ABSTRAK

Penelitian ini mengembangkan dan menganalisis kinerja model *deep learning* dalam mengklasifikasikan jenis durian berdasarkan citra digital menggunakan arsitektur ResNet50 berbasis *transfer learning*. Identifikasi jenis durian merupakan faktor penting yang menentukan kualitas dan nilai ekonomis buah di pasaran. Metode klasifikasi konvensional berbasis pengamatan visual terhadap bentuk, pola duri, dan warna kulit bersifat subjektif dan rentan terhadap kesalahan, sehingga diperlukan pendekatan otomatis yang lebih objektif dan konsisten.

Dataset yang digunakan diperoleh dari platform Roboflow yang terdiri dari 11.716 citra buah durian utuh, diklasifikasikan ke dalam lima varietas premium: Bawor, Black Thorn, Kanyao, Monthong, dan Musang King. Pra-pemrosesan mencakup pembagian data (70% latih, 15% validasi, 15% uji), penyeimbangan kelas menjadi 1.500 citra per kelas, *resize* citra ke resolusi 224×224 piksel, normalisasi piksel menggunakan parameter ImageNet, serta augmentasi data. Pelatihan model menerapkan strategi *fine-tuning* (pembekuan selektif) dengan mengevaluasi berbagai kombinasi *optimizer* dan *batch size*.

Hasil pengujian menunjukkan bahwa konfigurasi model terbaik dicapai menggunakan *optimizer* AdamW dengan *batch size* 32, yang memperoleh *test accuracy* sebesar 98,07%. Model tersebut memperoleh *macro average* F1-*Score* sebesar 97,62%, *precision* sebesar 97,26%, dan *recall* sebesar 98,02%. Performa tertinggi dicatatkan pada kelas Kanyao dengan presisi sempurna, sedangkan sedikit kesalahan klasifikasi terjadi antara varietas Musang King dan Bawor akibat tingginya kemiripan morfologi visual di antara keduanya. Penelitian ini menyimpulkan bahwa pendekatan *transfer learning* menggunakan ResNet50 sangat efektif dan andal untuk diimplementasikan sebagai sistem klasifikasi cerdas dalam membedakan varietas durian secara otomatis.

Kata Kunci: citra digital, durian, klasifikasi, ResNet50, *transfer learning*

ABSTRACT

This study develops and analyzes the performance of a deep learning model in classifying durian types based on digital images using the ResNet50 architecture based on transfer learning. Durian type identification is an important factor that determines the quality and economic value of the fruit in the market. Conventional classification methods based on visual observation of shape, thorn patterns, and skin color are subjective and prone to errors, necessitating a more objective and consistent automated approach.

The dataset used was obtained from the Roboflow platform, consisting of 11,716 whole durian fruit images, classified into five premium varieties: Bawor, Black Thorn, Kanyao, Monthong, and Musang King. Pre-processing included data splitting (70% training, 15% validation, 15% testing), class balancing to 1,500 images per class, image resizing to a resolution of 224×224 pixels, pixel normalization using ImageNet parameters, and data augmentation. Model training applied a fine-tuning strategy (selective freezing) by evaluating various combinations of optimizers and batch sizes.

The test results showed that the best model configuration was achieved using the AdamW optimizer with a batch size of 32, which obtained a test accuracy of 98.07%. The model achieved a macro average F1-Score of 97.62%, precision of 97.26%, and recall of 98.02%. The highest performance was recorded in the Kanyao class with perfect precision, while slight classification errors occurred between the Musang King and Bawor varieties due to the high visual morphological similarity between the two. This study concludes that the transfer learning approach using ResNet50 is highly effective and reliable to be implemented as a smart classification system for automatically distinguishing durian varieties.

Keywords: *classification, digital image, durian, ResNet50, transfer learning*