. • Improve drainage and thining of the dense shade. • Give alkaline wash after certain measures. • Actions can be taken to minimize the infestation.
2	Charcoal Root Rot Disease	• Leaves of any age can be affected. • Affected parts are not useful in any manner but it not affects the other uninfected portions.	• Removal of affected part during rejuvenation. • Flat shears can be used to avoid intensive harvesting. • Nitrogen & potassium fertilizers are useful for treatment but in balanced manner. • Plant stress must be avoided. • 5% aqueous solution of Amphineuron opulentum/ Cassia alata by spraying in approx. 15 days interval.
3	Voilet Root Rot Disease	• Affected bushes bear leathery and carry few	• Burning & deep burying of infected plants can be done.
		plucking points which gradually become unproductive and die.	• Reducing the soil acidity by using lime amendments. • To reduce the risk of severity early harvesting can be done. • No chemicals are used to prevent from this disease.
4	Red Root Rot Disease	• Algal spots are seen in the upper leaf surface. • Pathogens reproduce and survive in the leaves or stems.	• Spraying with strong jet of water to remove aphids from leaves. • Insecticidal soaps or oils such as neem or canola oil are treatment of choice. • 5% EC @ 411.2 ml in 200 – 400 I of water/acre of Phosalone is the best chemical treatment.
5	Brown Root Rot Disease	• Defoliation can be seen eventually when dried tissue falls. • This disease get aggravate by poor air circulation, high temperature and high humidity or prolonged periods of leaf wetness.	• Uproot the infected bushes & burnt it. • Maintain proper spacing. • 50% WP @ 0.24 kg in 50 I of water/acre of Copper oxy chloride is treatment of choice.
6	Tarry Root Rot Disease	• Fungus does not produce any external symptom on the affected roots. • Stem from collar upwards shows a black smooth, hard, effused and adherent encrustation.	• Recommended methods of decreasing soil pH are through the use of ammonium sulfate or ammonium phosphate fertilizer at around 4.5 kg per 9.3 m^2. • Applications of fertilizer in this manner will cause the soil pH to decrease making to less favorable to Texas root rot which has a preference for a higher more basic soil environment.

CNN- CNN is the method in which the image can recognize deeply and give the best result of defected roots. With the help of neural network, the image identifies clearly and the default(colour) of root rots can be verified easily by these the proper care will be taken for tea roots rots and then the roots give full nutrition to the leaves. By the help of these method, it find the result upto 95.5% of accuracy. From which the proper identification will be done.
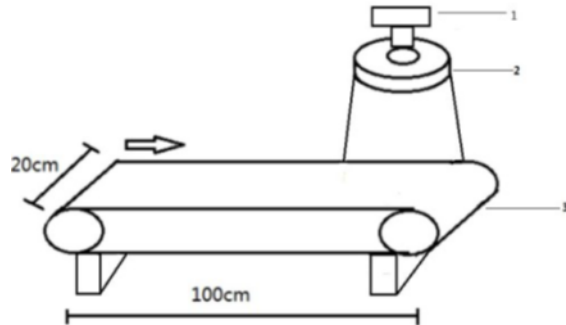

Note : 1. Digital camera , 2. LED ring light source, 3 Conveyor belt.
Fig.1 The acquisition device of experimental image

PROPOSED SYSTEM ARCHITECTURE

The architectures proposed and designed, as part of this project, have been demonstrated to deliver superior performance when compared with standard image of a Tea plant and obtain similar performance from the transform of that particular plant which convert the roots in different-different colour. The results are promising, and they open up the scope for further research on the root rots colour which occurs due to lack of aeration that show on-chip interconnects and architectures, and distributed cores and memories. The need for future research in sophisticated CNN and Machine Learning designed with architecture in mind are still required.
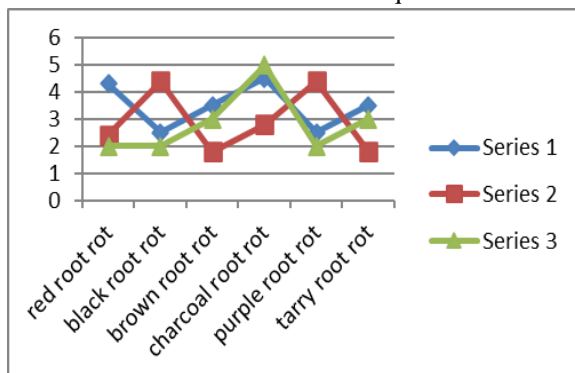
RESULT

- Result of the study shows that due to some conditions & reasons like lack of aeration, soil inefficiency, unfavorable environment, etc. root rot diseases takes place.
- Different colors of root rot shows different disease conditions which has various characteristics and consumption percentage of rotten roots.
- Some don't affect other roots or other parts of the plant but some of them are harmful for whole plant if not treated properly.
- 90% of the plants can be prevented from root rots if soil is favorable and aeration is maintained.
- Treatment helps to cure the disease up to 75% depending on the extent of rotten parts.

CONCLUSION

This study concludes that water logging and non-aerated soils are the leading causes of plant root rots. Above done survey helps to gain knowledge regarding various plant root rots and however to identify if any abnormalities or any loss occurs during growth period of plant leaves. As plant leaves are most consumed product, which is used by a huge population, so it's mere responsibility to identify the abnormality and resolve it quickly to consume it up to fullest. This paper also immerse that plant root rots occurs due to poor absorption of oxygen as wet soil fails to do so which also allows the root to decay. Prevention of root rots can be done by using proper aerated soil for plantation, replant in fresh and good soil, avoid standing water, etc.

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