

Identification of Banana Type According to Banana Tree Using Machine Learning

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Abstract

Bananas play a significant role in agriculture, especially in Sri Lanka, where approximately 29 varieties are cultivated. Proper identification of the types of bananas is essential for maintaining the best crop management practices, including fertilization, irrigation, and control of disease aspects. Identification of banana type by non-experts, done manually, may result in inefficiencies and errors. This research is intended to automate the identification of major banana species, such as Red Banana, Sour Banana, Cavendish, and Ash Plantain, with the help of machine learning coupled with image analysis. For this research, images were collected from multiple banana plantations across different regions, focusing on key identifying features such as petiole nature, color of the petiole, branching style, color of the midrib, and leaf blade base. Including the above features, two image data sets as branching style and leaf upper side per tree were collected. This data has been split into 80% for training and 20% for testing to ensure accurate model evaluation. The labeled data were used in training different machine learning models like VGG16, InceptionV3, VGG19, and a CNN custom model. The CNN custom model performed better among the selected techniques and gave a classification accuracy of 90%. The findings suggest that the custom CNN model can classify the banana types into four categories, which is a great approach to automating the identification process. Nonetheless, there are limitations, particularly the need for a bigger dataset size to cater to different conditions. These limitations could be mitigated in future studies by adding more banana types and a variety of data in the training of the models. From the findings of this research, it is obvious that farmers will be able to enhance crop management by employing this technique to boost agricultural productivity.

Keywords: *Banana Type Identification, Convolutional Neural Network (CNN), Digital Image Processing, Crop Management Optimization, Automated Agricultural Systems*