CSE438

Task-2

Paper Report

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Section: 1

Paper Title:

Automatic Detection of Citrus Fruit and Leaves Diseases Using Deep Neural Network Model

Paper Link:

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Summary:

Introduction:

The passage highlights the significance of citrus plants in the agricultural industry and the challenges posed by diseases such as black spots, cankers, scabs, greening, and melanose. These diseases can lead to substantial crop losses and affect the quality of citrus fruits. Traditionally, disease identification has been a manual and subjective process, leading to inefficiencies and inaccuracies. The need for an automated system for detecting citrus fruit/leaf diseases is emphasized. The text also discusses the limitations of conventional machine learning techniques in recognizing and diagnosing plant diseases, highlighting the challenges in image processing tasks and the need for highly qualified personnel. In contrast, deep learning is presented as a more effective approach due to its ability to automatically learn hierarchical features of pathologies, eliminating the need for manual feature extraction and classification. Furthermore, the potential of deep learning techniques in various agricultural applications, such as plant disease detection, weed analysis, seed discovery, and fruit processing, is acknowledged. The proposal of an integrated deep learning model for automated citrus fruit disease detection, leveraging the success of CNN-based methods in image classification, is put forward as a promising solution to address the challenges in citrus disease identification.

Motivation:

The passage discusses the use of supervised machine learning and deep learning methods for the classification of citrus diseases from images. It highlights the challenges related to performance degradation in neural network models due to poor parameter and layer selection. In response to these challenges, the authors propose a CNN model for classifying citrus diseases in both fruit and leaf images, utilizing a revised number of layers and parameter settings. The text also mentions conducting experiments with various CNN model variants and comparing the findings to baseline studies. Ultimately, the authors suggest a CNN model for effectively classifying citrus diseases from fruit and leaf images, with the capability to detect specific diseases such as black spot, canker, scab, greening, and Melanose.

Contribution:

The passage highlights the contributions of the proposed research, which include the use of a state-of-the-art CNN model for classifying citrus diseases such as black spot, canker, scab, greening, and Melanose. The proposed deep learning model integrates a sufficient number of layers, and the efficiency of the proposed model is contrasted with that of similar studies. The text emphasizes that the proposed approach can help in the development of more sophisticated practical applications in the field of plant disease recognition based on their visual symptoms. The article organization is also briefly mentioned.

Methodology:

The proposed methodology for automatic detection of citrus fruit and leaf diseases using deep neural network model involves the following steps:

1. Dataset acquisition and splitting: Datasets are collected and split into training, validation, and testing sets.

2. Data preprocessing: The images are preprocessed to remove noise, resize, and normalize.

3. CNN model application: A multilayer convolutional neural network is proposed for the classification of citrus and leaves infected with different diseases. The CNN model is trained on the preprocessed images and tested on the testing set.

4. Evaluation: The performance of the proposed CNN model is evaluated using various measures such as accuracy, recall, macro, and f-measure. The results are compared with baseline studies to demonstrate the efficiency of the proposed model.

The proposed CNN model uses a different number of layers and parameter settings compared to earlier works to increase classification accuracy rates. The model is capable of distinguishing between healthy and diseased citrus fruits and leaves and can classify citrus diseases into black spot, canker, scab, greening, and Melanose.

Result:

The results of the proposed CNN model for automatic detection of citrus fruit and leaf diseases indicate its high performance in classifying citrus diseases. The model achieved a maximum accuracy of 94.55% when tested with the Citrus dataset, outperforming other deep and machine-learning works. The use of various convolution layers in the CNN contributed to the model's superior performance. The findings demonstrate that the proposed CNN model reached the best performance level in terms of citrus disease recognition compared to other studies. However, the comparison of published methodologies was noted to be challenging due to variations in datasets and limited information in the contributing authors' articles, making direct comparisons difficult for future researchers.

Future Direction and Limitations:

The proposed method for recognizing citrus diseases has some limitations, including the use of only one dataset in a single domain, a small dataset size, and the use of only one deep learning-based CNN model. To address these limitations, the authors suggest exploring other citrus datasets, using multiple plant disease datasets of varying sizes, and employing various deep learning models such as RNN, LSTM, Bi-LSTM, and hybrid models such as CNN + LSTM, CNN + RNN, and so on. Additionally, the authors suggest investigating additional disease classes for fine-grained analysis and creating and implementing a precision farming framework based on the internet of things (IOT).