Design Plant Disease Detection System Using Deep Learning Convolutional Neural Network

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ABSTRACT

Background: Indonesia is an agrarian country whose people mostly work in agriculture by contributing to the 3rd largest GDP. But on the other hand, the main problem in agriculture is the development of pests and diseases of crops. There are cases where there are crops that are attacked by diseases with less obvious symptoms for farmers. For example, in citrus plants that are attacked by CVPD. Initially, the citrus plant does not show too early symptoms of the disease, making it difficult to distinguish from healthy plants. Based on these problems early detection and identification of plant diseases are the main factors to prevent and reduce the spread of plant diseases.

Method: The study used deep learning methods with the Convolutional Neural Network (CNN) algorithm model. The dataset used comes from PlantVillage with a total of 20,639 leaf image files that have been classified based on their respective classes. The design of the model architecture is done by designing the CNN model following the DenseNet121 architecture, by changing the parameters to improve the accuracy results. Image size is 64, train shape (20639, 64, 64, 3), epoch value 50,100, and 150. The number of input layers used is 4 layers with shapes (64, 64, 3). Densenet121 shape (1024), global average pooling2D shape (1024), batch normalization 2 (1024), dropout (1024), dense (256), batch normalization 3 (256), root (Dense) (15).

Result: This research was conducted with 3 epoch iteration tests to find the best accuracy value. The training data for epoch 50,100, and 150 produces an average model accuracy of 99.38% and the average value of the model loss is 0.019% can also be seen from the testing data results for epoch 50,100, and 150 has an average model of 95.16% and can be seen also from the average value for the loss is 0.20%.

Conclusion: Based on the algorithm that applied the resulting training accuracy of 99.58% and the accuracy of testing 96.41% then design this application is useful to accurately detect diseases in plants by using leaf imagery of the plant.

Keywords: Agriculture, Classification, CNN,

Table 1. Classification Result

No	Epcoh	Acc Training	Acc Testing	Loss Training	Loss Testing
1	50	99.087977	95.639533	0.02886844	0.1771074
2	100	99.489266	96.414727	0.01654786	0.137703
3	150	99.580473	93.435079	0.01379718	0.2927735

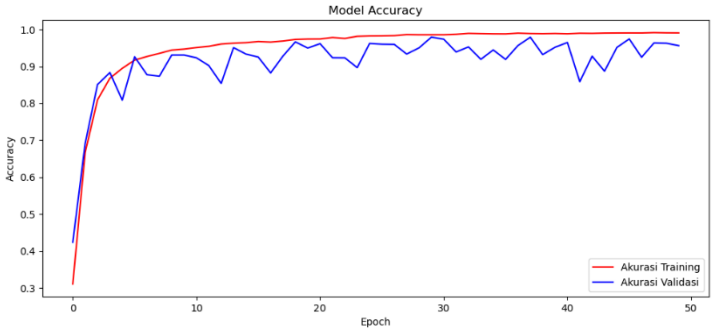

Image 1. Visualization of Iteration Accuracy 50 Epoch.

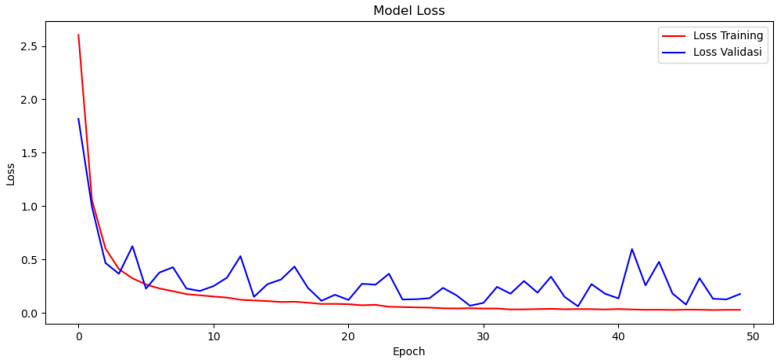

Image 1. Visualization of Iteration Loss 50 Epoch.