

INTISARI

ANALISIS KINERJA KLASIFIKASI MODEL VGG16, RESNET50, DAN INCEPTIONV3 MENGGUNAKAN *TRANSFER LEARNING* UNTUK MENENTUKAN TINGKAT KEMATANGAN BUAH PISANG CAVENDISH

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Pisang Cavendish (*Musa acuminata* Cavendish) merupakan salah satu buah tropis yang populer di dunia pasar global. Tingkat kematangan pisang menjadi salah satu indikator utama kualitas, yang berpengaruh pada pengambilan keputusan terkait distribusi, konsumsi, maupun pengolahan lebih lanjut. Namun, proses penyortiran tingkat kematangan sering kali dilakukan secara manual, yang berpotensi memunculkan masalah ketidakkonsistenan dan tidak efisien, terutama dalam skala besar. Oleh karena itu, penelitian ini bertujuan untuk mengevaluasi kinerja model transfer learning dari tiga arsitektur *Convolutional Neural Network* (CNN), yaitu VGG16, ResNet50, dan InceptionV3 dalam klasifikasi tingkat kematangan pisang Cavendish.

Model CNN VGG16, ResNet50, dan InceptionV3 dilatih menggunakan dataset pisang Cavendish dengan skema transfer learning. Evaluasi dilakukan menggunakan metrik *confusion matrix*, akurasi, presisi, recall, ROC dan AUC, serta analisis waktu komputasi dan *class-wise*. Untuk memastikan performa yang optimal, penelitian dilakukan dengan *fine-tuning*, seperti modifikasi *layer* akhir, *learning rate* dan *epoch*.

Hasil yang didapatkan dari penelitian ini adalah, diperoleh model VGG16 sebagai model terbaik dengan akurasi sebesar 88.83%, diikuti oleh InceptionV3 dengan akurasi sebesar 85.96%, dan model terakhir, yaitu ResNet50 dengan akurasi sebesar 60.46%.

Kata Kunci: klasifikasi gambar, deep learning, convolutional neural network, visual geometry group, residual network, inception, tingkat kematangan buah, computer vision.

ABSTRACT

CLASSIFICATION PERFORMANCE ANALYSIS OF VGG16, RESNET50, AND INCEPTIONV3 MODELS USING TRANSFER LEARNING FOR CAVENDISH BANANA RIPENESS LEVEL DETECTION

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Cavendish banana (*Musa acuminata* Cavendish) is one of the most popular tropical fruits in the global market. The ripeness level of bananas is one of the main indicators of quality, which affects decision-making regarding distribution, consumption, and further processing. However, the process of sorting ripeness levels is often done manually, which has the potential to create problems of inconsistency and inefficiency, especially on a large scale. Therefore, this study aims to evaluate the performance of transfer learning models from three Convolutional Neural Network (CNN) architectures, namely VGG16, ResNet50, and InceptionV3 in the classification of Cavendish banana ripeness levels.

CNN models VGG16, ResNet50, and InceptionV3 were trained using Cavendish banana dataset with transfer learning scheme. Evaluation was conducted using confusion matrix, accuracy, precision, recall, ROC and AUC metrics, as well as computation time and class-wise analysis. To ensure optimal performance, fine-tuning, such as modification of the final layer, learning rate and epoch, was performed.

The results obtained from this research are, the VGG16 model is obtained as the best model with an accuracy of 88.83%, followed by InceptionV3 with an accuracy of 85.96%, and the last model, ResNet50 with an accuracy of 60.46%.

Keywords: image classification, deep learning, convolutional neural network, visual geometry group, residual network, inception, fruit ripeness, computer vision.