Paper Title: Plant Leaf Disease Detection and Classification based on CNN with LVQ Algorithm

Paper Link: https://ieeexplore.ieee.org/document/8566635

1.Summary:

The paper presents a method for tomato leaf disease detection and classification using a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm. The dataset used in the study consists of 500 images of tomato leaves with four different disease symptoms.The CNN model is used for automatic feature extraction and classification, with color information actively used for research purposes. The LVQ algorithm is trained using the output feature vector of the convolution part of the CNN model. The proposed method effectively recognizes four different types of tomato leaf diseases

1.1Motivation:

Early detection of diseases in agriculture is crucial for efficient crop yield .The bacterial spot, late blight, septoria leaf spot, and yellow curved leaf diseases significantly affect the crop quality of tomatoes .Automatic methods for disease classification help in taking timely action after detecting symptoms .The proposed method aims to develop a CNN model and LVQ algorithm-based approach for tomato leaf disease detection and classification .The study utilizes color information and applies filters to RGB components for feature extraction.The CNN model is trained to extract features, and the LVQ algorithm is used for classification.The motivation is to effectively recognize and classify the four different types of tomato leaf diseases .

1.2 Contribution:

The study contributes to the field of plant disease detection and classification, specifically focusing on tomato leaf diseases.
The researchers propose a method that combines a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm for tomato leaf disease detection and classification.The study highlights the importance of early disease detection in agriculture for

efficient crop yield.The researchers emphasize the use of color information and the application of filters to RGB components for effective feature extraction in plant leaf disease research.The study validates the effectiveness of the proposed method in recognizing and classifying four different types of tomato leaf diseases.

1.3 Methodology:

The study proposes a methodology that combines a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm for tomato leaf disease detection and classification.The dataset used in the study consists of 500 images of tomato leaves with four symptoms of diseases.The CNN model is used for automatic feature extraction and classification, with filters applied to three channels based on RGB components.The output feature vector of the convolution part is fed into the LVQ algorithm for training the network.The LVQ algorithm, known for its topology and adaptive model, is used as the classifier in this study.The experiments involve training and testing operations using 500 feature vectors obtained from the original images.The proposed method effectively recognizes and classifies four different types of tomato leaf diseases.

1.4 Conclusion:

The proposed method of plant leaf disease detection and classification based on CNN with LVQ algorithm shows promising results in recognizing and classifying different types of tomato leaf diseases.The combination of a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm allows for automatic feature extraction and accurate disease recognition .The use of color information in plant leaf disease research, particularly by applying filters to RGB components, enhances the accuracy of the classification process .The study highlights the potential for further advancements in automatic plant disease detection using deep learning techniques and LVQ algorithm .Future research could focus on expanding the dataset and incorporating more disease types to improve the model's ability to recognize and classify a wider range of plant leaf diseases

2.Limitations:

2.1 First limitation: Color information extracted from a single color component may be limited in accurately classifying plant diseases, as plant leaf images are complex with varying backgrounds .The similarity between leaves with different diseases can cause misclassification when relying solely on color information

2.2 Second Limitation: Plant leaf images are complex with varying backgrounds, and relying solely on color information from a single component may result in limited accuracy in disease classification .The similarity between leaves with different diseases can cause misclassification when using color information alone, as certain diseases may have similar color patterns .

3.Synthesis:

The proposed method of plant leaf disease detection and classification based on CNN with LVQ algorithm has potential applications in agriculture for efficient crop yield by enabling early detection of diseases .Automatic methods for disease classification can help in taking timely action after detecting symptoms of leaf diseases, leading to effective disease management in crops .The use of CNN allows for automatic feature extraction from plant leaf images, while the LVQ algorithm serves as a classifier for accurate disease recognition .The study highlights the importance of color information in plant leaf disease research, suggesting that using different color components instead of a single one can improve accuracy results .The combination of deep learning techniques and LVQ algorithm offers potential for further advancements in automatic plant disease detection from raw images .Future research could focus on expanding the dataset and incorporating more disease types to enhance the model's ability to recognize and classify a wider range of plant leaf diseases