

Abstract

Various deep learning and machine learning techniques were developed and used for classifying fruit grade or ripeness. However, these methods often require a large amount of training data and computational costs to produce reliable models. In this study, in order to address this issue, we propose a method that combines a ResNeXt-50 convolutional neural network with a support vector machine and optimizes it using an artificial bee colony as a metaheuristic optimizer in order to automate empirical tuning while finding an optimal solution. This approach achieved excellent results with 100% accuracy and a fast-training time of only 0.01 seconds, demonstrating the effectiveness of combining a convolutional neural network as a feature extractor with a support vector machine as a classifier in reducing the training data and computational costs of the model. Results suggest that this method could be a helpful tool for accurately and efficiently classifying fruit grade and ripeness.

Keywords: convolutional neural network, support vector machine, machine learning, deep learning, fruit grade classification, metaheuristic optimizer