AI Based Soybean Crop Disease Detection

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1. Abstract

Plant disease affect the growth of crop. Therfore, the earlier identification of disease is very important. This study is based on the use of machine learning in Image processing for the classification of various soybean leaf diseases. This study has proposed a optimized Convolutional Neural Network (CNN)-based technique for soybean leaf classification and detection. CNN is used in back word propagation for training the algorithm in order to improve accuracy and the overall system produces better results with higher accuracy. This research employs a standard data set of soybean leaves as well as real time data collection. ML methods can be applied to detect plant diseases, prior to the full appearance of symptoms.

Plant pathologists desire an accurate and reliable soybean plant disease detection system. In this study, we propose an efficient soybean diseases identification method based on a transfer learning approach by using pretrained AlexNet and GoogleNet convolutional neural networks (CNNs). The proposed AlexNet and GoogleNet CNNs were trained using 649 and 550 image samples of diseased and healthy soybean leaves, respectively, to identify three soybean diseases. We used the five-fold cross-validation strategy. The proposed AlexNet and GoogleNet CNN-based models achieved an accuracy of 98.75% and 96.25%, respectively. This accuracy was considerably higher than that for conventional pattern recognition techniques. The experimental results for the identification of soybean diseases indicated that the proposed model achieved highest efficiency.

2. Keywords:

Plant Disease, Deep Learning, Convolutional neural network.

3. Introduction

Soybean plays a crucial role in India's agricultural economy. With it's significant contributions to both both domestic consumptions and exports, Soybean have become an essential crop for farmers and the keyu driver of the agricultural sector. India is one of the largest soybean procedures globally with a substantial portion of its agricultural land dedicated to soybean cultivation. The crops popularity steams from its versatility as a source of edible oil, protein rich meal, and raw material for various industries.

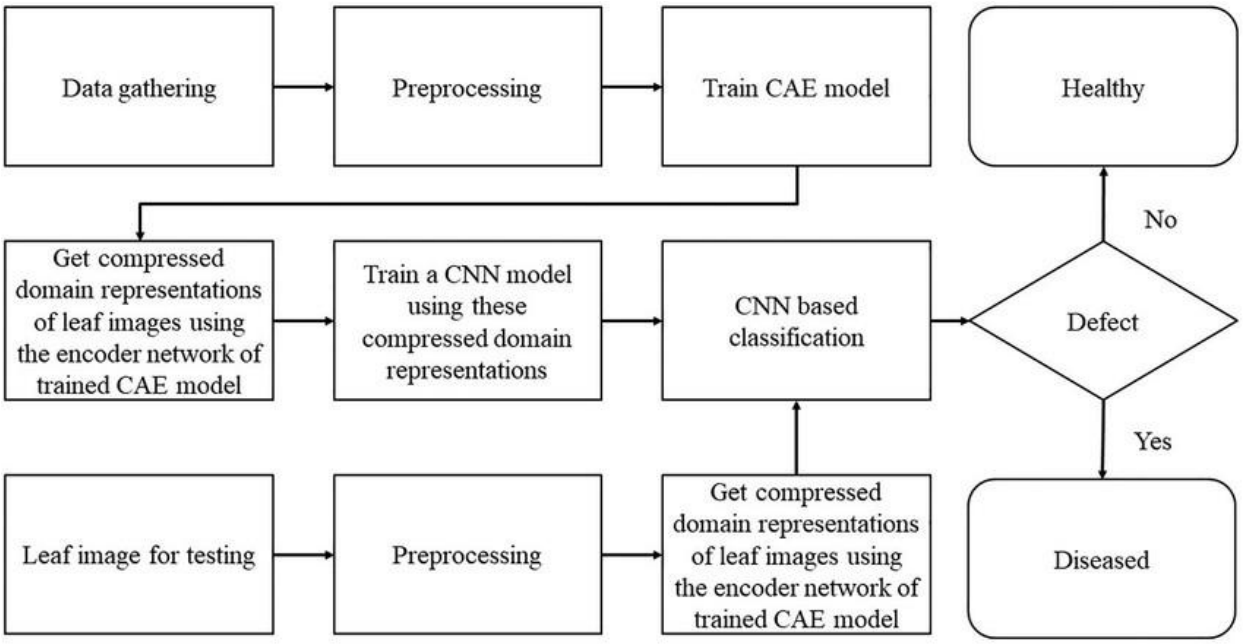
Soybean oil is a commonly consumed cooking oil in India, while the protein rich meal serves as a valuable ingredient in animal feed production. The high productivity of soybeans contributes to food security by meeting the growing demand for edible oil and protein rich products. As a reliable source of income, soybean cultivation provides livelihood opportunities for farmers across different regions of the country. Soybeans also have a positive impact on India's agricultural trade. The country exports a significant quantity of soybean products, including oil, meal, and other derivatives, contributing to foreign exchange earnings. This export potential further strengthen the agricultural economy and helps to stabilize the balance of trade. In addition to its economic significance, soybean cultivation brings environment benefits also have a positive impact on India's agricultural trade. The country exports is significant quantity of soybean.

To harness the full potential of soybean productivity in India, continued research and development efforts are essential. This includes the development of improved varieties, efficient farming practices, and the adoption of sustainable agricultural techniques. By focusing on enhancing soybean yields and maintaining product quality, India can ensure a stable and prosperous agricultural economy while meeting the demands of its growing population and contributing to global food security. To address these requirements, we can develop a high quality gold standard dataset that accurately represent the soybean crop, enabling advancement in disease , weed and pests, detection, yield estimation, and other related fields thus contributing towards improved productivity . This motive can be accomplished through use of machine learning, artificial intelligence and computer vision technologies which are recent trends in the field of Computer Science and Engineering.

4. Objectives

- To collect, curate and annotate Crop/Weed Field Image Dataset in Indian Agriculture for soybean crop.
- To design and implement a model for detection and classification of weeds and soybean.
- To design and implement a model for detection and classification of diseases, pests and soybean.
- To perform data analytics for improved productivity and sustainable agricultural practices.
- To analyse the leaf infection to make this service available on mobile app which can run on low level configuration devices.

5. flowchart



6. Conclusion

In this study, we proposed a deep learning approach that involved using the AlexNet and GoogleNet CNN architectures to build a classifier model for the defined one nondisease and three disease classes (bacterial blight, brownspot, and FLS). The classification accuracies for the AlexNet and GoogleNet CNN models were 98.75% and 96.25%, respectively. Classification was performed with the AlexNet and GoogleNet models by modifying various hyper parameters, such as the minibatch size, max epoch, and bias learning rate. Our experimental results indicate that the proposed deep convolutional neural network model outperformed the machine learning model in soybean

disease classification. Future studies can attempt to increase the performance rate of the model by varying the minibatch size, bias learning rate, and weight.

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8. Authors' Biography

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9. References

Example of List of References

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