ABSTRACT

Tomato cultivation is a major agricultural industry worldwide, with a focus on plant quality and productivity improvement. Leaf abnormalities indicate the presence of diseases in tomato plants, whose management complexity increases due to the increasing variety of diseases. Manual observation of tomato leaf diseases is very difficult and time-consuming. Moreover, experts assistance is needed to accurately classify the diseases. With the development of technology, Machine Learning (ML) has been introduced to overcome these issues by learning and extracting patterns from raw data. Various previous research have developed methods for classifying tomato leaf diseases using CNN model architectures. However, they often face limitations in choosing the number of target class, low accuracy values, and poorly structured architecture explanations. Furthermore, the process of determining architecture hyperparameters was still done through trial and error. Therefore, this research proposes optimizing the modified VGG16 architecture with the best hyperparameters from bayesian optimization to cover these shortcomings. The best hyperparameter combinations were sought through 50 trials, then the optimally modified VGG16 model was retrained using these combinations. The training results of the modified VGG16 model were then compared with the training results of the original VGG16 model which implemented transfer learning. The experimental results show that the modified VGG16 model has an accuracy of 97.1% with an error of 10.66% against test data. This result is significantly better than the original VGG16 model, which has an accuracy of only 89% with an error of 65.83%. Finally, bayesian optimization proved to be able to optimize modified VGG16 architectures in accurately classifying tomato leaf diseases through effective selection of hyperparameter combinations.

Keywords : Convolutional Neural Network, Bayesian Optimization, Multi Class Classification, Tomato Leaf Disease, VGG16