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Plant Disease Detection and Classification Using Deep Learning

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Abstract - Agriculture plays a critical role in the economic development of any country, and in India, a significant portion of the population relies on it. Crop diseases pose a major challenge, as they can have detrimental effects on plant health and agricultural productivity. This paper presents an AI-based system for automated detection and classification of plant leaf diseases. The proposed system aims to assist farmers in quickly identifying diseases and implementing appropriate measures. The methodology involves image collection, preprocessing, segmentation, and classification using artificial intelligence techniques. By enhancing disease detection and management, this system aims to improve crop productivity in the field of agriculture.

1. INTRODUCTION

In this project, a deep convolutional network model is employed to detect plant leaf diseases using photos. This model utilizes neural networks and digital image processing techniques to accurately identify various types of diseases. It serves as a valuable tool, especially for inexperienced farmers, who may struggle to spot infections based on visual symptoms alone. Recent advancements in the field have led to the development of more efficient methods for disease identification, providing farmers with improved capabilities to manage and increase crop productivity.

2. LITERATURE REVIEW:

Subject: Detection of unhealthy region of plant leaves using Image Processing and Genetic Algorithm

In the context of the Indian economy's dependence on agricultural productivity, detecting and managing plant diseases is crucial. This paper introduces an algorithm for automatic detection and classification of plant leaf diseases using image segmentation techniques. By employing genetic algorithms, the algorithm achieves accurate segmentation, aiding in early disease symptom detection. The paper also provides a survey of different disease classification techniques. Implementing these automated techniques reduces the manual monitoring workload and enables timely intervention, ultimately enhancing crop productivity and quality.

Topic: Expert System for Diagnosis Mango Diseases Using Leaf Symptoms Analysis.

This research focuses on developing an expert system for diagnosing plant diseases in Barracuda mango (Nam-Dok Mai), a significant agricultural yield in Thailand. Being a tropical country, Thailand experiences various plant diseases that adversely affect mango tree growth. However, many agriculturists lack the necessary knowledge to accurately classify different types of plant diseases.

Additionally, there is a lack of a suggestion system to assist in decision-making for suitable disease prevention or treatment methods, leading to errors in plant treatments. To address these challenges, this expert system has been developed to aid agriculturists in diagnosing infected plants and providing immediate solutions. The system serves as an application that emulates the expertise of human specialists in the process of plant disease diagnosis. It aims to bridge the knowledge gap and guide agriculturists in effectively managing and treating infected plants.

Subject: Computer Visionimage Enhancement For Plant Leaves Disease Detection

Enhancing images through computer vision techniques like color conversion and histogram equalization has proven beneficial in various real-time applications, including remote sensing, medical image analysis, and plant leaf disease detection. The original captured images are typically in RGB format, representing a combination of primary colors (Red, Green, and Blue). However, the wide range of values (0 to 255) in RGB images can pose challenges in implementing certain applications. To address this, grayscale conversion is employed, reducing the range to 0 to 1, making it easier to implement a wide range of applications. Additionally, histogram equalization is utilized to enhance image clarity. Grayscale conversion and histogram equalization techniques are particularly relevant in plant leaf disease detection, where they aid in improving the accuracy and visibility of disease-related features.

Subject: Disease Detection of Plant Leaf using Image Processing and CNN with Preventive Measures

Agriculture plays a vital role in meeting the world's growing population's food needs and has significant implications for nutrition and the global economy. However, many farmers, particularly those in remote areas, face challenges due to the lack of accurate knowledge and disease detection methods. Manual observation of crops is time-consuming and often leads to substantial losses. Digital farming practices offer a potential solution by providing efficient and rapid plant disease detection. This paper proposes a technique for detecting and preventing plant leaf diseases in the agricultural field using image processing and two well-known convolutional neural network (CNN) models: AlexNet and ResNet-50. The technique is applied to datasets of potato and tomato leaves obtained from Kaggle to investigate the symptoms of unhealthy leaves. The process involves feature extraction and classification to detect leaf diseases using the AlexNet model.

Subject: Plant Leaf Detection and Disease Recognition using Deep Learning.

The advancements in computer vision, particularly through deep learning, have revolutionized the detection and diagnosis of plant diseases. This study presents an effective solution for detecting multiple diseases in various plant varieties using image-based analysis. The system focuses on detecting and recognizing plant varieties such as apple, corn, grapes, potato, sugarcane, and tomato, while also identifying several diseases that affect plants. The trained model exhibits a high level of accuracy in detecting and recognizing both the plant variety and the specific type of disease. The achieved accuracy rate demonstrates the effectiveness of the system in accurately identifying and diagnosing plant diseases. The system showcases remarkable performance and achieves a high level of accuracy in detecting and recognizing the plant variety and the associated diseases. This research contributes to the field of plant pathology by providing a reliable and efficient method for disease detection and diagnosis. The utilization of deep learning techniques and image analysis opens up new possibilities for automated and accurate disease identification in various plant species.

3.METHODS

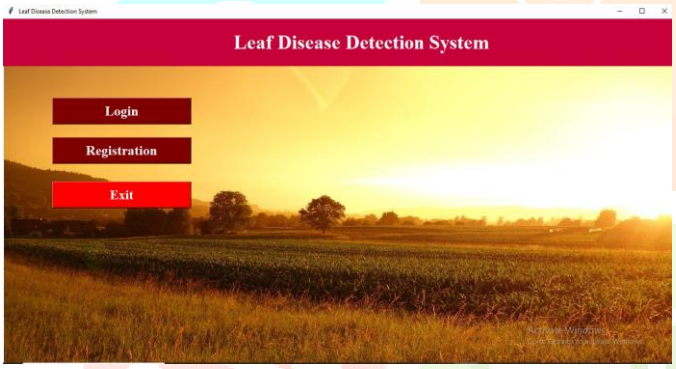
The methodology for plant disease detection and classification using deep learning algorithms, specifically CNN and SVM, involves several steps. Firstly, a dataset of plant leaf images is collected, comprising both healthy and diseased leaves. These images serve as the training data for the models. Next, image preprocessing techniques are applied to enhance the quality and remove any noise or irrelevant information from the images. This step helps in improving the accuracy of disease detection and classification.

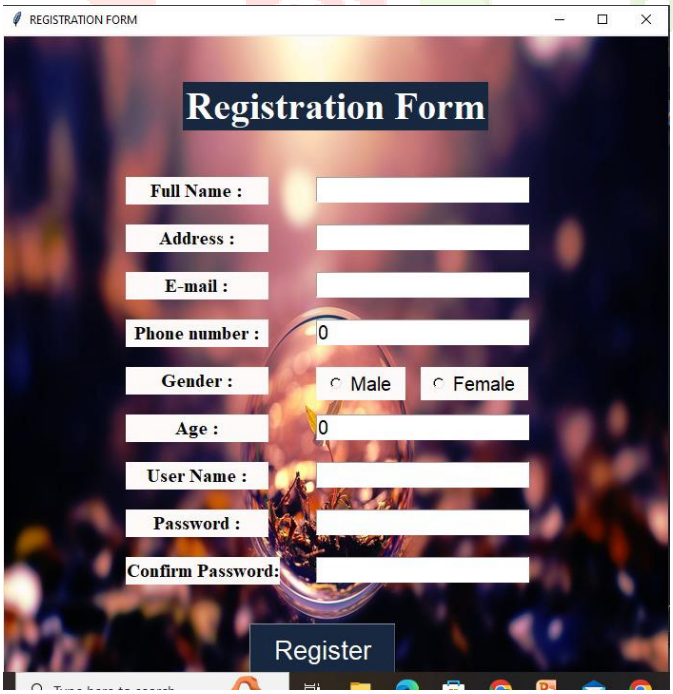
The deep learning algorithm, specifically a CNN, is employed to learn and extract relevant features from the preprocessed images. The CNN architecture is designed to capture intricate patterns and structures present in the leaves, enabling effective disease identification. Once the CNN model is trained, it can

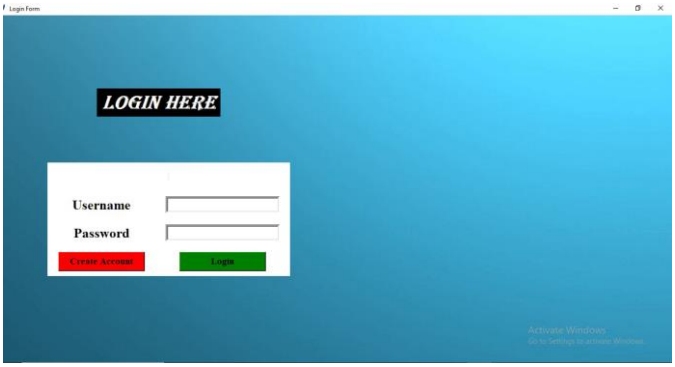
be used to classify new, unseen leaf images as healthy or diseased. The model assigns a probability score to each class, indicating the likelihood of the leaf being affected by a particular disease. To further refine the classification results, a Support Vector Machine (SVM) algorithm can be utilized. SVM is a supervised learning algorithm that creates a decision boundary to separate different classes. By incorporating SVM, the accuracy and robustness of disease classification can be enhanced.

The trained CNN model and SVM classifier work in conjunction to detect and classify plant diseases based on leaf images. This methodology provides an automated and efficient approach for farmers to identify and diagnose diseases in their crops, enabling timely interventions and improving overall agricultural productivity.

4. Results







5. DISCUSSION

The combination of CNN and SVM algorithms for plant disease detection and classification has shown promising results. CNN excels at extracting features from plant leaf images, enabling effective disease detection. SVM, on the other hand, enhances disease classification by creating decision boundaries between different classes. Comparative evaluations against traditional methods validate the superiority

of the CNN and SVM approach, demonstrating improved accuracy in disease identification. Considerations should also be given to computational efficiency. Overall, this combined approach offers a robust and accurate solution for plant disease management.

6. CONCLUSION

The agricultural sector is vital for global food production, making early disease detection crucial. This paper successfully employs a convolutional neural network (CNN) to detect and recognize 32 different plant varieties and their associated diseases. The trained model can be applied to real-time images for disease detection and recognition. Future work may involve expanding the dataset to include additional plant varieties and diseases, enhancing the trained models. Experimenting with different CNN architectures, learning rates, and optimizers can further improve the performance and accuracy of the model. The achieved accuracy of the proposed model offers valuable assistance to farmers in detecting and recognizing plant diseases.

7. REFERENCES

[1] H. Park, J. S. Eun and S. H. Kim, Image-based disease diagnosing and predicting of the crops through the deep learning mechanism, In Information and Communication Technology Convergence (ICTC), IEEE 2017 International Conference on, pp. 129-131, 2017.

[2] K. Elangovan and S. Nalini, Plant disease classification using image segmentation and SVM techniques, International Journal of Computational Intelligence Research, vol. 13(7), pp. 1821-1828, 2017.

[3] A. Vibhute and S. K. Bodhe, Applications of Image Processing in Agriculture: A Survey, International Journal of Computer Applications, vol. 52, no. 2, pp. 34-40, 2012.

[4] S. Militante, Fruit Grading of Garcinia Binucao (Batuan) using Image Processing, International Journal of Recent Technology and Engineering (IJRTE), vol. 8 issue 2, pp. 1829- 1832, 2019

[5] J. G. B. Garcia, Digital Image Processing Techniques for Detecting, Quantifying and Classifying Plant Diseases, Springer Plus, 2013.

[6] A. M. Mutka and R. S. Bart, Image-Based Phenotyping of Plant Disease Symptoms, Frontiers in Plant Science, vol. 5, pp. 1-8, 2015.

[7] S.P. Mohanty, D.P. Hughes, and M. Salath´e Using deep learning for imagebased plant disease detection, in Frontiers in plant science 7, p. 1419, 2016.

[8] B. Benuwa, Y. Zhao Zhan, B. Ghansah, D. Wornyo, F. Banaseka, A Review of Deep Machine Learning, InternationalJournal of Engineering Research in Africa, 24, pp 124-136, 2016, 10.4028/www.scientific.net/JERA.24.124.

[9] Y. Su, F. Jurie. Improving Image Classification Using Semantic Attributes, International Journal of Computer Vision, Springer Verlag, 2012, 100 (1), pp.59-77. 10.1007/s11263-012-0529-4.

[10] Y. LeChun, Y. Bengio and G. Hinton, Deep Learning, Nature, vol. 521, pp. 436-444, 2015. eprint https://doi.org/10.1038/nature14539.